AMACHAZINE

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Editorial

MACHAZINE

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Dieuwer Hondelink

As the year is nearing its end and the weather is getting better and better, I'm sitting here writing this editorial instead of studying for my tests. The past few weeks have been filled with evenings bbqing at the Delftse Hout, swimming, going to the beach and studying for the last few tests. You really start to notice that it is almost time for the summer break. People are talking about their holiday plans and how they wish they were outside enjoying the sun. Instead they have to sit inside and study. Good news however, it's almost time!

But first, I want to look back on this year. We had so much fun activities. We started with the lustrum week at the beginning of the year, then in december the gala at Kasteel de Berckt, the Skiing Trip to Les Orres, AreaFiftyLan, KingsDay, the rally, the zichzach competion through delft, parents day, iCom's trip to



Budapest and the lustrum ending party to name a few. There was so much to do this year! You can read more about the rally, parents day and the trip to Budapest in this issue.

Now that the year is almost over, the freshman aren't so fresh anymore, and a lot of them can't wait to go to the EJW to teach the new nulletjes all about CH. It's going to be a weekend filled with laughter, partying and probably a lot of additions to the regelgraaf. Following the EJW comes the OWEE. To those of you who have become mentor, congratulations! Have fun showing the new students around the city and giving them a good impression of what studying and being a student means in Delft!

But before all of that, we get to enjoys a well-earned summer break. I myself will go to Budapest for a week, and after that three more weeks of interrailing throughout europe with two friends. We haven't planned where exactly we're going but I think that's part of the charm. I'm really looking forward to it and already know it's going to be great. Visiting different countries is always an amazing experience. You meet new people, learn about a different culture and eat delicious local food. I can't wait!

In this edition of the machazine we put a lot of puzzles for you to complete, like a summer puzzle special, so don't forget to bring your machazine on your holidays. Good luck with them and have fun! I wish you all a great summer time! And as always, if you have any questions or suggestions for Machazine, or photos from your holidays with CH-buddies, you are welcome to mail them to machazine@ch.tudelft.nl. We are always happy to receive feedback and content from the readers.





Board 60 of the association for Applied Mathematics and Computer Science 'Christiaan Huygens' would like to present the Potential Board 61 of 2017-2018:



Section

Chairman

Secretary Treasurer Chief Commissioner of Applied Mathematics Education Chief Commissioner of Computer Science Education Chief Commissioner Public Relations Chief Commissioner of Career Events

Willemijn van Varik Daphne van Tetering Ricardo Jongerius Marc Corstanje Francis Behnen Niek van der Laan Irene Vooijs

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From the Board

Beer van der Drift

"That's something that I miss, 'leden' (members)" said a StuD board member who I was sitting on the couch with. "I'm seen as a work provider, not someone who gets appreciated as a board member". That

got me thinking.

Now, I'm not here to hold a plea of us as board members needing more recognition, but I realized some interesting things in the social workings of a study association or probably any association on that matter. Even on governmental level I guess this rings true. Boards or any organ of governance are 'do-gooders'. This contrasts with committees.

It's fun to be a board member and all, but the association couldn't live if we didn't have our committees. We try to show our appreciation as much as possible towards them, and also our members do that! There's this famous Dutch song we sing towards groups to thank them "Zonder onze <committee> kunnen wij niet leven!". That's a clear sign that members are aware and thankful of the effort they put in.

With a board that's different, at least it feels different. "It's their job" right? In a way we extend the efforts putting in, really focusing 100% on it, thereby making it 'normal' instead of 'extra'. Because of this we are seen as a group that is supposed to do everything well. Because of this we only get remarks when we do something wrong, while committees often get remarks when they something good.

Last week we had a committee evaluation lunch with the entire board which also functions as a way to say thanks to them. To our surprise they wanted to thank us as a board as well! It was amazing, they bought us all a DIY owl stuffed animal kit as well as a cake with our photo on it. It felt so nice receiving this!

It's pretty weird that we're now at the end of the year, and even weirder that you will be reading this only after the year is over. I can't really say whether the year is what I expected from it, probably since I didn't know what to expect. The things I think I am the proudest over are the LAN and the Symposium. Both of them were an immense amount of work but the end results were really nice.

