

MACHAZINE

Volume 21 - Issue 2
February 2017

Wiskunde
Informatica
Studievereniging



'Christiaan
Huygens'

GARBAGE IN IS GARBAGE OUT

Modelling

NEWLY APPOINTED COMMITTEES

Comittee Kick-off

ARE KIDS' PROGRAMS SMELLY TOO?

Coding by kids

EXPERT JUDGEMENT AT DELFT UNIVERSITY OF
TECHNOLOGY

25 years strong

CONTAINING:

CURRENT AFFAIRS | ASSOCIATION | COMPUTER SCIENCE | MATHEMATICS | MISCELLANEOUS



KICK START YOUR CAREER!

Every year 'De Delftse Bedrijvendagen' (DDB) leads over 2800 students to the start of their career. If you want to hit the ground running this year, make sure you do not miss this event. Whether you are job hunting or in need of an internship or graduation project, DDB offers an unique opportunity to get to know a wide variety of high-profile companies.

DDB is the largest technology oriented career event in the Netherlands, and takes place each year in the Aula of the TU Delft. This career event is specifically aimed at the students of Delft University of Technology and offers them a wide range of national and international companies and institutions.

DDB kick starts your career:

- 1 Receive tips and tricks about job interviews during the Application Trainings.
- 2 Get to know over 120 companies during the Presentation Days.
- 3 Go to the companies during the In-house Days to get an even better idea of each company and experience their work environment.
- 4 Have personal conversations with companies during the Interview Days.

IMPORTANT DATES

- 26th of January:
Deadline reduced entree fee
- 1st of March:
Deadline registration for In-House Days and Interview Days

PARTICIPATION

All activities described above are included in a single price when participating in DDB. On top of this, you also receive a magazine with tips and tricks for a successful start of your career.

You can participate by signing up via our website, www.ddb.tudelft.nl, or by coming to the Aula Congress Centre on the 24th, 25th or 26th of January. Until January 26th it is possible to register for a reduced fee. Hence we advise you to register before January 25th.

All personal information will be treated strictly confidentially.

DDB is organized by five study societies, that form 'The Pentagon' together:

- Vereniging voor Technische Physica | Applied Physics
- Gezelschap Leeghwater | Mechanical Engineering
- Technologisch Gezelschap | Chemical Engineering
- VSV 'Leonardo da Vinci' | Aerospace Engineering
- W.I.S.V. 'Christiaan Huygens' | Applied Mathematics and Computer Science

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Daphne van Tetering


Winter is coming: it's freezing outside and the streets are decorated with Christmas lights. One of the things I enjoy about winter are the various Christmas markets that can be found in the larger cities. Each market has its own stalls selling delicacies, but there are also stalls selling Christmas ornaments and even Christmas trees. I always enjoy going into the skating ring for an hour or so and finishing with a cup of hot chocolate. It gives me the ultimate winter feeling.

In Delft, we celebrate the winter with an annual event called 'Lichtjesavond'. During this evening, the Christmas tree on the town square is lit up for the first time. Scattered over the city center are small stalls, which sell typical winter-foods and drinks, such as hot chocolate, glühwein and the typical Dutch poffertjes. Besides this, there are groups of people caroling in the streets and several orchestras are playing Christmas songs. I would recommend everyone to go to 'Lichtjesavond' at least once!

Not only is the city of Delft celebrating the winter. At our study-association we have our annual 'Sinterklaas lunch' and the 'Oliebollenborrel', where we celebrate the coming new year with 'oliebollen', also a typical Dutch delicacy. Besides this, we celebrate Christmas together during a Christmas dinner and we go on a ski-trip in February! Lots of activities, which means that we have a lot to write about in this issue.

For those interested in joining a TU Delft DreamTeam somewhere in the near future, the article written by Martijn Janssen, one of CHs members, might be interesting! Martijn joined the Formula Student DreamTeam as part of his minor and tells you all you want to know about it in his article. The computer scientists among us are also in for a treat: Efthimia Aivaloglou, staff member at EEMCS, wrote an article about programming for children. I guess you're never too young to learn! For the mathematicians, I think the column Fred Vermolen wrote will be a good read.

Besides all the activities that have happened in the last quarter, a lot has happened within MaCHazine itself: we said goodbye to Sven and Floris. After putting in a lot of effort in former issues of the MaCHazine, they decided it was time for new committee members to take over. The new committee members that will be taking their places are Jamy, Dieuwer and Angelica. Jamy and Dieuwer will be focussing on making each issue look even better than the one before. Angelica will make sure that we will never miss any news, since she joined our editorial staff! I would like to thank Sven and Floris for everything they have done for us, and welcome Jamy, Dieuwer and Angelica! I'm sure we will have a lot of interesting meetings and of course a lot of fun.

By the time this issue will get to you, Christmas break will be over and the exams will be coming soon. In that light, I would like to wish you good luck with your exams and a great time reading the MaCHazine! If you have anything that you would like to tell us, whether it's a fun subject for an article or just something you would like to say, don't hesitate to contact us at machazine@ch.tudelft.nl. There is always room for improvement. 



WHAT DOES 'DE DELFTSE BEDRIJVENDA- GEN' OFFER YOU?

STARTUP AREA

New this year at 'De Delftse Bedrijvendagen' is the startup area which has been realised in cooperation with YES!Delft. During the presentation days 15 startups will be present spread over 2 days. The startup area can be found on the floor in between the auditorium and the 1st floor.

So if you are looking for a job, an internship or a graduation project, subscribe now at www.ddb.tudelft.nl.

1

Application Trainings

Prepare yourself for your job interview and the fair

On the 14th, 15th and 16th of February DDB offers Application Trainings. The companies will provide you with both general tips and tricks as well as detailed personal advice. During the Application Trainings you can also have your résumé checked, so it is up to standard when visiting the Presentation Days. Note that it is only possible to have your résumé checked during the Application Trainings!

→ 14th, 15th and 16th of February

2

Presentation Days

Get to know over 120 national and international companies

On the 21st and 22nd of February DDB hosts its most well-known event, the Presentation Days in the Aula of the TU Delft. This technical career fair gives you the opportunity to get to know over 120 different national and international companies! There are several ways of meeting these companies. For instance, you can visit their information stand or view their company presentation. Each day ends with an informal drink with the recruiters.

→ 21st and 22nd of February

3

In-house Days

Take a look behind the scenes at the companies

From the 20th of March until the 7th of April the In-house Days offer an opportunity to form a better, more complete idea of the companies you are interested in. Your résumé will be forwarded to the companies of your choice. Based on the résumés the companies will select the participants. You can sign up for the In-house Days until the 1st of March, the Wednesday after the Presentation Days.

→ 20th of March until the 7th of April

4

Interview Days

Take part in one-on-one interviews with the companies

From the 15th until the 26th of May DDB will be completed with the Interview Days. During this period, there are two different kind of interviews possible: Orienting interviews or even the first step in an application process. For the Interview Days your résumé will be sent to companies you are interested in. You will receive an overview of which companies are interested in meeting you, and from these you can make a selection.

→ 15th until the 26th of May





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From the Board

Karim Osman

Dear reader,

Before I start with talking about myself, I want to thank you all for taking the time to read this amazing MaCHazine. Over and over, the MaCHazine committee surprises me with how beautiful they can make this MaCHazine and I am honoured to start this issue with a page about myself.

For those who do not know me, my name is Karim Osman and I am a fourth year Computer Science student. To continue with labeling myself, I am also an Egyptian Muslim who is privileged to call himself the treasurer of our association this year. Being the treasurer of the association sounds pretty vague for some of you, which is why I will briefly try to explain my role. After that I will walk you through some of the choices I have made and how I got so lucky to write this article.

When you hear the title treasurer, the first thing that probably pops into your mind is money, 'the man with all the money', and actually, that is sort of right. As treasurer of this association, I am the one that knows everything about the financial part of W.I.S.V. 'Christiaan Huygens'. My responsibility is to know how every penny is spent, and if so, with the right reason for it. A big responsibility, which is also the reason why I am doing it and why I love doing it. I am learning every aspect of bookkeeping, but also the right way to decide what to spend our money on and what not. These choices are hard to make, but that is why I always need to be a 100% sure about my choices and think 3 steps ahead. Is this the best choice for the association, or is it just fun for now? This taught me to do good research and to always be prepared before I say something. It is a bit like a game of chess, always know what you did and why.


But before I was in this position, I had a busy path to follow. As a tiny boy, I set foot in EEMCS in 2013 for the first time. Not understanding anything of all the different people calling themselves WieWie and Wocky, and a group calling

itself the board of 'Christiaan Huygens'. Why would you ever stop a year with your study to do this fulltime? Not knowing I would end up as one of them, I started making friends and learning about the association. After the freshmen weekend I made more and more friends, even so much that I ended at the 'KMT' of one of the biggest student associations of Delft. Of course, I changed my mind really fast, but the reason why and how is a story for later.

At the end of my first year, I was not really active at the association yet. This changed when Board 57 asked me for the FaCie, a first year committee which makes a beautiful booklet about the freshmen weekend. And, wow, we had so much fun. It was a group of people who I can still call some of my best friends, and I think will remain that for a while.

The night we were signing the booklets, a very special tradition, Board 58 asked me for another committee, the WiFi. This committee organizes a winter sports vacation, party and 'something'-activity. I was stunned, why are they asking an Egyptian to go on a winter sports vacation? The stereotype Egyptian is a pharaoh with his pyramid in the desert, not a snow owl on skis. But ok, why not, let's try something new and I am happy I did. I liked it so much, I am actually going again this year and to be fair, no, I did not like the cold. I like the 30 degrees Celsius and above, not below. But the people and vibe made it for me. The members at our association are so open and great, they can make everything fun.

Of course, Board 58 kept going on with surprising me. At the end of my 2nd year they asked me for yet another committee, the study visit committee, the biggest committee that our association can offer. Wow, sure, I was ready for the challenge. The Board formed a diverse group, with some people I had known from day one and a person I had never seen before. It was weird in the beginning, but after this amazing trip, where we chose to go to Brazil, I am pretty sure she will ask me to attend her wedding.

But sure, I never got the choice to wait for the end of one committee before I continued to the next step in my life. Months before we went to Brazil, Board 59 was standing in front of me. As the chairman was talking, I did not realize what was happening. I was asked to choose between 2 options, continue my life as it is and forget this moment ever happened, or, take a jump into one of the most challenging, greatest, hardest, amazing, weird, fun year of my life and end here.... writing this article. 





TU Delft News

Dieuwer Hondelink

The Delft University of Technology is the biggest and oldest Dutch publicly available technical university, established by King Willem II on January 8th, 1842. But what is currently happening in and around the TU Delft? This article will list the most important events of the recent month.

Microsoft doubles investment in quantum research

On the 21st of November, Microsoft announced that the company will double its investment in quantum research. Microsoft is a big private partner of QuTech, the quantum institute of the TU Delft and TNO, and they will be reinforcing their bonds. Furthermore, Microsoft is planning to create its very own lab on the TU Delft campus, which will be directed by professor Leo Kouwenhoven. The tech company already has a quantum lab in Santa Barbara on the campus of the University of California and wants to start another one with the university of Copenhagen.

Virtual sleeping coach effective against insomnia

Good news for the 10% of the Dutch population suffering from chronic insomnia, the new app called SleepCare is here to the rescue! This virtual sleeping coach developed by TU Delft, Utrecht University and University of Amsterdam tries to help people learn a better sleep rhythm. The use of this app should reduce sleeping problems. Because of the lack of sleep therapists the access to cognitive behavioural therapy, including sleep restriction and relaxation exercises, is limited. SleepCare tries to solve this problem. It records sleeping patterns, helps users practising sleep restriction and teaches them relaxation exercises and sleep hygiene. In a controlled study, researchers saw a clear reduction in sleeping problems amongst the participants who used the app. Currently, the app is only available for the research group, but the researchers hope to release it soon.

Professor Arno Smets winner of first edX prize


Professor Arno Smets of TU Delft has won the first ever edX prize for Exceptional Contributions to Online Teaching and Learning. edX is a non-profit international platform offering MOOCs (Massive Open Online Courses), which universities have been using to make education more accessible through the internet. Professor Smets' lectures on Solar Energy and Sustainable Energy; 'Design a Renewable Future' reach more than 150,000 students around the

globe. Through the Solar Energy MOOC, TU Delft gives students from all over the world access to knowledge related to solar energy systems and applying that knowledge in practice. Congratulations Professor Arno Smets!

The Motown Movement

Three students of the faculty of architecture started the Motown Movement. They bought a house in Detroit which costs one month of "stuff" and want to



completely restore it and make it self-sustainable. The three students, feeling lack of real world experience and frustrated with the costs of making a house sustainable, want to prove that it can be done without having huge stacks of cash. The house requires a lot of care; all the windows are broken, the floor is damaged and the basement contains asbestos. The students want to start renovating the house in April of 2017. The plan is to place solar panels and boilers on the roof, the external walls will be insulated with layers of cellulose material and water from the roof will be collected, filtered and reused in the urban farm next to the house. A small "knowledge centre" will be created in the basement with books, computers and internet. On the ground floor, non-profit organisations will give workshops about building sustainably, energy efficiency, eating healthy and living healthy. In the future they want to renovate more houses, with new students every time. 

References

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Modelling: Garbage in is garbage out

Fred Vermolen

Nowadays you will see a lot of animations on your computer or television screen. These animations are shown in documentaries or even in commercials. Most people trust these simulations. Is this a good thing?

On the internet and on youtube, you are able to see many fancy animations of all kinds of processes. We can see animations that model physical phenomena as well as biological phenomena to mention just a few of them. Most people are deeply impressed by what they see and consequently, they put a lot of trust in these simulations and animations. In particular, if the animation looks physically very realistic, like in modern computer games, we tend to believe the simulations to be trustworthy. In this column, we take a look at simulation aspects. How are the simulation tools generated? The first thing that needs to be done is to construct a model for the phenomenon we are interested in. What is a model? The definition of the word *model* is the following:


Definition: A *model* is a (simplified) description of a system or a process to assist predictions.