The LAN is one of the projects which I am the most fond of. It's one of those things that is becoming some sort of family for everyone involved. Also, the resulting survey has proved every edition over and over again that not a single survey participant is negative about the event.

The LAN I had organized myself before my board year, but the Symposium was new for me. Because of that it was more of a challenge. But with the excellent service of the theater de Veste as well as a committee that had everything figured out perfectly the result was something we can look back onto happily. Especially the great names that were present on the event was something that made the event.

But the most memorable will be the people that I have met because of the position I am in. It's incredible, the culture that exists around all the boards here in Delft, and the people from the other study associations. People I otherwise would have never met. A couple of weekends ago I found myself baking a ham with someone from the student council at home. Or watching a movie on a Saturday with some others just because we all never saw 'The Breakfast Club' even though we all watched 'Pitch Perfect'.

Where CH will head is unbeknownst to me. I of course can say some things about the near future; the projects we will pick up on in the coming years and things I expect to change. But what triggers me the most is what it will be once I started working, build a family etcetera. Will CH be completely turned upside down into an international association? What traditions will still stand and which will have gone?

Personally, I'm really looking forward to my next adventure; going to Berlin and studying abroad. It's something I am very happy with, and am also looking forward to going more in depth into the field of Cyber Security. The feeling of having chapters in my life is really present. I am now going towards the end of CH and will open the one on Berlin, where for sure I will have some amazing memories afterwards.

Thank you for reading this, if you're still with me I find that amazing. Whether you have close connections to the associations or not, I hope that in a way I contributed to your experience as a student. It might be the Symposium, Career College or just a smile at the book counter, but it's been worth it for me!



Current Affairs





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

months.

Nuon Solar Team breaks world record

The nuon solar team has broken the world record for solar racing. Their goal was to race 750 km in 12 hours, but they exceeded their own expectations and managed to get to 882 km! The race, which took place on the longest day of the year, was held in Lelystad. For the team it was the first field test before the Bridgestone World Solar Challenge, which is being held in Australia this october. The team is real proud about the distance they covered, especially because the intensity of the sun here in the Netherlands is a lot lower than in Australia. With the Nuna9, the Nuon team will try to win the challenge this year, which they have six times already. Good luck and congratulations!

Self driving cars on campus

On the 27th of June, the Researchlab Automated Driving Delft (RADD) was opened by Minister Melanie Schultz van Haegen in Thee Green Village on the TU Delft campus. The focus of this lab will be on experiments involving automated driving.

Co-initiator of the RADD, professor Bart van Arem said the technology is 95% ready. There are however challenges in the remaining 5%, like purely technical aspects, acceptance by users and interaction with other traffic. Much of the research is being done using computer models, but to get better insight, real-life tests have to be done. So starting this summer, a safe route with monitoring system will be constructed on campus. The first research should take place in the first quarter of 2018 after which the research area will be expanded out of the campus.

TU Delft rises further in QS Ranking

The TU Delft has risen from the 62th to 54th place in the worldwide QS Ranking. This means it is now at the first position in the netherlands. The QS World University Rankings is a ranking list of 1000 universities selected from a total of around 4000. Universities are ranked based on six factors: academic reputation, employer reputation, faculty student ratio, citations per faculty, international students and international faculty. Most factors have increased, except for Citations per faculty which had a slight decrease. It is still one of the strongest factors though.

Together with the Shanghai and THE rankings, the ranking by QS is one the three leading international university rankings.

Tom Dumoulin wins in suit co-developed by TU Delft

Cyclist Tom Dumoulin has won the Giro d'Italia in an aerodynamic suit co-developed by the TU Delft. Team Sunweb worked together with the TU Delft for a long time to make the cyclist even faster. Improving the aerodynamics is one of the areas which can still make a difference. Posture on the bike and a more streamlined outfit are crucial for aerodynamics. So the cyclist team together with the scientists from the TU Delft developed an improved cycling suit. To do this, Dumoulin's body was scanned and from that a 3D printed mannequin was created. The drag of this mannequin was then tested and optimised in a wind tunnel by putting on different suits each time.



What is programming?