The above definition allows the use of *model* in various different contexts, such as: a person who serves as a pattern for an artist where the system of interest could be themed as 'fat people' for instance, or a person who wears several clothes on a catwalk where the system of interest is what the clothes look like if they are worn, or a maquette of the Eiffel Tower in Paris in a museum. In all these cases, the model is just a representation of its specific reality and in particular it is the best representation that the modeller can think of. The Eiffel Tower in Paris really looks very different if the weather is fine with a clear sky or if it is raining cats and dogs. I also look differently in my clothes from the 'model' who wore it on the catwalk in order to sell these clothes to the people. Hence to which extent is this model reflecting reality? Science and technology also use models to simulate processes and phenomena. How is this done? Also in science, a model is a representation of reality that needs validation by means of (experimental) observations. First, based on these observations, a theory is developed in terms of series of hypotheses. Since experimental results are represented in terms of patterns and numbers, the theory needs to be quantified. This is done by setting up quantitative relations, and therewith a *mathematical model* is born. These mathematical models may have different appearances, like dynamical systems, (systems of) partial differential equations or stochastic processes or combinations of all of them. This all sounds easier than it actually is. One of the largest problems is that different model formulations can lead to the same results. One also has to bear in mind that the developed mathematical model is the representation of the modeller. Hence, often different modellers develop different models. For one phenomenon, there often exist different models that are based on totally different principles and assumptions. One might say that the model is as good as the modeller is. Therefore, it is questionable whether modelling can always be used to develop insight into the physical or biological process under consideration. It will mostly say that the developed hypotheses can explain the observed patterns. This may not be the only possibility for the description. *Modelling errors* will contribute to uncertainty and false predictions. The next step for the simulation of the process is to obtain or to approximate the solution of the developed model system. One has to construct a solution procedure and to implement this procedure into the computer if it is too com-

plicated to calculate the solution by hand. In most real-world problems this is very common. Also, we have to deal with errors in terms of *implementation errors*, *construction errors* (does the developed procedure make any sense? Does it lead to approximate solutions that exhibit the same properties as the exact solution does?). To this extent, mathematical analysis is indispensable. It is very important to know the characteristics of the solution of your problem and to be sure that the numerical approximation of the solution exhibits these properties to a large extent.

Each mathematical model needs various input parameters. To what extent are these parameters known? How large is the impact of these parameters on the quantitative description of the process under consideration? These are very important aspects. Further, once a numerical method has been developed or chosen, the numerical method will also exhibit certain approximation errors, or in jargon, *truncation errors*. Next to these errors, the computer only allocates a finite, predefined amount of memory to store each real-valued number. Hence this will introduce *rounding errors*. The last step is drawing conclusions and validating as well as visualisation of the results. Visualisation is used to present, explain and more importantly to sell the results. Visualisation can also serve educational purposes.

Concluding, behind each simulation or animation, a lot of work has been done and a lot of errors have developed behind the screens of performance. To this extent, it is crucially important to have a critical attitude towards models, although some models are very good. It is important to distinguish between the good and bad models. A good model is able to reflect experimentally observed numbers and patterns. Although this agreement will *never* be perfect. It also seems that some people think that everything that results from computer simulations is reliable. This is a very dangerous attitude and if a civil engineer with this attitude has to construct a bridge over which I have to drive my car with my wife and children as passengers, then this does not take away my anxiety. Hence sometimes modelling can be a matter of life and death. In other cases modelling can be used for making decisions, such as risk analysis, which is often used by insurance companies. Another model can be used to model population dynamics where several competing species rely on the same resources. This type of model could be used to predict the development of a multi-ethnic society, such as the Netherlands. One should be careful with computation of the results, development of the model as well as the interpretation of the results. If one does not interpret the results properly, then one may draw the wrong conclusions and carry out the wrong policy. In Law, this could lead to a wrongful conviction of the suspect by applying a wrong probability model if it comes to estimating the likelihood that the suspect actually has murdered the victims. Here I refer to the life sentence inflicted on Lucia de Berk, who allegedly killed seven patients and tried to kill three more of them when she was carrying out her night shifts as a nurse. In the first stage a wrong probability model was used to estimate the likelihood that these people died from natural causes during her night shifts. Later, a more sensible model was used and her innocence was evidenced, whereas she already spent 6.5 years in prison as an innocent prisoner. Hence, once again, it is crucially important to use modelling but also to remain critical at all times since *garbage in, is garbage out!*

I am sorry that I bored you with all this. I am going to drink lots of beers and other alcoholic beverages right now! Cheers – Skål! 



Not for girls?!

Felienne Hermans

A little bit of context: when I started the Bachelor Computer Science, in Eindhoven in 2002, there were about 120 first year's students of which 2 girls, myself included. At that point, I did not find this in any way annoying or troublesome.

If other girls wanted to be programmers, they could study computer science too? The fact that they did not choose to, was their choice and nothing else. Their choice had nothing to do with me.

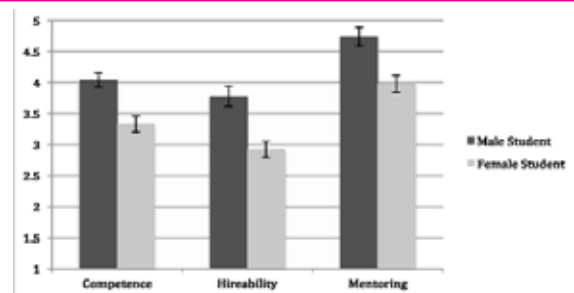
However, people do bring it up a lot! My guess is that this happens to other female students too. "I would never have guessed that you are studying computer science!". Especially at conferences I visit, my gender, rather than my research, is often a topic of interest. This is not just my topic; it is an area of interest of TU Delft as well. To attract more female staff, our university started a Female Fellowship to attract more women. This was not without issues, a male staff member sued the university for discrimination, but the Dutch court for Human Rights decided that TU Delft was right, since the gender ratio is extremely unbalanced. So, why do women need special help? Are they just not interested? Are they not smart enough maybe? Nope! It turns out that science, and especially computer science, is very much biased against girls.

It is not us girls, it is society. This article summarizes a number of scientific studies that explain why women are less likely to succeed. My hope is that by making you aware of these biases, the next generation of girls will not need extra help anymore.

It starts at a young age

Boys are better at maths than girls, right? Well, not so fast! In 2002, three Israeli researchers started a big study, in which over 3000 students were followed from age 11 to the end of high school. All their tests were graded twice, once by their own teachers, and once by another teacher, anonymized. The results were shocking (to me). In maths, the girls outperformed the boys in the second, anonymous exams, but the boys outscored the girls when graded by teachers, who of course were aware of their name and gender. This effect existed for maths only, it was not found in other subjects, like English and Hebrew.

The researchers hypothesized that in maths and science, the teachers overestimated the boys' abilities and underestimated the girls' math skills. And this did not only hamper the girls in school, no, this had long-term effects on students' attitudes toward maths. After controlling for other factors affecting the choice of study subject, the researchers concluded that the girls who had been discouraged by their elementary school teachers were much less likely



to take advanced courses than the boys. So, boys. As early as age 11, chances are that you were given the benefit of the doubt by your teachers, while girls were ranked lower.

And it does not stop there

This effect, of course, does not magically disappear when we graduate high school. If we fast forward to job applications, the effect lasts. In another study, researcher send the exact same resume out 120 times to senior researchers, of which half had a female name and half had a male name. The result? The female resumes were ranked significantly lower for competence, hire ability and mentoring, see Figure 1. Furthermore, they received salary offers that were 13% lower than their equally qualified male competitors.

Wow! Not only were they being discriminated against for this current job, the fact that they get less mentoring and a lower salary is also very likely to inhibit their future career chances. While a wage gap is, of course, very hard to quantify, this is surely giving credibility to the hypothesis that women get less pay for equal work.

Letters of Recommendation

And of course, it does not stop at the first job either. When people write letters of recommendation for female faculty, they are often much shorter for women, and contain different words. For example, recommenders used significantly more standout adjectives to describe male than female candidates. I could go on for pages and pages, but they only give me 800 words each MaCHazine and I am already over that. Also, I trust you get the idea by now. We, women in tech, are not being judged neutrally. Meritocracy, my ass.

Addendum

I understand that your first reaction to this is: this cannot be true. The studies weren't well executed, Israel and the US are different from Europe, and so on. If you are a woman, you want to be treated fairly. Realizing that is not true hurts. As a boy, you want to believe that you got to where you are on merits alone. Realizing that is not true hurts.

But the science is the science, I hope at least some of you will examine their own biases after this article.



Faculty Student Council

Stan Hennekes

During the first quarter of the year, the Faculty Student Council has done its very best to improve the faculty of EEMCS in every possible way. But what exactly did we achieve, apart from free coffee for ourselves? And what are we going to focus on next? For this issue, let's have a look at three different topics:

Coffee break

You may have seen us at our very successful first coffee break of this year. During this coffee break in the central hall of EEMCS, we were ready to hear your stories about studying at our faculty. The FSC was very eager to hear about all problems you encountered throughout the faculty or about any ideas for improving the education at EEMCS. While enjoying free cups of coffee, we received lots of feedback on a wide variety of topics. This resulted in two huge boards of sticky-note feedback, which we analysed and presented to the dean. As we were already (a little bit) expecting, the main issue turned out to be the amount of study places. One suggestion the FSC already has made to improve this, is opening lecture halls and class rooms as silent rooms during the exam periods. You will hear more later!

Furthermore, some comments were conflicting each other: "It's so cold in the lecture halls" vs. "Can the heating be turned off please?" and other comments were just pure compliments. Many people wrote down that they actually liked our faculty a lot! Some people were also thinking a little out of the box: "You should build a rooftop for students, with barbecues". Great idea, but did you take the wind into account? ;)


During the rest of the year, we will keep these sticky-note feedback moments to support us when talking about student needs. Did you miss our latest coffee moment? Don't worry, we will organise a feedback moment every quarter... If you cannot wait to give us your opinion, you can always send us an email at: fsc@ch.tudelft.nl

Collegerama

A big focus point of the FSC this year is to improve the coverage of courses on Collegerama. A lot of courses have been recorded and are available on Collegerama to watch. However, some important bachelor courses are missing and some recordings are too old to really use as a replacement for lectures. Furthermore, many master tracks are not recorded at all. Due to the restrictions on the capacity on Collegerama, it is simply impossible to record all courses every year. Therefore, the FSC is asking you to tell us which courses you want to have best on Collegerama in our online survey at bit.ly/collegerama. With your input, we can make sure that Collegerama is as good as it can be!

EEMCS2.0

You may have heard a lot of rumours and big plans concerning the building we are in. As an FSC, we are actively involved in the process of making plans for EEMCS in the future (under the name EEMCS2.0). At this moment, there are no definitive decisions that we can communicate, but if any interesting decision is coming up, we will keep you updated. In the meantime, we are open for any kind of ideas, thoughts and feedback on EEMCS2.0!

P.S. You may think that the FSC is always doing very important stuff very capably. But did you also know that we suck at escape rooms? 





[illegible]



ADSL

Lucile Nikkels

On Wednesday November 23rd we, the MindfAkCie, hosted the yearly ADSL (Algemene Docenten Studenten Lounge/General Teacher Student Lounge) in the /Pub. This was our first activity and, if we may say so ourselves, it was a great success!

From November 16th, a week before the ADSL, we walked around EWI during every break to promote the ADSL and hype students to come join us. We could anticipate many enthusiastic students at the ADSL, which in turn made us more enthusiastic!

If you weren't at the event and you don't know what the ADSL is: it is a drink (in Dutch we call it 'borrel') during which students integrate with their teachers, who give them free beer in return for their social skills and integration! (For once it's not about mathematical integration with your teacher...) As we are the MindfAkCie, we decorated the /Pub accordingly with mind-blowing festoons and brain-breaking questions, to help spark original and interesting conversations.

We started decorating and preparing the /Pub for our amazing event at around half past 2 (the ADSL would start at 4). Just as we were finished with this and the first enthusiastic students and teachers came in, we had a minor setback. The /Pub was around half full when suddenly the fire alarm went off and the entire EEMCS building had to be evacuated. Apparently, something had gone wrong with the frying pan in the /Pub. Oops! We're sorry for the people who were studying hard at that time, but on the other hand, since everyone had stopped studying anyway, they were all the more ready to come to the /Pub for the ADSL. Also, we wouldn't be the MindfAkCie if we wouldn't mess with people now and then. When we were allowed back inside, it became packed quickly and the fun could begin! So, luckily it turned out very well in the end.

We gave people the option to order pizza for later that evening because evidently our frying pan was out of order and cocktail snacks are obviously not sufficient for so many hungry students and teachers. Many of them were having such a good time that they decided to order a pizza and stay longer.

As the evening progressed and more and more people joined us, the awesome bar crew became busier by the minute. For a large part thanks to the always present Cor Kraaikamp, what a hero for our thirsty fellow students! We talked to several teachers and students and their response was always something along the lines of "I'm having a great time!", thus Marleen Hielkema, a 1st year applied mathematics student. The /Pub was filled with enthusiastically talking, laughing and toasting people.

Around 7 o'clock the pizzas we ordered arrived and everyone enjoyed their not-so-healthy-but-very-delicious bite. Thanks for the teachers who gave up a little bit of their family time to share dinner time with their students!

People couldn't get enough of all the fun in the /Pub because the party kept going for quite a few hours after dinner. Special shout out to teachers like Otto Visser for keeping the party going and even outlasting many of their students!



We from the MindfAkCie have really enjoyed ourselves with the organization of this event. The preparation, with our space glasses and colorful bandanas, was a lot of fun, but of course the real fun could only begin once the evening had started. We have our fellow CH members and awesome teachers to thank for this joyful evening. Especially a big thanks to all the teachers who turned up and proved that they are awesome not only during lectures, but also at the bar!

Now that our first activity was such a success, we are very excited to organize more events throughout the year. The next thing on our planning is the 'SinterklaaslunCH' and right now we are all working hard to make this event even better than the previous one. After that we are still far from done! During the course of the year you can expect us to organize more members' lunches and who knows what other surprises we have in store for you. We hope to see all of you at our events! 🍷



Area FiftyLAN

Lotte Bryan

Hi everyone!

My name is Lotte Bryan and it is an honour and my pleasure to tell you

all about one of the most awesome events and committees of CH: Area

FiftyLAN, organised by the LANcie. The event itself is quite new, with the

coming event being only the third edition organised so far. This gives us

a lot of freedom to do whatever we want with the upcoming event.

But first, let me tell you something about Area FiftyLAN. As the name implies, it has something to do with a LAN-party. At this point you might be thinking: "Huh, a LAN-party, isn't that one of those things where a couple of nerds come together and do nerdy things?" To be honest, "a couple of nerds doing nerdy things" is not too far off when aiming to describe CH (just kidding), but when it comes to the LANcie, we take the nerd-factor, enlarge it, turn it around and make it something awesome!

The difference between Area FiftyLAN and an average LAN-party is that Area FiftyLAN has everything a LAN-party has, but adds a lot of cool, awesome activities which makes it enjoyable for everyone. For example: last year an official Rocket League tournament was organised alongside a poker tournament, people were competing at very serious levels in a match of League of Legends and in a match of Just Dance. Minecraft was played parallel to Counter-Strike and Achtung die Kurve was just as much a success as Hearthstone. The entire event was topped off with contests in Starcraft, Overwatch and so on. This goes to show that Area FiftyLAN is an event which is enjoyable for people who have dedicated more than half of their life to gaming, people who enjoy gaming on a more casual level or people who can't tell the upside of a console from the downside and think LoL just stands for a funny joke. The combination of all this results in a wonderful weekend with an incredibly fun atmosphere.


Now let me tell you a bit more about who we are as a committee. As for me, I was quite surprised when asked to be a part of this committee. Being -admittedly- a member of the third category of gamers (the not-knowing-which-way-is-up type) I didn't really understand why anyone would ask me to organise such an event. But soon enough it was crystal clear to me that this event is also a blast for people who aren't that good at gaming, and that it was going to be even a hundred times more awesome to be able to organise it! After agreeing to being a part of LANcie 2016-2017, I was dragged into a crazy, fun whirlpool of planning, acquisition, odd-sounding words that have something to do with computers, 'chillings' with my committee and so much more. Sterre Noorthoek, Francis Behnen, Hilco van Wilk, Millen van Osch and Matthijs Kok make up the rest of the committee together with Beer van der Drift, who is our

Qualitate Qua and helps us every step of the way. Being the previous chairman of this committee, he knows just about everything about Area FiftyLAN and can either answer our questions or knows someone who can.

But what are we doing now? The organisation of Area FiftyLAN is just in its beginning phase. Making sure the website is up to date so that we can start the ticket sale is one of our main priorities right now. We're also starting to look for companies who want to sponsor us, so that we can offer amazing prizes for our main tournaments. Making a good schedule is important right now, so we don't have to rush anything. Of course, we must have a budget as well in this phase. One of the things I'm enjoying most at this moment is coming up with fun things to do during Area FiftyLAN, apart from the tournaments, the most important rule is: nothing is too crazy, if you can make it work.

As we come nearer to the event, the promo will start to get more and more important. At this point you will see the Area FiftyLAN banner hanging around campus, flyers attached to bicycles and giant L-banners at EEMCS. And of course, there will be awesome give-aways to make it extra advantageous to buy early bird tickets.

As you can tell, Area FiftyLAN is one of CH's newest and most modern activities, and it is a true adventure and a great learning experience to be able to organise it. If I can give you one tip, make sure you keep the 3rd, 4th and 5th of March blocked in your agenda so you can discover the gaming world in all its aspects.

All the best, and I hope to see a lot of you at Area FiftyLAN 2017! 

Association



Lustrum update

Felix van Doorn

As many of you have noticed, the lustrum year is underway in full force.

The first lustrum week was a fantastic success. The week got off to a

great start with our owl show. Many different owl species from all over

the world were on display. The highlight was of course Joep, the majestic

owl adopted by our association last year. Backed up by a charismatic

trainer, this activity was surprisingly entertaining for those who

attended.

Afterwards, many of you joined us for our autumn barbeque. The link between barbeques and ancient lustrum traditions was highlighted extensively in earlier lustrum articles in the MaCHazine. So if you are curious at this point, grab a few of the older editions and enlighten yourself with a bit of Classical history. The first lustrum lecture, on open source Data Science was visited by over 150 people. Here we learned about the work of Data Scientists through interactive examples using Pokémon. Aside from food for thought, people also got to enjoy 'Broodje Leo'. Our beer tasting at 'de Koperen Kat' will probably go down as one of the great positive surprises of the year. Apparently we had assumed our tour included four beers per person, upon arrival however we found out that there was no limit and that snacks were included. What more does a person need in life? The more ambitious among you joined us for a workshop in Amsterdam at Optiver! On friday we organized our 'Friends from the Past'-day. People could bring their friends to show what they were up to at EEMCS. Afterwards we enjoyed pizza and free beer in the /Pub. We capped off the night with a Pubcrawl through Delft. Most of the activities were sold out and we are very happy with all the positive feedback we received. The lustrum committee definitely intends to keep this #Trend going in that direction! We would like to remind you, that it would make your own life a lot easier if you would buy your tickets for activities as soon as possible. The sooner you buy these, the more time we get to make these activities even cooler.

The hitchhiking competition was also a great a succes. On a cold and rainy saturday morning all contestants gathered at a gas station by the A13. There they heard that their destination was Cologne and they had to meet by the Cathedral at 19:00h. This challenge was not for the faint of heart, but eventually everyone managed to do pretty well. Virtually every team made it to Cologne on time, only 3 teams out of 17 needed to be bailed out! Winners Floris Verburg and Steffie van Loenhout reached Cologne in only 3.5 hours, they even beat the lustrum committee there! For this extraordinary effort, they received

a fabulous prize. Groups like these however had to wait for a long time until we had decided to meet at the cathedral. Luckily Cologne is a city where there is a lot to do! The group then went out into the city for a well deserved dinner in a typical Brauhaus and then responsibly enjoyed some of the cities more affordable nightclubs.

Of course, dear reader, the lustrum committee also knows that you are all a lot more interested in the events that are all still on the horizon. There are still plenty of activities, so you do not have to worry that you missed out on all of the fun. Note down all the dates below in your agenda and keep your eyes peeled for the magnificent men and women in orange and rejoice when they bear news of the availability of yet more awesome tickets.



Another thing to keep your eyes out for, is the lustrum game. Around the 12th day of each month we will be hosting another challenge that is part of our lustrum game, 60 seconds!. You will have to come to the CH room to take part and earn points. To earn points, you will have to complete a given challenge in under 60 seconds. The quicker you manage to complete this challenge, the more points you receive. With these points you can earn fantastic prizes at the end of the year.

In the week of 20 through 24 March, we will be celebrating the second lustrum week. That monday is similar to the traditional monday during our association its Dies week. There will be a reception in the hall at EEMCS and you are invited to come by congratulate the board, enjoy a drink with us and celebrate the 60th anniversary of our association. After the reception, there is the option to join for dinner in a restaurant in the city. On Tuesday, it is time for the second lustrum lecture of the year. This time, the lecture will be held by former political journalist and tv presenter Ferry Mingelen! Throughout his career,




Ferry was an important factor in informing our nation on political affairs. With parliamentary elections coming up soon after this activity, we thought it would make for an amazing opportunity for Ferry to tell us something on #Trends in Dutch politics that he has observed throughout his long career. On Wednesday, it is time for another classical CH activity, the cocktail night! Suit up and join us in the /Pub for a night filled with a wide range of luxurious cocktails. Need we say more? On Thursday we have an interesting workshop in cooperation with Magnus. On Friday we are going to visit the Tiki Pool, the largest indoor swimming complex in the Benelux! A great chance to relax and wind down and get some rest from studying and the extremely tiring task of celebrating our association's 60 year anniversary.

On the 27th of April it is possible to celebrate Kingsday together with us! Time to join us in our #Trending orange outfits on our partyboat in Utrecht! After that we will visit one of the many parties going on in the city!

On the 13th and 14th of May, it is time for one of the biggest events of the year. Our association will be hosting its first Hackathon! It will take place at the Sports & Culture centre on campus. Together with Optiver, Aegon, KPMG and SNS Bank we are looking forward to hosting the biggest Hackathon in Delft. These partners will supply us with data and/or API's for you to get your hands dirty with! You can choose on which partner's track you would like to work. Then you have to form a team, if you did not have one already. You then have 24 hours to work on an original idea of your own. Although hackathons are always associated with Computer Science students, we would like to remind all of you that this activity is open to anyone who is interested in programming, design and mathematics. A quick glance at our partners also indicates that we have a lot to offer to those interested in Finance and Optimization as well. The goal of this competition is more about creativity and your idea than simply flashing one's programming skills. If you feel that you lack the experience to compete in such a competition, then you are still more than welcome to come. Activities like these are all about the learning experience and not so much about flashing what you can already do per se. We will try to organise a number of interesting workshops and techtalks, to further enhance the learning experience of each contestant. Upon submitting your project, the grand jury will take a good hard look at each team's submissions. You then do not only compete for a prize in your individual track, but also for the Audience Award. This one is awarded to the project that is best received by the other contestants. Admission to this event is completely free and food and beverages will be provided. There will also be a sleeping area, plenty of

gadgets for you tinker with and interesting people to talk to. Admission for this event opens a few months before the start of the event and closes at the beginning of April. Be sure to sign up early as spots are very limited.

As the year draws to a close, we do not have any intention of letting the year simply fizzle out. Therefore we simply cannot omit an #Ending party! This will be our association's biggest party of the year, which befits the title lustrum #Ending party. The line-up is not yet fully known, but we will provide you with updates during the course of the year.

The final event of the lustrum year is however the Day at the Lake. We will go to the Delfste Hout, where we will enjoy the weather, the water and refreshments. This is also the moment when you can redeem all the points earned during our immensely challenging lustrum game. In an auction, you can choose your own prize. The more points you earn in our competition, the more you will get to choose at this moment. 





Career College

Beer van der Drift

I'm sure you have thought about what career path might be interesting for you. It's a question most people will be asking themselves over and over again during their studies and after. Career College is here not to give a final answer, but to help in making decisions and to give insight. It's a new project which is well structured around possible career paths, created in a long thought process.

With the introduction of a new board member this year, which task is to focus on career related activities, there was time and energy to pay more attention to this very important aspect of life. After hard thinking and taking much into consideration, Career College was born! Pretty hard to think of a good structure, and finding the right people, but it has been a productive process so far!

In Career College every quarter focuses on a different aspect of making a career. Three of the quarters will focus on different paths, and one on personal development. All lectures have an aim of being two hours long, starting at 6pm. I hear you thinking: this is around dinner time! That's why we chose to make sure there is dinner, for an even cheaper price than you'd normally expect!

Personally, I have been in unique situations abroad in which I met some people which were a great addition to my network. Most of the things I do, also during this board year, are possible because of the people I know. Because of this I really wanted to focus on showing the importance of networking. The first quarter's focus was on personal development. We had a great networking workshop by Regina Tange and Marleen van de Kerkhof. There was also a workshop on problem solving thinking, great stuff!


An academic career can't be missed as well of course. That's why the second quarter has this subject as its main focus! The goal was to make the events chronologically correct. For example, we started with a lecture on writing papers. We all do that in our studies. The second event is a panel which will open up discussion around doing a PhD. The last event will be on doing research outside of a University.

The third quarter has a focus on working at a big company. This is a real hard quarter to make up events for, because the term 'a big company' is very broad one. Facebook, Unilever, Shell, they can all be considered a 'big company' but each separately does not represent the generic 'big company'. We had a great

discussion with a partner at one of the big strategy companies which one of the board members knew (network!), where our eyes really opened on the fact that there is not a generic 'big company'.

So, we are still finding out what might be interesting. Maybe another workshop, on lobbying for example? It will not open your eyes on what working at a big company means, but it's certainly a big aspect of any industry. Also we will host an event this quarter called 'Career after University' in which our alumni come by and talk about what they are currently doing. Great stories always come from this.

The last quarter (but not least), is a quarter focusing on starting your own company. Personally, I always wondered why on earth people would choose this over a good job? There is so much risk involved, why take this risk? For me, after meeting people and meeting the start-up community, I changed my mind. The risk is what makes it fun, it's the whole adventure of being really passionate about your product, and making it work. This quarter will focus on people telling their stories about the adventures they had, while also giving a helping hand in starting a company.

All in all, we are really happy with the way things are going. All the previous events had an average score of 8.5 or higher. Please do join us at these events, by registering on time! All the info can be found on the career college website: <https://wisv.ch/careercollege>. Cheap dinner, good stories, and help in an aspect of life which is important till your 60's. Sounds good right? 





Winter Sports: 2016

Elsje Burgers


Last year, after the exams of the third quarter, a group of 50 members of 'Christiaan Huygens' gathered at CH. In less than an hour, they would leave to Saint François Longchamp for an amazing week with snow, sun and lots of fun! Everybody was excited and ready to have an exhausting but unforgettable week.

After a long trip with the bus, we arrived at Saint François Longchamp. Skis and snowboards were rented and some people started skiing and snowboarding right away. The others enjoyed the sun (which wasn't too bad either) while waiting to enter the apartments. Even though everybody was very tired from the long journey, quite some people decided to take a look at the Yeti bar in the evening which resulted in a fun night there.

The next days were great days for skiing and snowboarding and almost everybody could be found on the slopes. The beginners made more and more effort and soon they all dared to descend the blue slopes by themselves. The more advanced skiers tackled the red and black slopes, fortunately without any serious accidents. Of course there was also time for some party in the evening, and the Yeti bar was visited every night by many participants.

Thursday afternoon, we gathered with the whole group at one of the lifts to go up together. Halfway down the slope, there was a café where we sat down with the whole group for some glühwein or hot chocolate. That evening it was time for a party with all study associations from Delft. After all, we were not the only students from Delft there since the VvTP, ETV and PS had also chosen the same destination. It was a fun night in the Yeti bar with lots of onesies and other crazy outfits.

On Friday, the WiFi organized a dinner for all participants. Unfortunately, this was already the last night and everybody started gathering their belongings and cleaned the apartments. On Saturday we could enjoy one last day of skiing and the evening it was time to get on the bus again to head back to Delft where we arrived the next morning.

It was an amazing week filled with skiing, snowboarding, partying, sledging, laughing and even a little bit of sleeping. I guarantee, you will hear amazing stories if you ask one of the participants of last year and they all can't wait to go again this year. 

Winter Sports: 2017

WiFi 2017


After the success of the previous trip, everybody was ready to sign up for the next edition of the CH Winter Sports. We opened the signup form and just three minutes later every place we had was taken. Unfortunately, there were many more that would like to join our awesome trip. Luckily after some calls and emails, we could arrange some extra spots. This means we will be with even more people than last year!

We will travel with a delegation of 66 people to our next destination: Les Orres. On the evening of the 3rd of February we will travel the 1135 kilometres by bus to arrive at this winter sports paradise in the South-East of France at Saturday morning. After an amazing experience, we will take the same approximately 12-hour trip back to return on the 12th of February.

Of course we will be skiing and snowboarding a lot, but there's so much more to a winter sports trip! There will be plenty of room to enjoy a nice beer, or even some sCHnaps! Of course we will also be partying! We already have a few parties lined up and our commissioner of escalation Lot will also be scouting for plenty of parties and things to do. So don't worry, you won't be bored! We think you will have a 'Lot' of stories to tell when you come back and join the other students again!

This trip will be the best opportunity to learn skiing or snowboarding! There are lessons available for those who need them. The lessons are generally a lot of fun, as you'll be seeing quite a lot of the area in a very quick time!

On the 11th of January at 6pm, there was a gathering with drinks ('de pre-wispo borrel') at which the WiFi will announce who will be your roommates in February. Afterwards, you can get to know your roommates and discuss how you are going to make this holiday an unforgettable one, so write this down in your calendars!