Felienne Hermans

Do you know that joke about two little fishes that swim into an older fish? He asks the young fishes how the water is, and they respond: "what's water?". They live and breath water, so they have no clue that it is even a thing. I love this joke and I often try to be aware of the waters of programming. What are the things we believe so strongly that we can

no longer realize them?

What is programming? What is the essence of programming? Ask 10 people this, and you will get 10 answers. But despite the differences there are some things that are generally accepted in programming. For example, programming is technical, we are software "engineers". This belief leads to other assumptions, for example that you need math skills to be a good programmer. But is this a fact or a belief? What if programming had more resemblance to another important skill: writing? What would be different?

How programming is really writing

Together with Marlies Aldewereld, a teacher and researcher at Pabo Windesheim (a school for teachers), I recently wrote a paper called Programming is writing is programming in which we outline why programming and writing are in fact two sides of the one coin.

The idea is that they are both, in essence, the activity of taking a very high-level idea and translating it to low level statements: sentences and words for the writers, and methods and lines of code for the programmers.

How to approach this is a topic for many methodologies in both writing and programming. Is it better to draft broadly and then iterate, or to take one chapter or feature and make it perfect before adding others? In both fields, there are people on both sides of the argument. In writing, these two extremes even have terms: pantsers and plotters.

One aspect where the high-level idea into low-level implementation transformation manifests is when one makes changes. No text is perfect at the first try; books and stories are often reviewed and rewritten, sometimes assisted by formal reviews. Programmers review each other's code and suggest changes, or fix bugs in existing code bases. In this adaptation, the high level translating plays a big role. If writers decide to remove a character from a story, they need to make sure it is deleted from all chapters. If programmers change their architecture, this will result in changes to many classes and methods.

Am I a keyboard?

Of course, observing similarities between fields can be interesting in and of itself, but the question arises, of course, what we can learn from this. Given enough layers of abstraction, all things are similar. I am an object, the computer on which I type this is one too, but what insight does that give me?

Well, the way we view programming impacts the field. We take our words and concepts now from, for example, engineering: building, systems, maintenance, scaffolding. But the field of writing has to offer us a lot too. I for one have found the plotters and pantsers views very appealing also for programming, some people like planning, while others want to see where the code takes them. The same person might even be plotting sometimes and pantsing in other situations. The metaphor of software creation as 'software engineering' feels as designed by and for plotters.

Here's a thought: If we had viewed programming more alike writing from the start, would we have come to agile design methodologies sooner?

Impact on education

It is not just the way we think about programming, but also the way we teach it that is greatly influenced by the way we see our field. If we see programming as writing, can we learn from writing education? This question warrants a full paper, but there are a few directions we see we can learn from. Could we apply these methods to programming education too?

For example, in writing observational learning is the most prevailing way of using models for learning. In this teaching method the teacher thinks out loud, they explain and demonstrates parts of the writing task. Especially the model where teachers make mistakes and backtrack raises the self-efficacy of the pupils and enhances their performance more effectively.

What if we taught programming like this, by programming while thinking aloud? Would that be effective?

A second inspiration comes from topic integration. Writing can be taught in isolation, but can also be taught in combination with other topics, for example, when pupils are writing an essay about modern history. A study compared the effectiveness of two different methods of teaching science: one aimed at just teaching science, a second on combined with reading and literacy. In this latter group the kids learned to think, speak, read and write like scientists. The other group got more traditional science lessons. The first group had a better understanding of what science is, a better understanding of the basic concepts and also they identified more as scientists.

This last study could prove especially interesting for programming education, as it also could help a broader group of kids identify as programmers! But oops, I think I am talking about inclusiveness again.... time to go to bed.



Tom Heijnders

The new academic year is only a couple of months away, so the new

Faculty Student Council (FSC) must be ready to get started. The election

results are in, the first meetings have taken place and the new members

are excited to begin.

What is the FSC?