The WiFi is currently working hard to make this the best CH winter sports trip yet! If you have any questions or suggestions to make this edition even better, you can let the WiFi know by mailing to wifi@ch.tudelft.nl. We are looking forward to seeing you in France this February! 

Association



Kick-off!

Marleen Hielkema

November 15th the board organized the Christiaan Huygens Committee kick off. This is an evening on which the committees get a chance to meet each other and compete against each other. The committees were recognizable by their incredible clothing: The Sjaarcie wore leopard printed masks and the AkCie had bubble blowers.

First, there was a competition called "Crazy 60", a spin off from "Crazy 88", but 60 because this year there is a 60th board. The game's goal is to get as many points as possible. Each team gets a list with challenging assignments with which you can score points. Assignments like 'Eat a complete burger in one bite', 'Do a dance battle', 'Take a selfie with a mannequin' and 'Take a group photo without touching the ground'. To prove you actually performed the assignments, we were asked to take pictures and make videos of all our actions. We started off at the Bastiaanplein, where we got the assignments and went to the grocery store as fast as we could to get all the necessities to win the game. From there on all the committees were actively running through the centre of Delft and made some interesting photos and videos while trying to win the game. Quoting an enthusiastic participant: "I am having a great time!", Lucile Nikkels (Chairman of the freshmen committee AkCie). My favourite assignment was the dance battle. On behalf of the CHoCo, I dared Beer (from the board) to dance with me, with a few spectators to witness the battle. We danced 'Single Ladies' by Beyoncé, but Beer didn't find his inner-Beyoncé, so he lost... The first points for the CHoCo were earned! At the same time, on behalf of the SjaarCie, Doris put an entire hamburger in her mouth, she ate like she hadn't eaten in half a year. Almost anything was done on that evening to earn the points to win. Everybody was going through the assignments at a steady pace and points were earned very rapidly. It was a very tight game, but eventually this battle was won by the LuCie. Congratulations on this amazing victory!!!

Around 8pm the committees went to a restaurant called "Stadsherberg de Mol" that was very cosy and inspired by the middle ages. The plates and spoons were made out of wood and the room was very dark, only lighted

by candles. The restaurant staff was dressed as people from the middle ages to encourage the middle age atmosphere. At first there was a speech given by Karim, because Marjolein was not present. This speech gave a chance for every committee to "Vo"; all the committees were mentioned in the speech and got a little introduction. After that the dinner started. Every committee was seated at their own table at which they enjoyed a very nice meal. We started off with a vegetable soup and as main course there were spare ribs and chicken, some guys managed to eat an entire chicken... Everything had to be eaten with bare hands, because that is how middle agers used to eat their meals. The QQ'ers (CH board members which are also member of a committee to guide them) gave presents to the committee members to show them how much they love them and how much they appreciate their effort!!

When the dinner came to an end, there was some time for the committees to integrate with each other and to share the pictures and videos made during the game. At last, a few members of the committees went out to some pubs in Delft. A spectacular ending to an incredible night! 🍷





'Be the You want to be' at Capgemini

You might have seen this quote before from 'De Delftse Bedrijvendagen' or another career fair. Capgemini is my current employer since October and I will share my experiences from my study to where I am now: why I chose Capgemini, how I got in and what I currently do.

From 2010-2016 I was a member of W.I.S.V. 'Christiaan Huygens' and in that time I have written a few columns for Machazine concerning events. Now I'm moving on from writing event summaries and will take you on my personal journey with Capgemini.

The journey started at high school. Choosing Applied Mathematics was based upon the fact that it gives so many job opportunities, apart from the fact that I enjoyed mathematics so much. With that I postponed the unpreventable question of what I want and who I want to be. Choices in my Bachelor's and Master's were purely based on what I enjoyed doing the most at that point in time, keeping in mind that with this thought you will end up doing what you like the most. For me this was numerical analysis, which is also the department where I did my thesis. During my thesis I concluded that a PhD was not something I aspired. I enjoyed the project very much, but another 4 years of individual research did not sound appealing to me. Working alone most of the time made me realize that I want to work with other people. Teamwork is the first aspect I wanted to have in a job.

When you don't opt for work in the research area, it is most likely that a job does not contain much mathematics. Even though I did not want to go into research, I also did not want to have a job which was not related to my studies in any way. Wanting a bit of both worlds (mathematics and something new) I ended up going to multiple career fairs. Capgemini caught my attention several times, but I refrained from talking to them because the stand was always so busy. In the middle of my summer holidays I found out that there was an event at Capgemini for 'Insights & Data'. This immediately intrigued me. I enrolled and visited this event to become acquainted with Capgemini.

Why Capgemini?

Capgemini is a large company with over 180.000 employees in more than 40 countries and offers a wide range of consulting, technology and outsourcing services. The size of the company brings many advantages:

- A large variety of roles/work: to know whether you like a role/job, you have to experience it. As there are many different kinds of projects, you can explore what you like best. As this can change in time, the possibility to keep exploring different roles is an advantage.

- Diverse teams: the work areas of Capgemini are Europe, Asia, North and South America. It allows meeting with people with very different interests and backgrounds. It also offers many chances to work abroad.
- Training: Capgemini is supportive of your personal growth and offer many different trainings on hard skills and soft skills
- An excellent brand on your CV: whether you are starting your professional life or changing jobs, the companies on your CV reflect on you. Capgemini is a trusted consultancy and will stand out.

Something I personally liked is the environment, the way people interact with each other. A good work environment is also important to Capgemini. When applying for a role, an important part is the assessment psychologist meeting. In that conversation they will assess whether you fit in the role of consultant and within the company. During the event we also had one-on-one conversations: this was someone from recruitment or in my case, the deputy of I&D. If these conversations leave a positive impression and the assessment and the psychologist give positive results, you are offered a contract. This can happen within a week (2 dedicated days)!

Having multiple offers to choose from, the final decision was based on gut feelings. I often hear that people have a biased opinion of consultancies and therefore also of Capgemini: long workdays, suits, deadlines and most of all a clear hierarchy. Capgemini proofed my biases to be wrong. The welcome feeling, to start with peers, the fact that everyone is very open (yes, you can have coffee with your boss and your boss's boss) and the possibilities to keep learning and being challenged were decisive. "Be the you, you want to be" is a key phrase: create your own opportunities and grow to be the person you want to be.

Onboarding

The first day starts with a general onboarding: all new employees from all departments. You are welcomed, are provided with some general information, more practical information and the entry badge etcetera. There are also some workshops getting you to understand the 7 Capgemini values: Honesty, Boldness, Trust, Freedom, Team spirit, Modesty and Fun. The second day my department (I&D) had introduction with another department, so about half the people from the day before. You get some more detailed information and get to find your way around the building. The third day focused on I&D itself, the department my job is in: consultant Insights and Data.

The department focusses on Business Intelligence and Big Data. The goal is to give insights to our clients in their own data to improve processes. Translating data into insights should serve as input for client choices. You build or improve tools to have the customer use data better. You can specialize in analyzing



data, modelling data warehouses, integrating data from different sources, or create complex report structures. Both my study background as my interest are in becoming a Data Scientist.

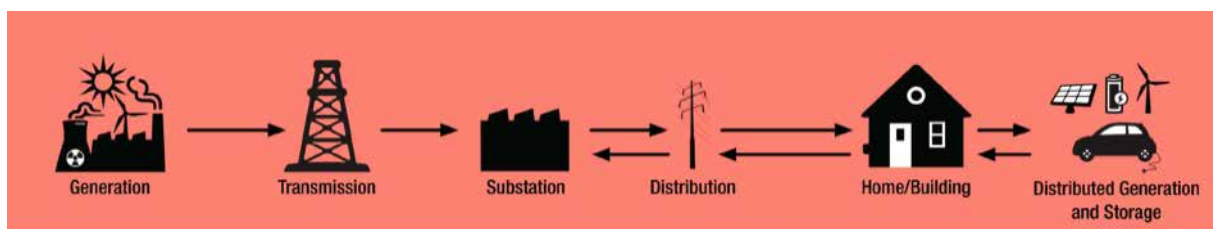
After three days of introduction there is preparation. Because Capgemini is a consultancy and works for customers, everyone needs to create a fitting CV. The second week consisted of a Business Intelligence training. With my background, most of the information was completely new, but very interesting. You are taught how data is acquired from the source, transformed to a usable format, sorted and combined with more data and stored before analysis can take place.

In my third week, the real job began. When you do not have a project yet, you are on the so-called 'bench'. I started with a tooling called SAS, which is commonly used at clients. In some branches, R is widely used and therefore I recommend the mathematicians to obtain as much experience as possible in R. Another important part is to network. Get to know your colleagues: what are their interests? What have they done up to now? At which companies have they had a project? Also letting people know your interest is a good way to find a project. You aim to be the first person to come to someone's mind when an interesting project comes along.

Project

My first project is 8 weeks long and in the utilities industry. A hot topic is Smart Grid, a reinvention of how energy is transmitted, distributed, and measured. It is becoming the new standard for utilities and consumers.

Large centralized power plants are no longer the only source of electricity and that selling more power is no longer the key objective of energy providers. The new goal is managing supply and demand. Classic grids were designed for one-way flow of electricity, but next-generation transmission and distribution infrastructure will be better able to handle possible two-way energy flows, allowing for distributed generation such as from photovoltaic panels on building roofs, but also the use of fuel cells, charging to/from the batteries of electric cars, wind turbines, pumped hydroelectric power, and other sources.



The smart grid enables operators to manage and monitor millions of devices and sensors. The smart grid has extensive communications capabilities that enable smart metering, as well as transformer monitors and other data gathering devices.

A distribution system operator in the Netherlands is adding data gathering devices at medium-voltage stations. The 35000 devices each have roughly 40 attributes and are recording real-time. This will result in a considerable amount of sensor data. The aim of our project is to optimize the link between IT and OT domain, with data as the main focus. Some aspects that we have to

deal with are: security risks, legal restrictions, how to incorporate the use of data from the existing smart grid, company strategies, where to store the data and which technologies to use. Next to these aspects we also need to keep in mind that the advice we give should be 'future-proof'.

This project is more on the Business Intelligence side and really follows up well on my BI training. It is very interesting to learn about this topic, how the company works and about the corresponding technologies. As I said I want to become a Data Scientist so this is a side step which allows me to understand the process before the data is available for manipulations.



Capgemini and you

If my experiences have triggered your interest, I am more than happy to provide you with more information. You can contact me (melissa.wijchers@capgemini.nl) for questions about Capgemini, about my project or about the solicitation procedure.

Getting projects done: our BEP story

Gijs Weterings

How do you measure how good your bachelor students are? At the TU Delft, we get thrown head-first into a big challenge: Find a real-world problem, and use everything you have learned to create an awesome piece of software, that is then deployed into the wild. This is what we did last year, and today we tell you how it went!

After $2\frac{3}{4}$ years at the TU Delft, the big moment was there. Job Engel, Maarten Flikkema, Martijn Steenbergen and myself teamed up for our BEP (Bachelor End Project). This is considered the grand-challenge of the bachelor phase, where we can show our worth in a ten-week long project for a real customer. But, as real customers go, nothing is set up for you when you start. You find your own coach, and get your own assignment from your own customer. The challenge is on!

Finding our project

Even before the project started, we were busy getting everything in order. With some searching, we found an awesome company from Utrecht that had a job for us. Progressive Planning was preparing to launch their updated product *gpd.today*, or *Getting Projects Done Today* in full. They provide a task planning and management platform that can be used to get and maintain a better view of projects. Individual employees of a customer define their tasks that need to be done, and can provide the system with dependencies, deadlines and sub-deliverables. The system then uses their own planning algorithm to provide a good task order, that keeps track of all deadlines in the system.

The system works great as long as it has enough data. However, this is where a problem arose. Many employees that should use the system daily, don't even get around to a daily sit-down to update the system. Because of that, the strong planning algorithms had no input data to base anything on. Asking the users why this was happening provided us with a clear problem: many of them were on the move a lot, and the existing application only worked on desktops/laptops. A lot of employees mentioned they would use the system way more if they could manage their tasks on their phone. This provided us with the perfect project for our BEP: creating a mobile app that brings the platform to a mobile device.

Getting started

With our problem clearly defined, and after doing some background research, we came across a pain point: We had ten weeks to build a pretty advanced mobile app, that had to work on both Android and iOS. For those of you that have never done this before: It means we actually had to build 2 apps, in 2 different programming languages. It was at this point our technical consultant at Progressive Planning, Marcel, strongly advised us to use Ionic[1]. With this framework, we can write Angular2 based webpages, which then get wrapped into a native layer for both iOS and Android. This meant, that with only one codebase, we could deploy apps to multiple platforms.

Another challenge we had to tackle from the first day was the user experience. We had to go beyond the logic and expectations we have as Computer Science students, as less technology-aware users would also be using the product. From the start, we shared our demo's to a few selected users for their feedback, and got some great insights from them.

It's alive!

Soon after starting our first development cycle, we were able to provide our customer with functional demo's. We set up a strict one-week sprint, with weekly demos and alpha-releases. Our coach from the faculty, Rini van Solingen, taught us how to best apply SCRUM to our project, warned us of the pitfalls many developer teams encountered, and then pointed out how we could improve our progress from week to week.



Figure 1: Setting up for a new sprint demo over Hangouts

After a few weeks, we had a nice minimum viable product, good enough for our first "real" users to start testing it. The suggestions we got from them were added to the backlog and reviewed. A lesson we learned here, is that it isn't bad to have multiple ways of executing a specific task. For example, the checking off of tasks is done quite differently between users. Some want to check it off, some want to swipe it away, some want to log additional specifics. We supplied ways for all test users to adhere to their workflow. Sometimes, we went back to the drawing board to propose some different ideas for UI/UX, and used that process to verify our steps in the process.



Figure 2: Sketching up an A/B test of the inbox page

Gamification

Getting users to use your app is one thing, but to keep them coming back is a different story. We decided to gamify the process slightly. Every day, the user starts out with checking out his schedule for the day. This is done by using the algorithm's output, combined with the knowledge of the user. He selects the specific tasks that really need to get done today. In that process, he's greeted with a graphic of a small sapling. By completing his tasks for the day, he's helping the sapling grow up. If all tasks of the day are completed, the sapling has turned into a mighty tree. This is obviously a small and simple thing, but in user testing we got the feedback the users really liked it, as a reward for their task management. In the future, the app may get updated with more gamification elements, to keep the user engaged with the app.

Choosing to go for such an interaction is a fun but challenging project. Users want a real simple experience that doesn't attract too much attention away from the functionality. Finding and using these minimal interaction windows is hard, but the reward is more than worth it. If you have an app, website, or anything user-facing really, try it out! Make a small gamification element in your app, and test it with a few users. If they like it, deploy it to all your users to give them that small endorphin release while using your app. They'll get hooked!