The FSC or Faculty Student Council is a student representative council within our faculty EEMCS. In practice the FSC will try to improve the faculty on behalf of the students by giving advice and participating in important meetings and discussions within the faculty. We have a weekly meeting with the FSC to discuss problems within the faculty. Then we can discuss these problems with the board of EEMCS in another monthly meeting. We also attend the budget meetings within EEMCS where we have a say in how the faculty spends its millions. On top of that we also discuss university-wide issues through meetings with all of the FSC's and the Student Council of the university. The FSC has the right to advise and the right of initiative regarding anything relevant to the students of EEMCS. So we are definitely a force to be reckon with.

The elections

The FSC is chosen every year by elections. Everyone could sign up for the elections, this makes the FSC very diverse. We have a freshman, master students and internationals within the FSC. Then, depending on your number of votes, you could get a seat in the FSC. Within the FSC there are different "chambers", with each chamber representing a program within EEMCS. Depending on our program we could only run for a seat at our own chamber. There are 4 seats available in the Electrical Engineering chamber, 4 in the Computer Science chamber, 3 in the Mathematics chamber and 1 in the SET chamber. This last chamber might be unknown for most students. The SET chamber represents a master which belongs to Electrical Engineering but also applied physics. Almost everyone who joined the elections are now members of the FSC. Most of

us are new members but we have two members who were in the FSC last year. They help us a lot because they can explain everything that is unfamiliar to us. We already had a first meeting were we got to meet each other and divide the roles within the FSC. We will introduce the members of the new FSC here:

Electrical Engineering chamber:

Karen van der werf	
Philip van den Heuvel	
Luc Enthoven	(Secretary)
Lotte Zwart	(Secretary)
Computer Science chamber:	
Felix van Doorn	(Chairman)
Bartosz Czaszynski	
David Allaart	(Vice-Chairman)
Jayme Freeke	
Mathematics chamber:	
Elsje Burgers	
Dion van Lange	
Tom Heijnders	(Finance)

What we're doing now

The new FSC is not yet officially installed, we will be at the beginning of the new academic year. Nonetheless we are already busy with the FSC now. We have had a training with all the FSC's from TU Delft where we have learned a lot. And in our last meeting we already thought of issues we want to address in the next year. We are picking up where the old FSC left off. We will continue their work on the improvement of collegerama and we will make EEMCS more accessible for international students. As you all probably know by now, EEMCS has to be left soon. In December the teachers will move to a building behind Civil engineering and it's a matter of time until the students will move their too. We will make sure that the transition is as smooth as possible. We will make EEMCS great again.

We want your input!

We are still thinking of subjects we want to improve next year. For that we will also need your help. Every quarter we will organize a coffee moment to talk to students. You can then find us in the hall of EEMCS with free coffee, ready to hear your stories about studying at EEMCS. We would be pleased to hear about all the problems you encounter throughout the faculty or any ideas you might have for improving the education at EEMCS, big or small. If you cannot wait for the next coffee moment, you can always send us an email at: fsc@ ch.tudelft.nl.



Association





Hackathon Throwback

Felix van Doorn

On May 13&14 our association organized TU Delft's first Hackathon, Hack-

Delft! Most of the attendants were also a member of W.I.S.V. 'Christiaan

Huygens', but there were also participants from other faculties, other

universities and even participants coming from abroad!

These participants came such a long way to participate, because our Hackathon was also part of Major League Hacking's 2017 European season. For those readers who are not familiar with MLH, MLH is the official student Hackathon league in Europe and North America. They helped us gain international attention and entries from the most unexpected places.

The day began very early for our crew. The event took place in Hall 1 of the Sports centre. As one might imagine, it would take a couple of hours to properly prepare a hall of that size for the event. To make matters worse, we could not prepare anything in advance as the hall still needed to be used to play sports until closing time the previous day. We arrived at 08:00 in the morning and the first contestants would arrive at 12:00. In that time we needed to fit the room with a protective carpet, place all furniture, build the stage and fix electronics. Luckily we did not face this daunting task alone, many enthusiastic members of our association turned out to help us! The room was prepared far more quickly than anyone had expected.

Around 11:00, the sponsors started showing up. One of the largest question one could have when you are organizing your first Hackathon is "How do I deal with my sponsors actually?". On the one hand, they are enabling your event through money and resources and therefore you should help them as much as you can. On the other hand, you'll quickly learn that some of those wishes are not necessarily beneficial for your participants, who happen to fulfil a role of some importance during the event.

After 12:00, we realized that there were also some people who despite signing up and confirming their participation decided not to show up. To us as organizers, this was probably the only part of the event that was somewhat disappointing. Luckily it was not as bad as what our MLH contacts had experienced at other Hackathons, where over 30% of the participants on average decide not to show up.

Once all the participants had arrived, it was time for the opening ceremony. Finding a keynote speaker had turned into somewhat of a struggle for us and due to circumstances and cancellations, we found ourselves without a keynote speaker only a weak before the event. Fortunately, a member of the jury, Cynthia Liem stepped in and delivered a fantastic opening speech. Here she discussed 'bad' data science, common fallacies that occur when the science in data science is not practiced properly. To some of the audience that were not as familiar with Data Science, this was a terrific introduction filled with funny examples.

After the closing ceremony, it was time for our participants to check out the cases that were supplied by our sponsors. We had cases from de Volksbank, where the hackers could use real transaction data to create a project of their liking. The case by Aegon was to develop a cloud-based application using NodeJS. KPMG cooperated with Owlin, a start-up in Amsterdam to give our participants the opportunity to create a real-time intelligence feed for customers. The last case was supplied by Optiver and involved building a trading algorithm. Participants could take a look at two different demos out of these four and then choose to participate in a case of their liking. After the demos, we had a pitch workshop to help our participants brush up on their soft skills and to help them form teams.

After the formation of the teams, the participants could finally start hacking! Shortly after hacking started, dinner was already served. Due to the unfortunate situation at Sports & Culture, this meant you had to walk 10 minutes to get dinner.

As the hacking went on until deep into the night, I was happy to be able to get some sleep at around 22:00, lucky me! When I got up for the rest of my shift at about 04:00, some of the teams were still hacking! That despite our Red Bull Wings team, who would supply our hackers with some much needed Red Bull, not showing up!

Slowly but surely, the rest of the hackers returned from their slumber to prepare themselves for the final stretch. Hacking ended at 14:30 and it was time to present to the jury. What did not exactly help the jury, was that Feyenoord were on their way of becoming champions for the first time in 18 years and therefore causing some superfluous background noise.

Eventually 7 team were selected to pitch in front of all participants. In third place we had Kwindo, who built an accurate trading algorithm by alternating between ARMA models and Neural Networks for stock price prediction. In second place team 'Can I spend it', who obviously won the subprize for best domain name, who thought of an app that helps you manage your spending. Our overall winners were team ThetaGo, who built an app to gamify saving and help young people get out of debt!

We had a great deal of fun organizing this event and hope all participants did too!



For the second time in CH's long, long history we, the WiFi, got a tough job to do; organising the CH Weekend Rally. For the yet unskilled in this kind of event, a short explanation is in place. A Rally is a competition in which automobiles are driven over public roads under normal traffic regulations but with specified rules as to speed, time, and route. In our Rally we decided to skip the speed part because of the possible danger

that comes with it.

The Weekend Rally took place in the fourth weekend of April this year. The group of 65 participants gathered behind EEMCS at 8 o'clock in the morning. Every car was filled with 2, 3 or 4 participants .The first track started with the word game Rebus. It was definitely not the most difficult assignment, maybe even the easiest, however some groups managed to skip the ferry-boat entirely and missed all the water and fishing fun. The second track that day was the so called "bol-pijl-track". This type of track consists of symbols showing you where to go for every step of the way. After that the blind route followed. We had filled in the starting and end address into Google Maps, made the actual map disappear and handed it to the participants that way. They had to follow the blue line while having no clue about where they were going. It seems quite hard but everyone did very well. For the fourth track that day we made an audio file and named it's voice 'Henkie'. Henkie told everyone where to go through songs, word games and math problems "count the number of words in the chorus of the Marco Borsato song De meeste dromen zijn bedrog to find which exit to take on the highway". It turned out Henkie made it quite hard for some of the more lazy participants.