Figure 3: The tree, all grown up after a hard day's work

Presentation day

After 10 weeks, it was time to present what we had created. After a prime example of Finagle's Law (*Anything that can go wrong, will go wrong—at the worst possible moment.*), where first the last bugfix didn't come through on the demo device, and then the beamer refused to recognize our laptops until the entire system was reset twice, Martijn and I delivered our presentation to fellow students, our customers and Otto Visser, who was our judge of the day. Luckily, we managed to present with a working demo, and were pleased with the reactions we got.



Figure 4: Reflecting on the project during an EWI tour with our customers

Lessons learned

During the course of this BEP, we came across plenty of challenges. If you still have to do your BEP in the future, remember these lessons:

1. If you are using frameworks in beta, *account for breaking changes in your planning*. We used a beta version of Ionic 2, which changed up some APIs almost every other week, resulting in a few long refactor runs.
2. Stick to SCRUM for projects with a roadmap. Deviations from the backlog we set up often came back to haunt us, resulting in deadline stress.
3. Maintain communication with your customer, but realize they are not your main users. Priorities between customers and their users may conflict, and be ready to respond to this.

Interested in reading more? Our full report is up on the TU Delft repository: <http://repository.tudelft.nl/> (search for *Getting Projects Done today: A mobile cross platform project planning app*) [2].

References

- [1] The Ionic framework, <http://ionicframework.com/>
- [2] Our report, on the TU Delft repository, <http://repository.tudelft.nl/islandora/object/uuid:20368a6a-f316-44c9-9a47-eb47aadda22f?collection=education>



How kids code and how we know

Efthimia Aivaloglou

“Are kids’ programs smelly too?” Felienne Hermans asked me about a year ago.

And we embarked on a journey to find it out; using the Scratch project repository, Felienne’s experience in teaching kids, and the edX platform. And we found out not only that kids’ programs are indeed smelly, but also that smells matter to kids, and that we can teach them how to write good quality code.

Children are programming!

Block-based programming languages like Scratch, Alice, Blockly and App Inventor are becoming increasingly common as introductory languages in programming education. Scratch, which is developed by the MIT Media Lab, currently has more than 14 million users from around the world. It is aimed at children older than 8 years and provides a web interface through which they can create games and interactive animations.

In the Netherlands, Scratch is already being used in some high schools and even in some elementary schools. During the CodeUur challenge in October this year, the Netherlands broke the world record of elementary school children programming simultaneously with over 11 thousand children programming in Scratch.



Figure 1: Snapshot of the Scratch project that kids programmed during the CodeUur challenge. The code shown on the right is associated with the ‘Drone’ sprite.

Are they learning?

Given the increasing popularity of Scratch in programming education, questions naturally arise: are kids really learning how to program? Are their programs of significant size and complexity? Do they utilize programming abstractions and concepts? Is the code they produce of good quality?

These questions can be answered by analyzing the programming artefacts, i.e., the saved and shared Scratch projects. Since no public dataset of Scratch projects was available for analysis, we had to create it. We built a web scraping

program and used it to retrieve the source code of 250.000 Scratch projects publicly shared on March 2nd this year. We further made this dataset available to the research community.

Small and simple...

The majority of Scratch projects are small: 75% of the projects have up to 5 sprites and 76 blocks, while one fourth of the projects have up to 12 blocks [1]. They are also simple. We used the McCabe cyclomatic complexity metric, which measures the number of linearly independent paths through a program’s source code. We found that 78% of the scripts in the dataset have the minimum cyclomatic complexity of 1, since they contain no decision points, while 13.08% have a cyclomatic complexity of 2, containing exactly one decision point.

Certain programming abstractions and concepts were also found to be used rarely. For example, only 8% of the projects use procedures (named custom blocks in Scratch), but they use them a lot and for more complex code. One third of the projects uses variables, sometimes without initializing them. 40% of the projects contain conditional statements and 77% contain loops, but conditional loops are rarely used.

On the other end, 5% of the projects are large, having more than 18 sprites, while 4.8% consist of more than 500 blocks. The analysis also highlighted some surprisingly large projects: 135 with more than 300 sprites and even 30 projects with more than 20,000 blocks, and 209 scripts with a cyclomatic complexity over 100 and up to 246. We also found projects with 340 variables, 850 procedures, and even recursive procedure calls.

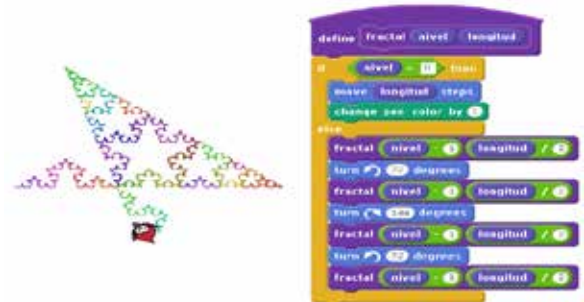


Figure 2: A recursive custom block and a snapshot of the output of `fractal(4,80)`, taken from the project at: <https://scratch.mit.edu/projects/99044492/>

...and smelly too

Code smells indicate weak spots in source code that are in need of improvement, i.e. refactoring. We explored 4 types of code smells in the Scratch dataset: dead code, code duplication, large script and large sprite.

The most common one is the dead code smell: we found that 28% of the projects



contain code that is never invoked. Scratch code suffers from the duplication smell when similar computations or events occur in multiple places in the program, either within or across sprites. This smell is also commonly found, since code clones are detected in 26% of the projects, with almost half of the clones copied three or more times, in the same or across sprites. Moreover, 30% of the projects are suffering from the large script smell, containing at least one script with 18 or more blocks, while 14% of the projects exhibit the large sprite smell, containing at least one sprite with 59 or more blocks.

Quality matters!

Does it matter that such a great deal of Scratch programs is smelly? It is already well documented that code smells hamper the comprehension and maintenance of code by experienced programmers, but does this stand true for children too? To investigate this, we performed a controlled experiment with 61 children, in the first year of Dutch high-school [2]. We created three different versions of a Scratch program implementing the 'Pong' game. The first version of this program was a 'non-smelly' version, in a second version we introduced the large script smell, and the final version suffered from the duplication smell. We then divided the students into three random groups, and had them perform the same comprehension tasks on their program, including explaining the program's behavior and modifying it. We measured both the time to completion and the correctness of the tasks of the three groups. We found that the students performed significantly better on the smell-free programs, even though there was no significant difference in their task completion time. Investigating different types of tasks in more detail, we found that the long method smell mainly decreased their understanding of the game as a whole, while the duplication smell made it harder for them to modify their Scratch programs.

Teaching kids to write good code, massively

Knowing that code smells are both common and harmful, and that basic programming concepts are rarely used in Scratch projects, we wanted to explore if it's possible to teach children to write good, feature-rich, smell-free code. We developed and ran an online introductory Scratch programming course in which we simultaneously teach elementary programming concepts and broader software engineering concepts, such as debugging and code quality issues like smells, duplication, refactoring and naming. The course ran as a MOOC (massive open online course) on the edX platform from June 15th to September 1st 2016. In total 3,179 students enrolled in the course, 2,220 participated in it, meaning they watched videos, submitted answers to quizzes or participated in the forum. Most of the participants (73%) were between the ages of 7 and 11. 181 students successfully completed the course, which is defined by edX as obtaining 60% of the possible points. This completion rate of 5.7% appears low, but it is in line with the usual completion rates for MOOCs. The course includes 6 weeks of material. Every week, the students are walked through the creation of one Scratch game through the course videos and material. In the course videos, Felienne often creates parts of the game and challenges the students to finish the remainder, or introduces errors and challenges them to find them. Examining the course results, we found that there is no difference in the students' performance on questions related to core programming concepts with their performance on concepts related to code quality, indicating that children can comprehend and be taught about avoiding code smells.

We also examined the effect of age on the performance of students. Comparing the performance of 11 and 12 year old students with 13 and 14 year old ones, we found that there is a significant difference between the performance of

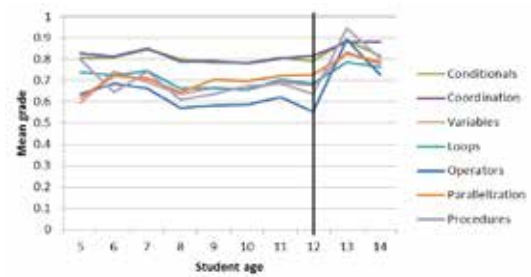


Figure 3 Answer correctness per student age and tested programming concept

the two groups, especially for questions related to operators and procedures. It is notable that the threshold of 12 years of age that we found for increased performance at those concepts is also the age after which the children in the Netherlands move from elementary school to high school. Something we are interested in for the future is whether their increased performance on those programming concepts is due to the more advanced mathematical concepts that they are taught within their high school curriculum.

Finished? Not even close!

With so much existing research on how university-level students can learn programming and so few works on early programming education, we still have many questions. For example, will the children that were taught about avoiding code smells actually avoid them when they are programming in the wild? We have to wait before we collect their follow-up projects to find out. Recent research has found gender differences in how good students think they are at programming and how this affects their performance in their first university-level programming course [3]; do such age-related differences exist in school age children too? It is often discussed that elementary school children may be able to focus and learn basic concepts better while being away from computers; can they indeed be taught programming while being unplugged? Also, knowing that 1 in every 3 or 4 programs in the Scratch repository are smelly, is this due to bad programming habits of all kids or of a specific group of them with certain characteristics? To answer those and many more research questions, we work on all directions: we constantly write code to enrich our Scratch dataset with more information, we perform static code analysis on the projects it contains, we are about to conduct more experiments at schools, using questionnaires and interviews, and we have lots of data analysis to perform. If you find our work interesting, for example for your Bachelor project or a MSc thesis, then feel free to contact Felienne Hermans at F.F.J.Hermans@tudelft.nl to discuss how we can work together!

References

- [1] E. Aivaloglou and F. Hermans, "How Kids Code and How We Know: An Exploratory Study on the Scratch Repository," in Proceedings of the 2016 ACM Conference on International Computing Education Research, 2016.
- [2] F. Hermans and E. Aivaloglou, "Do code smells hamper novice programming? A controlled experiment on Scratch programs," in Proceedings of the 24th International Conference on Program Comprehension (ICPC), 2016.
- [3] A. Lishinski, A. Yadav, J. Good and R. Enbody, "Learning to Program: Gender Differences and Interactive Effects of Students' Motivation, Goals, and Self-Efficacy on Performance," in Proceedings of the 2016 ACM Conference on International Computing Education Research, 2016.




Computer science puzzle

Anna, Alex, John, Nolan and Pauline are five American citizens. They still have to pay their hospital bills, none of them live in the same state, and they all live in a colored house. The goal of the puzzle is to determine which hospital bills belong to whom, where each person lives and what color their house is. The results can be put in the table below.

Hospital Bills	First Names	States	House Colors
\$270			
\$370			
\$410			
\$700			
\$1910			

To derive the table, the following information can be used.

1. The person who lives in Alaska owes less money than the owner of the blue house.
2. The owner of the purple house is Paulina.
3. Nolan owes less money than the owner of the purple house.
4. John owes less money than the person who lives in New Jersey.
5. The owner of the aquamarine house does not live in New Jersey.
6. The owner of the blue house is not Alex.
7. The patient with the \$370 hospital bill lives in New Jersey.
8. Of the person who lives in Nevada and Paulina, one lives in the blue colored house and the other has the \$700 hospital bill.
9. Either one of these people could be the owner of the burgundy house: the person who lives in Arkansas, the patient with the \$410 hospital bill, Anna, or the owner of the cyan house.
10. The owner of the burgundy house does not live in Alaska.
11. Either the patient with the \$410 hospital bill or the patient with the \$700 hospital bill lives in the blue colored house.

You can use the following table for help. 

		First Names					States					House Colors				
		Anna	Alex	John	Nolan	Paulina	Alaska	Arkansas	Iowa	Nevada	New Jersey	Aquamarine	Blue	Burgundy	Cyan	Purple
Hospital Bills	\$270															
	\$370															
	\$410															
	\$700															
	\$1910															
House Colors	Aquamarine															
	Blue															
	Burgundy															
	Cyan															
	Purple															
States	Alaska															
	Arkansas															
	Iowa															
	Nevada															
	New Jersey															





The card game SET: a mathematical challenge

Dion Gijswijt

The card game SET connects to a wealth of mathematical ideas. Here, we will explore recent developments on the *cap set problem*.

SET is an amazing card game invented by the population geneticist Marsha Falco in 1974. After the official release in the US in 1990, it has become hugely popular among children, students and mathematicians alike. Apart from being fun to play, the game connects to various mathematical problems. The title of the recently published book

The Joy of Set:

The Many Mathematical Dimensions of a Seemingly Simple Card Game[3]

is a pretty accurate description.

The rules

The game consists of 81 cards. Each card has four attributes:

- Number:** each card has One, Two, or Three equal symbols.
- Shape:** the symbol is either Diamond, Oval, or Squiggle.
- Colour:** the symbol can be Red, Green, or Purple.
- Filling:** the symbol can be Open, Striped, or Full.

For each combination of attributes, there is exactly one card. The objective of the game is to quickly find a SET. A SET is a triple of cards whose attributes match: for each of the four attributes, the three cards are all equal or all different. See Figure 1 for two examples.

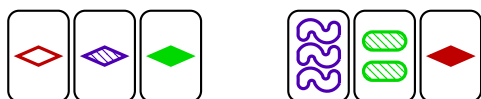


Figure 1: Two examples of a SET.

In the first, three attributes are all-equal and one is all-different.
In the second, all attributes are all-different.

The game begins by placing twelve cards face up on the table. The first player who spots a SET can take the corresponding three cards. The empty spots are filled with new cards. It may happen that there is no SET among the cards that are on the table. In that case three additional cards are laid out. The game ends when all cards are used up and no SET can be made using the remaining cards on the table. The one who has collected the most SETs wins.

Most toyshops sell the game, but you can also play online at <http://www.setgame.com/> (or one of the many unofficial sites).

Exercise 1. Can you find the six sets inside the twelve cards in Figure 2?

Enter geometry

The mathematical structure of SET becomes more transparent by encoding the cards in the following way. Let $\mathbb{F}_3 = \{0, 1, 2\}$ be the field of three elements (so we compute modulo 3). For each of the four attributes, we encode the three flavours by the three elements from \mathbb{F}_3 . This way, the cards correspond to the 81 vectors in \mathbb{F}_3^4 .

You can easily check that for three different 'cards' $\mathbf{x}, \mathbf{y}, \mathbf{z} \in \mathbb{F}_3^4$ the following are equivalent:

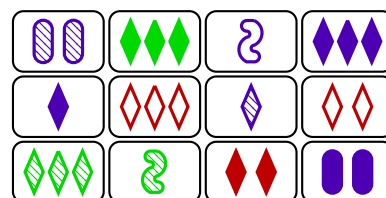


Figure 2: Find the six SETs.