Anyway, Henkie drove us to the great city of Antwerp, straight to our next assignment. Antwerp is a busy, beautiful and interesting city. A lot of street names in Antwerp are constructed as follows: "every-day-word"-street. This gave us the perfect opportunity to write this captivating story about an owl. While everybody was moved by these beautiful words they followed the route through the very small and crowded streets of Antwerp. The last assignment of the day required quite some calculations and mathematical knowledge. When (almost) everyone found this beautiful big house we stayed in in Genk we started off with some well-deserved beers and a good meal. Only one group managed to mess up the last assignment and almost ended up in Gent. In the end everyone ended up where they needed to be; in their beds, on the soccer field or doing some crazy board games.

When the group woke up, some too tired to actually drive, to a very inviting breakfast they were already confronted with the first assignment of the day. We had mixed up some directions to Brussels and they had to arrange it in the right order to actually get somewhere. They all did very well which backfired in the next 'follow-the-river-track' where almost every road seems to be broken or changed. Once everyone arrived in Antwerp again, also Antwerp decided to host this awesome, essential and of course very exciting, not to miss bird market which messed up the next assignment a bit as well. Not everyone felt as sore as we did about it since this assignment was quite a task. We called it the women-track. It was again an audio-file but now with two voices the participants were more acquainted with. Lot and I (Ilona) talked for 1,5 hours straight about all the directions with only some breaks filled with the awesome sing-along lustrum songs. Many of the teams actually quit within 15 minutes and decided to listen to some music of their own instead of our tiring, endless voices. The day ended with only 2 more tracks: sudokus to find the coordinates to Willemstad and the final "Timo-lapse" which was a video of a time-lapse of the exact route, but then backwards.

Now, many weeks later we still look back on a fantastic weekend, with the most enthousiastic participants.

The winners were announced some weeks later, and they were as follows:

- 1. Team Route FiftyLAN
- 2. ElsKoraalFacie
- 3. Mcscuse Me!

We wish the best of luck to the next WiFi to come up with even more exciting routes and assignments, are still open to any feedback, are looking forward to actually participating ourselves someday and never forgetting Henkie's best joke of the day: (3)

'Wat krijg je als je met een Kever door het water rijdt?' -een golf

Lustrum Year Overview

Felix van Doorn

As I start writing this piece, it dawns on me that this will be the final piece that I will write for you during the lustrum. This realization both saddens and delights me, cliché as that might sound. With all the fantastic activities we've been organizing and working together with my committee for such a long time really makes the lustrum a pretty important part of your weekly routine. To give you an idea of how long we've been working on the current lustrum, we started in October 2015 and we organized our first activity in May 2016! Let us reminisce by going

over all the activities one last time!

We started with the absolutely delightful Beer Cantus. An unforgettable event, yet so many forgotten memories right there. The weather was looking terrible and therefore the Lustrum committee had decided to get a tent. All seemed well, until we figured out that our tent was not exactly suited to be set up on a hard surface like asphalt and tiles. Armed with crowbars and shovels, the committee furiously struck at the tiles in order to be able to set up our tent. For a few hours there was little progress and the situation looked dire, but to paraphrase Hannibal Barca "There is no greater spur to victory, than contempt of one's impending demise". We're still sort of clueless how we managed to get that monstrosity up in time for the first people showing up, but it felt fantastic and a cantus was the ideal occasion to celebrate afterwards. This would sort of turn into a recurring theme for our committee. We would run into trouble and then improvise our way out of trouble and one of us would out of nowhere save the day and the activity.

From there, there was a long wait until the first lustrum week in October 2016. We started off with an owl show, because they are the single most majestic creatures ever created. We then proceeded to our BBQ, where some birds were harmed, but they were definitely not owls. The day after we had a fantastic lecture by Vincent Warmerdam, a Data Scientist who explained is work by means of an interesting analogy to playing Pokémon. The next day we had a Beer Tasting at 'De Koperen Kat', where for some reason we had an open bar instead of just four drinks a person. With the Optiver workshop the next day, our students got to see the world of high-frequency trading. On Friday, we had a Friends from the Past day. Here members could bring their friends from high school or their hometown and go on a Pub Crawl through Delft. On November 19, we gathered at a petrol station by the A13 for a Hitchhiking competition! The destination was only revealed once the competition started. Our destination was Cologne! Some participants, Steffie and Floris, were mind-bogglingly quick. They reached Cologne before the Lustrum Committee did, a feat that still deeply impresses us! Upon arrival of the last participants, we had dinner in a beer house and went out into the city.