- \mathbf{x}, \mathbf{y} and \mathbf{z} form a SET,
- $\mathbf{x} + \mathbf{y} + \mathbf{z} = \mathbf{0}$,
- \mathbf{x}, \mathbf{y} and \mathbf{z} form an affine line.

Being mathematicians, there is of course nothing stopping us from considering n -dimensional SET, where the cards are the elements of \mathbb{F}_3^n and \mathbf{x}, \mathbf{y} , and \mathbf{z} form a SET if $\mathbf{x} + \mathbf{y} + \mathbf{z} = \mathbf{0}$.

Exercise 2. The average number of SETs contained in twelve cards is $\frac{220}{79}$. What is the average number of SET's contained in twelve cards from 5-dimensional SET?

Exercise 3. At the end of a game of SET, six cards are left on the table, see Figure 3. Determine the card represented by the question mark.

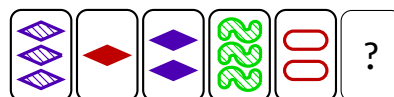


Figure 3: Six cards remaining. What card is missing?

Exercise 4. A magic square is a 3×3 array of SET cards in which all rows, columns and diagonals form a SET. Let \mathbf{x}, \mathbf{y} and \mathbf{z} be three cards that do not form a SET. Show that we can always (uniquely) complete the following magic square:

\mathbf{x}	\mathbf{y}	?
\mathbf{z}	?	?
?	?	?

The resulting set of nine cards is an affine plane inside \mathbb{F}_3^4 .

Caps

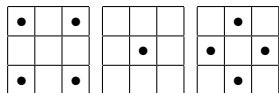
When playing SET, it often happens that there is no SET among the twelve cards on the table. On rare occasions, it may even happen that with an additional three cards there is still no SET! A collection of cards containing no SET is called a *cap*. The maximum size of a cap in n -dimensional SET is denoted $a(n)$.

Exercise 5. Show that $a(2) = 4$.

Proposition 1. The maximum size of a cap in \mathbb{F}_3^3 is $a(3) = 9$.



Proof. That a cap of size 9 exists can be seen in the figure below. The squares represent the $3 \times 3 \times 3$ elements of \mathbb{F}_3^3 .



To show that $a(3) \leq 9$, suppose for contradiction that C is a cap of size 10. If we partition \mathbb{F}_3^3 into three parallel planes, then each contains at most $a(2) = 4$ points from C . Hence they also contain at least 2 points from C as $1 + 4 + 4 < 10$.

Let H_0 be a plane containing 2 or 3 points from C , say $a, b \in H_0 \cap C$. Let ℓ be the line through a and b . There are three planes H_1, H_2, H_3 that intersect in ℓ such that H_0 and H_1, H_2, H_3 together cover \mathbb{F}_3^3 .

Since each H_i already contains a and b , it contains at most 2 other points from C . Also, H_0 contains at most 1 other point. This gives a total of $1 + 2 + 2 + 2 + 2 = 9$ points, a contradiction! \square

The maximum size of a cap in \mathbb{F}_3^4 equals $a(4) = 20$. This is not so easy to show¹. For a nice proof using Fourier transformations see the excellent overview paper [4]. Also for dimensions 5 and 6 the maximum size of a cap is known, see Table 1. Interestingly, up to dimension 6, there is (up to affine transformations) a unique cap of maximum size.

If you like to experiment with finding caps in n -dimensional SET, you can use the online ‘cap-builder’ by Jordan Awan [1].

Challenge 1. Find (with or without computer assistance) the number $a(7)$.

n	1	2	3	4	5	6	7
$a(n)$	2	4	9	20	45	112	?

Table 1: Known values of $a(n)$. Sequence A090245 in the OEIS

Asymptotic bounds of cap size

How does the maximum cap size $a(n)$ grow when we let $n \rightarrow \infty$? Clearly, we have $2^n \leq a_n \leq 3^n$ since $\{0, 1\}^n$ is a cap in \mathbb{F}_3^n . The *asymptotic solidity* of caps is defined as

$$\sigma := \sup_{n \in \mathbb{N}} \sqrt[n]{a_n}. \quad (1)$$

It is not hard to see that if C is a cap in \mathbb{F}_3^n and D is a cap in \mathbb{F}_3^m , then $C \times D$ is a cap in \mathbb{F}_3^{n+m} . Hence $a_{n+m} \geq a_n a_m$. This implies, by Fekete’s lemma, that in fact the limit $\lim_{n \rightarrow \infty} \sqrt[n]{a_n}$ exists and equals σ .

When C is a cap in \mathbb{F}_3^n , then we immediately have a lower bound $\sqrt[n]{|C|}$ for σ . The current record is $\sigma \geq 2.217389$ obtained by Edel[7] by constructing a very large cap in \mathbb{F}_3^{480} .

The *cap set problem* asks whether $\sigma = 3$. See for example Terence Tao’s blog post[6]. In May, Jordan Ellenberg and myself solved the problem by showing that in fact $\sigma \leq 2.75511$.

One of the interesting features of the proof is that it is very short and elementary. Although the proof is too long to give here (about 2 pages!), let me give a rough sketch here.

Idea of the proof. Let C be a cap in \mathbb{F}_3^n . We want to upper bound $|C|$. Now suppose that $f : \mathbb{F}_3^n \rightarrow \mathbb{F}_3$ is a function such that $f(\mathbf{x}) \neq 0$ if and only if $\mathbf{x} \in C$. Let $M(f)$ be the $\mathbb{F}_3^n \times \mathbb{F}_3^n$ matrix given by

$$M(f)_{\mathbf{x}, \mathbf{y}} := f(-\mathbf{x} - \mathbf{y}). \quad (2)$$

¹Donald Knuth has written a computer program to count the number of caps in \mathbb{F}_3^4 of each size using the group of affine transformations to reduce the search space. See [5].

Let us consider the submatrix N of $M(f)$ with rows and columns from C . Then, by construction, N is a diagonal matrix with nonzero’s on the diagonal. This implies that $|C| = \text{rank } N \leq \text{rank } M(f)$. The idea, therefore, is to find such a function f for which the rank of $M(f)$ is small, say $O(2.75511^n)$.

It turns out that this does not quite work: demanding that f is nonzero on C is too restrictive. Instead, we just consider the linear space L of functions $f : \mathbb{F}_3^n \rightarrow \mathbb{F}_3$ that vanish on the complement of C . Note that the dimension of L is large if C is large. Now we suppose, for contradiction, that C is larger than our proposed bound. Then, it turns out, L is sufficiently large to find a function $f \in L$ that is nonzero on ‘most’ of C , while at the same time $M(f)$ has small rank. This implies that C is small after all, contradiction.

To guarantee that $M(f)$ has low rank, we view the functions $f : \mathbb{F}_3^n \rightarrow \mathbb{F}_3$ as polynomials in the n variables x_1, \dots, x_n with each monomial being of the form $x_1^{\alpha_1} \dots x_n^{\alpha_n}$ with $\alpha_i \in \{0, 1, 2\}$. Each function $f : \mathbb{F}_3^n \rightarrow \mathbb{F}_3$ is (uniquely) represented by such a polynomial.

One can show that if f has degree at most d , then $M(f)$ has rank no more than twice the number of monomials of degree at most $\frac{1}{2}d$. If we restrict to polynomials of degree at most $d = \frac{2n}{3}$ (two-third of the maximum possible degree), then we lose only a tiny fraction of the available monomials. At the same time, the number of monomials of degree at most $\frac{2n}{3}$ (and hence rank $M(f)$) is quite small, see Figure 4.

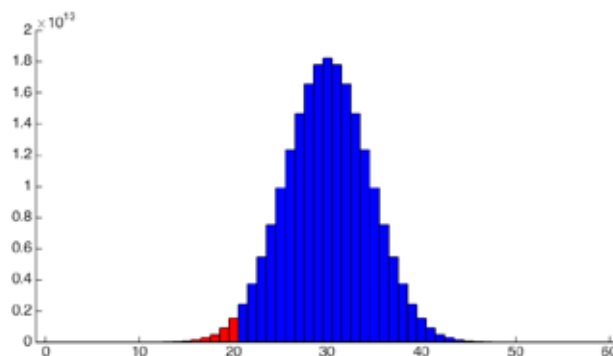


Figure 4: Counting the number of monomials of degree $0, 1, \dots, 2n$, where $n = 30$. The red part corresponds to monomials of degree at most $\frac{2n}{3}$.

The details can be found in [2]. \square

Although the cap set problem seems like an innocent question about a simple card game, it has connections to many other areas of mathematics. For instance, the fact that $\sigma < 3$ implies the so-called *Erdős-Szemerédi sunflower conjecture*. This in turn has implications for *Fast Matrix Multiplication*. If you want to know more about these connections, a good starting point is [8].

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25 Years of expert judgement at Delft University of Technology

Tina Nane

“The choice is not whether to use expert judgment, but rather to do it well or do it badly” (Thesis on expert judgment by Roger Cooke)

Why Expert Judgment?

The term ‘expert judgment’ encompasses a wide variety of techniques for using expert opinion in science. This article introduces the Classical Model (CM), one of the most established manners of performing expert judgment in a structured way, developed and extensively used here, at TU Delft. Roger Cooke is the patron and greatest endorser of the Classical Model (that is frequently referred to as the Cooke’s Method) for structured expert judgement, now an emeritus professor at TU Delft and a Chauncey Starr Senior Fellow at Resources for Future in Washington since 2005. His book, *Experts in Uncertainty* (hereafter referred to as THE BOOK [2]) was published 25 years ago and marks the formal birth certificate of CM.

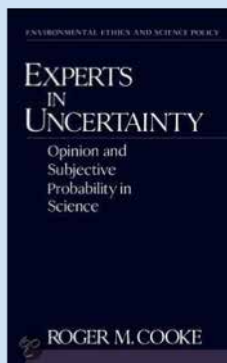


Figure 1. The book “Experts in uncertainty” published 25 years ago.

As quoted above, expert judgment is not a choice of analysis, but emerges from necessity. We choose to rely on expert judgment when there is no (or not much) available data at hand, or when the data sources are fraught with problems. You might think that today, in the great times of big data, this necessity would diminish. Nevertheless, there are numerous application with scarce or inadequate data. Take, for example, the gallium nitride (GaN) material developed initially for military radar chips, that “could make smaller, faster, more efficient and more durable processors” [6]. It is expected that GaN chips will soon replace the silicon chips. An interesting question is then: What will be the share of the market for GaN chips in 2025?

Consider now predicting the percentage of population resistant to antibiotics in 2020 in India. Currently, data from U.K. or U.S.A. are used to provide estimates worldwide or for other countries. Do you think the data are appropriate (statistically, we would ask if the sample is representative)? Can you think of another example where structured expert judgment should be used?

Numerous and very interesting projects have been carried throughout the years, where topics included climate change, nuclear applications, natural disasters and extreme events, foodborne disease, water pollution, dikes and barrier, aerospace applications, to only name a few. The 45 projects until 2006 have been documented in the “TU Delft expert judgment database” [4]. Many more recent projects are mentioned on Cooke’s personal website [8].

Making decisions under uncertainty

You certainly remember from your probability and statistics course that uncertainty is ubiquitous and should be included in the models that we use to make decisions. One possible tactic to handle uncertainties in the decision process is to ignore them. This however might lead to very poor decisions. Take as an example “We don’t really know the impact of climate change, so let’s not change our behaviour until we know more”, as Roger Cooke was mentioning in his lecture notes a number of years ago. Fortunately, climate change has meantime been recognized and the need of including structured expert judgment in addressing the issue has been acknowledged [7]. Uncertainty can also be acknowledged, while still remaining an abstract intangible feature of the model. With this respect, in the same context of climate change, deniers have used uncertainty to “shift the proof burden”, while alarmists have used uncertainty “to frighten us into precipitous action” (Roger Cooke). Think about whether you recognize this behaviour in the current trend of politics.

Another possibility is to express uncertainty in natural language. This eludes any quantification and expressing ones (un)certainities qualitatively, such as “very likely”, “highly unlikely”, etc. Although it may seem sufficient for our daily life decision making, in most circumstances a quantitative evaluation of uncertainty is imperative. Probability theory properly equips us to reason under uncertainty. Consider the example below.

“Suppose the Nuclear Regulatory Commission licensed nuclear reactors based on the finding that each reactor’s safety each year was “virtually certain” (99–100 percent probability). With 100 commercial nuclear reactors, each with a probability of 0.01 per year of a meltdown . . . well, do the math. That is the point: To reason under uncertainty you may have to do math.”[3,9].

And while you would think this is the obvious thing to do, you have to realize that in practice this is not always the case. The main take-away message is that science-based uncertainty quantification is possible, even in the absence of data. In this regard, the role of structured expert judgment is to quantify uncertainty not to remove it. The concept of “experts in uncertainty”, which gives the title of THE BOOK emerges therefore naturally.



Experts in uncertainty

Experts express their uncertainties in the form of subjective probabilities (more specifically as the 5%, 50% and 95% percentiles of an unknown distribution of interest). THE BOOK provides a good overview of Savage's normative decision theory, along with the construction of the subjective probability. The mathematical concepts and elegant proofs are gracefully enfolded by an admirable work of belle-lettres.

Structured expert judgment refers to the process of asking the experts for their uncertainty assessments that is subject to "transparent methodological rules, with the goal of treating expert judgment as scientific data in a formal decision process" [4]. The goal of CM is to achieve rational consensus, that is to provide a tractable method to compute and use expert's data; the experts are encouraged to state their true opinions and their assessments are subject to empirical control. Finally, "all experts are treated equally, prior to processing" their results [THE BOOK].


Typically, experts are not equal in their ability to quantify their uncertainties, nor are they equally informed. CM evaluates the performance of experts by asking experts questions from their field to which the answers are known by the analyst. Two performance measures are calculated based on experts' answers, statistical accuracy and information and experts' scores are used to aggregate their assessments mathematically. Statistical accuracy measures "the degree to which the data support the hypothesis that the experts' probabilities are accurate" [4]. The relation with the classical hypothesis testing has led to the name of "Classical Model". The information score measures the degree to which the distribution is concentrated [4]. The combined score, used to weight experts, is obtained by multiplying the calibration and information score.

Performance-based weighting has been extensively validated and has been shown to outperform the equal weighting. A strong case and plenty of references can be found in [10].

COST network

As mentioned in the beginning, there are numerous methods for using expert judgment in use and the field is still open. For this reason, a European Cooperation in Science and Technology (COST) project [5] emerged from a strong need for alignment, communication and interaction among practitioners and problem owners. COST initiative is run out of University of Strathclyde in U.K. and the network consists of active members from 27 European countries. Many other researchers outside Europe are also joining COST regular workshops.

Under the broad COST framework, the Expert Judgment Network aims to bridge the gap between scientific uncertainty and evidence-based decision making. The meetings intend to strengthen and enlarge the expert judgment network, as well as to reach out to other communities that use or would benefit from structured expert judgment. This includes reliability, natural hazards, health, food security and project and asset management.

This article is a very brief introduction to an exciting topic covered by many excellent materials. If you want to learn more about the uncertainty quantification or structured expert judgment, don't hesitate to contact me! 

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Shortest Path Problem in practice

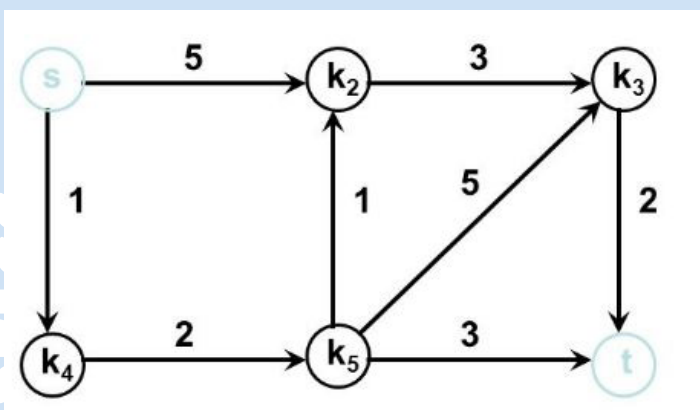
Irene Vooijs

During the lunch lecture on Tuesday November 15th, a well-known mathematical optimization problem was the subject of discussion: the

Shortest Path Problem (SPP). This was also linked to the hitchhiking competition that weekend, where a smart route might help to win!

The lecture was given by Henk Post, who graduated in Applied Mathematics at the TU Delft in 1995. During his graduation, he already had an interest in optimization problems in transport, because his graduation subject was about share-taxi's. The subject of traffic is also part of his current job, as he now works for Connexxion. During the lecture, he elaborated on the existing algorithms to solve the SPP.

The shortest path problem is part of graph theory, about finding a path between two nodes in a graph in such a way that the sum of weights of the edges is as small as possible. On a road map, roads are represented by edges and the intersections are represented by nodes. The longer the road, the larger the weight. For practical purposes, it is very useful to know the shortest route from location A to location B. For example, you have probably used Google maps before, so you could arrive at your destination without any detours.



An example of a shortest path problem

The algorithms

Finding the shortest path is of importance to optimize many modern practical problems. Therefore, many algorithms have been developed in the last century. The first algorithm is discovered by the Dutch computer scientist and mathematician Edsger Dijkstra, who published his idea in 1959. The algorithm starts at the first point, checking all routes, then choosing the shortest route. This is repeated until the final point is reached. A little bit more elaborate is Ira

Pohl's algorithm, who uses bidirectional search. This algorithm is almost equal to Dijkstra's, except for the fact that Pohl's algorithm starts at both the first and final point, performing Dijkstra's algorithm until both points meet.


Another approach was thought of by Hart, Nilsson and Raphael in 1968, and is based on the assumption that you want to look for routes that are already in the direction of the destination and not in the opposite direction. The method is called A*. It uses heuristics, and its runtime is considerably lower than Dijkstra's algorithm. A* can also be done in a bidirectional manner. However, performing bidirectional A* search requires special attention to when to stop the algorithm, because it is less evident that the first route that is found is indeed the shortest.

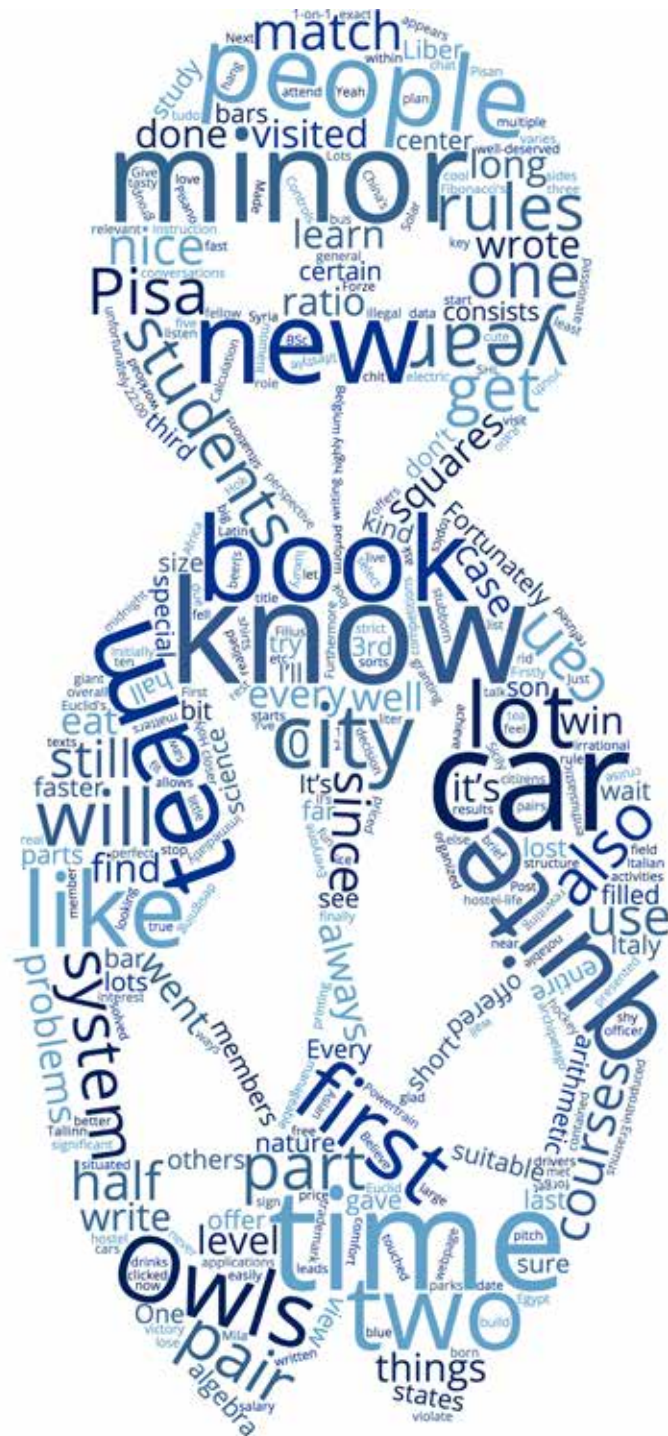
Completely different is the landmark algorithm, which has a 'landmark' on some points of the map, with all distances to all other points given. This will cost a lot of memory and time to set up, but if the same map is used many times it can be very useful.

SPP in practice

One of the applications of the shortest path problem can be by determining emergency vehicle routing. Henk Post elaborated on this example because it is his field of work at Connexxion. It is about the amount of ambulances needed in a region and where they have to be stationed to make sure every house can be reached quickly. This process is static as long as all vehicles are waiting at the station, but changes when one of the ambulances has to drive to an emergency. While the ambulance is driving, the time in which every house can be reached changes.

There are two techniques to simplify a map for the shortest path problem. The first is making a shortcut for every 2-degree path, which lowers the memory use. The other technique is biconnection, which means that trees are not taken into account unless the place of destination is in that tree. This simplifies the graph, and using this, emergency vehicles can have a live map which shows where they can be in 20 minutes.

This application of shortest path algorithms shows how useful the algorithms are in daily life. I do wonder whether the participants of the hitchhiking competition have used the information of the lecture to reach their destination quickly. However, I think it is for the best that they did not have to call an ambulance while they were on their adventure. 



Historical person: Fibonacci

Angelica Babel

We all know the Fibonacci Sequence and some people know that the Golden Ratio is found almost everywhere in the universe. We know a lot about the discoveries Fibonacci made, but we do not know a lot about the man who made these huge contributions to modern mathematics.

First of all, Fibonacci's real name is Leonardo of Pisa or Leonardo Pisano. And like his name states, he was born in Pisa, Italy. We will continue to use his nickname, Fibonacci, to avoid confusion. Fibonacci is the son of Guilielmo Bonacci. The name Fibonacci comes from his name Filius Bonacci, which means 'the son of Bonacci'.

His father was a Pisan businessman and was associated with mercantile business. Therefore, he travelled a lot and Fibonacci travelled with him to countries like Algeria, Egypt, Sicily, Greece and Syria. In North Africa, his father served as a customs officer, so Fibonacci was educated there. In those countries he learned a lot about mathematics and different languages like Latin, Arabic and Greek. While travelling around those countries he encountered the Hindu-Arabic numeral system and recognised the advantages of the system.

Around 1200 Fibonacci came back to Pisa. In the years after, he wrote a lot about the mathematical discoveries he made. These discoveries had a huge impact on modern mathematics. This is a list of the books he wrote. Because he lived before the book printing time, all his books were hand-written!

- Liber Abaci (1202) ('Book of Calculation') is his first book and begins with this sentence:

'These are the nine figures of the Indians: 9, 8, 7, 6, 5, 4, 3, 2, 1. With these nine figures, and with this sign 0 which in Arabic is called zephirum, any number can be written, as will below be demonstrated.'


This book is about arithmetic and algebra with special attention to the Hindu-Arabic numeral system and the huge advantages it has. The book did not introduce the numeral system to Europe, but his way of presenting it, made a large impact. The book has three sections and the last section leads to the introduction of Fibonacci numbers and the sequence, which he is most famous about.

A certain man put a pair of rabbits in a place surrounded on all sides by a wall. How many pairs of rabbits can be produced from that pair in a year if it is supposed that every month each pair begets a new pair which from the second month on becomes productive?

This sequence, in which each number is the sum of the two preceding numbers, has proved extremely fruitful and appears in many different areas of mathematics and science. If you divide a Fibonacci number by its previous number, the number will converge to the golden ratio: 1.6180339887. The golden ratio can be found all around the world, in the structure of buildings, and even the perfect human body has the golden ratio in it.

- Practica Geometriae (1220): This book consist of topics in practical geometry.
- Flos (1225): The Holy Roman Emperor Frederick II enjoyed science and mathematics. He and Johannes of Palermo (a member of Frederick II's court) presented a number of problems to Fibonacci. Flos is the book where Fibonacci solved these problems.
- In 1240, the Republic of Pisa honored Fibonacci by granting him a salary in a decree that recognized him for the services that he had given to the city as an advisor on matters of accounting and instruction to citizens.
- Liber Quadratorum (1225): In English, the title of the book means 'Book of squares' (1225). It is about algebra and also contains the Fibonacci identity, which states the product of two sums each of two squares is itself a sum of two squares.

However, we know that he wrote some other texts, which, unfortunately, are lost. His book on commercial arithmetic *Di minor guisa* is lost, as is his commentary on Book X of Euclid's Elements which contained a numerical treatment of irrational numbers which Euclid had approached from a geometric point of view.

The exact date of Fibonacci's death and the case is not known, but it estimated to be between 1240 and 1250 in Pisa. 

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Science Trends

Rebecca Glans

On this page you will find some brief info on recent scientific breakthroughs or interesting news. Whether they're big or small, if we think they might interest you, we will mention them here! Do you miss a certain trend or want to inform your fellow readers of an interesting innovation? Feel free to contact us.

Diamond wires

Scientists at Stanford University and the Department of Energy's SLAC National Accelerator Laboratory have found a way to create the thinnest possible wires. Diamondoids, the smallest possible piece of a diamond, are used as the outer shell of these wires. Because of the "van der Waals forces", diamondoids are strongly attracted to each other. Using this property, a diamondoid cage is created with a few (10) carbon atoms inside. The carbon atoms stay inside because the atoms "only fit together in certain ways that are determined by their size and shape", according to Stanford graduate student Fei Hua Li. Thus, the cage stays intact, giving the scientist the opportunity to add sulfur atoms to the cage. Each sulfur atom bonded with a carbon atom which, again with the size-and-shape rule, stays within the diamondoid cage. They have now created a nanowire building block –this process is done in a solution. Using the van der Waals property, building blocks will drift to each other and attach creating a (longer) nanowire.[4]

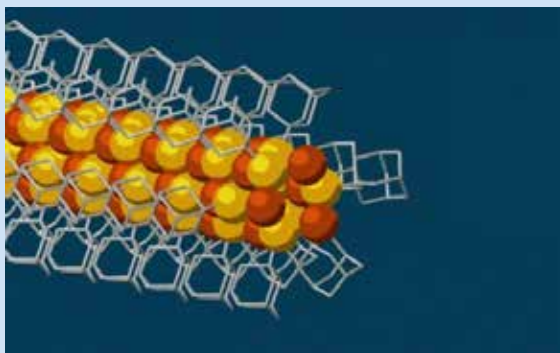


Figure 1: Illustration showing the nanowire building block [4]

Stretching polymer without losing much conductivity

As wearables (smartwatches, health aides) are becoming more popular, this breakthrough is a convenient one. Xu et al. have found a way to create a flexible transistor that can be stretched up to 100% of its length while having minimal changes in its conductivity. It resulted from the discovery that in confinement, crystallization in polymers is prevented and sometimes, the polymer chains gain an increase in motion space. A semiconducting polymer was confined inside an elastomer – a polymer with elastic properties. As

these two polymers don't tend to mix, the confined polymer is bundled. This increase in polymer chain dynamics reduces the drop of conductivity – the material conducted 0.59 cm²/Vs on average and 0.55 cm²/Vs when stretched 100%. The material didn't show any cracks after being stretched 100 times or stabbed.[1][5]



Figure 2: Researcher demonstrating the conductivity while stretching the polymer [5]

Nanobeads and prion diseases

(Incurable) Prion diseases "result from a normal brain protein called PrP twisting into a disease-causing 'prion' shape that kills nerve cells in the brain". Known diseases are mad cow disease (BSE) or its human variant Creutzfeldt-Jakob disease (vCJD). Before, bloodtests couldn't determine whether humans carried prions that could cause vCJD, probably obtained by eating BSE-infected meat. Meaning, more people could get infected through blood transfusions –of which four cases have been recorded. Researchers developed a new bloodtest using nanobeads coated with a protein which prions are attracted to (plasminogen). The beads trap the prions and normal PrP are added to the beads. If any prions were stuck on the beads, these would turn the PrP to prion form. Repeating this process amplifies the signal to detect vCJD prions. For every patient known to carry this disease, the test was positive. Prion diseases are known to have a long incubation period. In two cases the test also came out positive for frozen blood samples taken months before the patients showed any symptoms. [3]

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Miscellaneous

Formula Student Team

Martijn Janssen

I'm Martijn Janssen, a third year Computer Science student and currently doing my minor at the Formula Student Team Delft. When I started searching for a minor I wasn't quite sure what to do. I looked at all the different minors, some of them were not very relevant to me, and others were just not that interesting. I was searching for something else to do during my minor, something interesting where I could work on a bigger project than just a project attached to a course.

I saw the people from Formula Student Team Delft standing near the car and was quite curious what it was. I approached them and they gave me an introduction to the car, how it worked and what the team is about. They also introduced me to the D:Dream hall, which is where I started looking for a minor. A place to apply knowledge and come up with cool and new ideas to solve problems in a new or other way.

Why this DreamTeam

There are several teams situated in the D:Dream hall: Formula Student Team Delft, Nuon Solar Team, WASUB, Project March, NOVA, Forze, DARE, Solarboat, Ecorunner and Human Power Team. This is quite a collection of teams to choose from, so why did I select Formula Student Team Delft (FSTD) from all these teams? The first reason why I chose FSTD is the fact that from a software perspective point of view, it is a very complicated project. There are all kinds of rules to oblige and take into consideration when designing the car. The other reason is the fact that you have to fit in with the entire team. This was definitely the case, it immediately clicked between me and the team. We all have a certain interest in cars and the automotive field, and are very passionate about what we do.

About Formula Student Team Delft

Formula Student Team Delft is one of the very many teams in the entire world participating in the Formula Student competitions. The team consists of around 80 people from the TU Delft, with mixed nationalities. We have BSc and MSc students, mostly from the Netherlands, but also quite a lot from Germany, Belgium and Italy. All these people are fanned out over several departments. We have the departments Controls & Software, Aerodynamics, Chassis, Electronics, Operations, Powertrain, Suspension & Drivetrain and Vehicle Dynamics. All these departments have their own work to do to improve the car for the next year. The most important thing of all is that it still is a group project, so every part has to work together with all the other parts of the car. This is very

important for the departments, interfacing is key. We want our part to perform optimally in combination with all the other components in the car. We want to get the most performance out of our design to win the next competition.

What I do

For this year, the Software sub-department is rewriting the software to work on a brand new chip. By doing this, we are getting rid of the older parts of the software and making the software more suitable for the years to come. Since we have to write embedded software, this is quite new to me. We have to build drivers for our chip to control the functions we want to use, this is done on a development board. Since a chip itself has a lot of functions we are not going to use, the Electronics department is building a specific board for us to remove all the features we are not going to use. In the meantime, we will be using a development board to write our code and implement the features we want to have in the car. The development board consists of the chip and allows you to write software for all the interfaces on the chip. This enables us to develop the software before our own board is finished.

Writing the software is quite interesting. Firstly, we have to find out several things: What do all the different departments want? How do we get our data? How are we going to control the electronics in the car? How am I going to control a specific device? This all is already quite difficult to do, but since this is a competition with highly powerful electric vehicles there are rules. Lots of rules. There are about 170 pages of rules we all have to adhere to, if we violate a rule, there is a chance of disqualification at a competition. We have to find out ways to be better than the competition and try to get the most out of the car as far as the rules allow us to.

Workload

I have applied for a free minor, meaning that I am working on a project (the car) and also following courses. This is a very manageable workload, but apart from that, since you can come in at any time, you can completely plan your own working hours. Every evening, dinner is cooked at 't Hok by several team members and we always have lunch with each other. You can come in after lectures, eat dinner or lunch and work on your part afterwards. It is a great project to spend time on with great people, I can't wait to see this year's car finished and driving around! 🏁



Minor in China

Daniël Swaab



Minor in Portugal

Michaël Mersie

你好!我叫Daniël. Believe it or not, but after half a year in China, you can read that sentence completely! Of course it's just a few words, but the active community and possibilities to learn the second upcoming most important language are amazing.

Why do I say second and upcoming? China's economy is developing faster and faster than any other, and it won't be long before the trademark "Made in China" becomes "Created in China". Besides, don't forget China has 1/5 of the world's population!

Besides that, China offers a great variance of culture. Imagine Europe and all the different countries and cultures, the size of China is almost the same as the size of the EU. There are lots of interesting places to visit and different foods to eat.

Besides an amazing experience in Asian culture, studying in China will also give you a much closer look at all the new developing innovations and applications, which you can take part in. You can learn all about tea, their pressure to achieve good results, TaoBao and many other things. Give it a try! 🇨🇳



Oláá, tudo bem? Regrettably that is how far my knowledge of the Portuguese language reaches, but with a mixture of Spanish and English I can easily manage here!

I'm Michaël, a 3rd year student in Applied Mathematics, and I chose to do my minor abroad in Lisbon. There were several reasons for this decision, but the main reason was definitely to force myself to go out of my comfort zone in Delft and experience something new and totally different. Furthermore, I think it is important, particularly in these polarized times, to get to know people from other countries. And maybe it seems obvious, but only here I realised that everyone is essentially the same. Also I always expected that making good friends abroad is difficult, since there is always some kind of language barrier (for example being spontaneous in another language). Fortunately, this was not the case at all!

My reason to specifically go to Lisbon is not that well substantiated. Initially, Madrid was my first choice, but since the webpage of the university was one giant Spanish-written nightmare, which made it impossible to find suitable subjects, I went with Lisbon. Also the time pressure played a significant role in this story, given that this all took place two hours before the application deadline. But to be honest, I am glad everything went down like this: I could not be happier here. Lisbon is a beautiful city. I really fell in love with all the miradouros (viewpoints), cute little streets, the Portuguese lifestyle and especially all the hidden places the city has to offer. Walk into a random building and there is a reasonable chance you stumble upon an illegal Chinese restaurant, a beautiful bar, a midnight bakery or some kind of anarchistic vegan hippy canteen (all true by the way). Or maybe wait with walking into random buildings, if you don't know the city that well, to avoid awkward situations.

Since my stay here I unquestionably want to live in more countries and see what they are like. I definitely recommend doing an Erasmus! 🇵🇹

miscellaneous



Minor in Portugal, Hungary and Sweden

Mila Hendrikse, Mathieu Post, Niek van der Laan

Portugal

As goal for my minor abroad I choose: “getting to know another country, mingle with the culture and participate by learning the language”. I picked Portugal where the spoken language, Portuguese, is similar to my mother language Italian.

I started learning Portuguese while still in the Netherlands with an audio course and then spend my summer holidays in Lisbon where I would chit chat with everyone who wanted to listen to my, at the time, beginner’s Portuguese.

When the university lectures started it scared me. I was still unable to understand most of what the teachers where saying.

Luckily the professors were really helpful and offered me all sorts of support like changing the lecture language to English, writing emails to students in English and scheduling special 1-on-1 hours with me to make sure I understood everything.

Because I was quite strict with my goal I kindly refused. It’s important to know that in countries where the general knowledge of English is high, like in the Netherlands and in Portugal, people will probably start speaking English to you when they hear you’re a foreigner. I had to be quite stubborn to continue having conversations in Portuguese. One semester is a short period, but it’s enough to explore a new country, to learn how to talk to people in their own language and to make lots of friends.

Hungary

When I first arrived in Budapest on the 3rd of September I still had no room to stay, so I had to take the bus to the hostel that I booked. I realized pretty quickly that the hostel-life was not really something that I could do for more than the one week that I signed up for, while also having to attend lectures and study a bit. But it was a really nice week with a lot of parties and not so many lectures.

Fortunately, during that week I found a nice room between the center of the city and my university. The room is not very big, but I have my own small bathroom, it’s pretty cheap and within ten minutes I can be drinking beer in the ruin bars, or go the other way and I’ll be at the university in no-time.

During the first weeks here the weather was really warm and nice, but after one month I found out that I was maybe a bit optimistic with bringing only one pair of long jeans. It’s getting really cold here at the moment. But fortunately I’ll be done with my courses before Christmas. So from then on, I can just be nice and warm in one of the many amazing ruin bars with half a liter of beer for only 350 Forints.

Sweden

My time at Chalmers University here in Gothenburg kicked off with an intense five weeks, filled with activities to get to know your fellow students. The weather during the introduction period was extraordinarily good, so this gave us a chance to really enjoy the nature of the city. The city center is filled with parks to hang out, and there is also the archipelago; A chain of islands that offer various sand beaches and stunning nature.

Of course, there is also some studying involved. All subjects that are offered in English are Master courses, but overall the level of education does not change. Because of this I mostly did Computer Science courses, but I did one introductory medicine course, which was awesome! (I finally know what makes you crave the toilet while drinking alcohol!). One notable difference with the TU Delft is the grading system: You are graded 1, 2, 3, 4 or 5, each representing 0-20% score, 20-40%, etc. This means that achieving the highest grade is just as hard as scoring an 8 at TU Delft!

Every Friday, we visited a bar for ‘Afterwork’, Afterwork is drinks and food with friends when the work is done (hence the name). However the best part of it? Drinks are happy hour priced and the food is all you can eat buffet (like spare-ribs/ chicken-wings!), all included in the price of the drink... Yeah, it’s good.

Next to all of this I did a lot of fun things, way too many to name them all here but here are a few; I visited multiple ice hockey games, with the local team being the reigning champions in the SHL. I booked AirBNB’s with friends north of here and in Copenhagen, and last but not least we visited Stockholm, from where we went on a 2-day student party cruise with a stop in Tallinn.

It’s been a great time; I’ve met some awesome new friends and have not been bored here for one second!

Hejdo! 🇸🇪



Mathematical puzzle: Chocolate!

The Tony's Chocolonely chocolate bars are extremely popular these days.

They experiment with new and exciting flavors, but also with the shapes of the chocolate pieces. Ionica Smeets, a Dutch mathematician, science journalist, columnist, television presenter and professor in science communication at the University of Leiden, recently wrote a column on an interesting math puzzle, which you can solve with these chocolate bars, in her column in the Volkskrant[1]. Let's see if you can solve it as well!


The pieces of the chocolate bar all have different sizes and shapes. With this, Tony's Chocolonely tries to illustrate that the cacao-industry is not distributed fairly at all: The incomes in the chocolate-business are divided unequal as well. The bottom of the chocolate bar represents the equator, the pieces above form the Gulf of Guinee. From left to right you see Ivory Coast, Ghana, Togo and Benin (they were pulled together in a politically incorrect way because the hazelnuts didn't fit otherwise), Nigeria and a piece of Cameroon. Tony's Chocolonely makes 100% slave-free chocolate, and is also trying to change the whole chocolate industry into a slave-free industry.



The concept is very new and inspiring. Only one problem persisted: it is not possible to share the bar evenly with one, two, three or more friends. So let's think of a new way to divide the chocolate bar in such a way this becomes possible.

The total weight of bar is 180 grams. There is one piece of 33 grams, one of 12 and of 10, four of 8 grams, two of 7, four of 6 grams, seven of 5 and finally five of 4 grams. The challenge is to find a distribution for the pieces such that:

1. The bar has a total of 180 grams
2. You can share the bar evenly with 1 up to 6 people
3. The pieces are unequally divided (so not 30 pieces of 6 gram)
4. The pieces have a minimum of 4 grams, and should be a round number
5. Extra challenge: no piece can have the same weight

There are multiple solutions possible. Good luck! 



References

- [1] Smeets, I. (January 2nd 2016). 180 gram. Volkskrant <https://www.ionica.nl/180-gram/>
- [2] Tony's Chocolonely, (May 16th 2013). Tony's Chocolonely JaarFAIRslag 2012.



CH Owls

Marc Corstanje

Since a couple of years, CH has its very own football team: The CH Owls.

This is a project that started out small with just one team, but now, due to an overload of enthusiastic football players, there are two teams.

Together, they play two matches each Monday evening at Sports and Culture.

Just as the CH Owls, their opponents are also teams that consist of students only. They play in an organized competition against various teams from other study and student associations as well as teams that are formed by friends. The 7 versus 7 games, that take place on one half of the pitch, guarantee fast and intense games.

Now it is time for a brief sketch of a match with the famous CH owls. Monday evening usually starts with a luxury dinner at Sports and Culture, with a few members of the team. Usually, they are the starting line-up for the first match as they showed up as earliest. After dinner, it is time to warm up, put on the lovely blue shirts and prepare for the first match. After an hour of intense effort into trying to win, they play a second match straight after! These matches both take an hour and after two matches, everybody is pretty much out of energy. Therefore, it is time to do the thing that students do best: celebrating the 'third half'. Whether we win or lose, after the matches, the heroic sportsmen enter the Sports and Culture building once more to enjoy a (couple of) well-deserved and very tasty beer(s).

Now if you think of joining the CH Owls, don't let the thought that all of the Owls play on the same level as Messi hold you back. Some of them never touched a football before joining! However, as with the rest of the competition, the level varies a lot. Some have played football for a very long time in their youth, while others only played on the streets occasionally.

Are you interested in joining the CH Owls? Don't feel shy to ask anyone on the pictures or someone on the board. Everyone is, of course, also very welcome to cheer the Owls to victory every Monday evening between 20:00 and 22:00!





Calendar



Skiing Trip

February will start of with an epic skiing trip to Les Orres! On the 7th of February, 66(!) students will travel to the south of France to enjoy a week of skiing and, of course, après ski!



AreaFiftyLAN

The first weekend March will be completely in the theme of gaming, with the third edition of AreaFiftyLAN. This year's edition promises to again become a big success, with tournaments, Just-Dance and of course, lots of fun! Lustrum week 2 will also take place in March, to again celebrate the 60th birthday of our association!



Holiday Month

April will be a month full of holidays like Good Friday, Easter and King's Day. There also will be lot's of CH activities, like a T.U.E.S.Day Lecture with drinks from ING, the WiFi Rally to a mysterious location and of course the LuCie activity on King's Day!

February

- 1-3 Exams
- 7-12 Skiing Trip
- 13-14 Department Symposium
- 15 MeisCie Activity
- 16 Career College 3.1: National vs International Work
- 17 Department Symposium
- 20 General Assembly 5
- 21 Birthday Joost de Groot
- 27 Company dinner
- 28 Career College 3.2: Stages of Management

March

- 3-5 AreaFiftyLAN
- 6 W.I.S.V. 'Christiaan Huygens' 60th Birthday
- 7 T.U.E.S.Day Lecture
- 8 International Food Festival
- 10 LvV Activity
- 13-17 Exams
- 20-24 Lustrum week 2
- 21 Members Lunch
- 28 T.U.E.S.Day Lecture NS: Shortest Paths
- 30 Career College 3.3: Career after University

April

- 4 T.U.E.S.Day with Drinks ING
- 5 MatCH Activity
- 14 Good Friday
- 16-17 Easter
- 18-21 Exams
- 22-23 WiFi Rally
- 25 T.U.E.S.Day Lecture ASML
- 27 King's Day