We had to wait until January for our next activity, but luckily the Gala Committee organized a magnificent event in order to make the wait a little bit more bearable. On January 18, we had a /Pubquiz in cooperation with Alten. This turned out to be an ultimate test of wits, geekiness and life experience.

In March, it was time for a Lustrum version of the traditional Dies week. On Monday we started the week with a great lecture by Ferry Mingelen! It turned out mr. Mingelen was a great speaker, with a very pleasant and natural style. The audience got some very interesting insights into the current Dutch political landscape. Afterwards we proceeded with the Lustrum opening, where the Lustrum Committee presented their gift to the association, an engraved pendulum clock! The pendulum clock is one of Christiaan Huygens' most famous scientific contributions and therefore seemed a fitting gift. Afterwards we went for our traditional dinner at 'Het Koningshuys'. On Tuesday we went for an evening of swimming, slides and childlike glee at the Tiki pool. So much fun can make you very hungry and also dehydrated and therefore we chose to serve a lot of food and smoothies at our member lunch! On Thursday it was time for more food during our Agile cooking workshop with Magnus. On Friday we had a hilarious comedy night over at the Flora theatre.

On Kingsdag we rented a boat for a canal tour through Leiden, which was a great experience. As the tour progressed, it grew more dangerous as apparently alcohol and low bridges don't exactly mix well. Unless you climb over them of course.

On June 2 we decided to go and relax at the 'Delftste Hout'. Here we would also hold an auction for those people who persevered through our lustrum challenges.

At the time of writing the #Ending part is still before us, dear reader and we are doing our utmost best to end the year with an absolute bang. It will be the last lustrum activity for almost five years. We would also like to express our gratitude towards all members of our association. Thank you for helping us organize such a fantastic lustrum year, we had an absolute blast and we hope you did too.





















Early and affordable detection of premature born babies

Delft University Fund

The Delft University Fund and EEMCS have joined forces to further

develop an affordable and mobile prototype to detect brain deviations

directly after birth.

Yearly, approximately 14,500 babies are born prematurely in The Netherlands. This equals about 8% of all babies born annually. The first few weeks of the life of a premature born baby is a crucial period. Any deviation from the brain detected early can prevent health problems later. At this moment, a detection system is quite expensive. As such, most hospitals have only one such system severely limiting the number of babies that can be monitored. During his Bachelor Electrical Engineering, Alberto Gancedo-Reguilon from Spain developed an innovative way to monitor the brain of a premature born baby. The prototype Alberto has developed is wireless and much cheaper than the currently available expensive detection systems. This way, once available, many more babies can be monitored in a lot more hospitals.

EEMCS alumni donations

Last June, many EEMCS alumni contributed financially to make this new project at EEMCS possible. Because of their generous gift, Alberto can start his Masters Microelectronics at TU Delft in September and continue to further develop his prototype for premature babies. Thank you!

Interview Alberto Gancedo-Reguilon

Can you tell us a little more about yourself?

I'm Alberto Gancedo, a 24-year-old guy recently graduated for my B.Sc. studies in Electrical Engineering. I'm originally from Torrelavega, a small town in the North of Spain. Personality-wise I consider myself a curious, cheerful and open-minded person. I love sports, particularly Judo, and I would never reject having a drink with my friends during my free time.

Why did you choose to study Electrical Engineering?

I felt that electronics was the field that, for me, provides the most freedom to experiment and design new things, allowing me to think creatively.

Why did you come to the Netherlands?

For the last semester of my studies I only had the bachelor thesis left, so I started to look for an internship in a foreign company, in which I could explore a new field. In this case, the most interesting topic was in the bioelectronics field: developing an analog front-end for an amplitude-integrated EEG recording system, for HealthTech BV.



Universiteitsfonds

How has your experience been in the Netherlands/TU Delft so far? It has been amazing, both professionally and socially. During my time in Delft, I got to enjoy its international environment, and also had the possibility of travelling to different parts of the country to get know more about the Dutch culture.

How did you find out about this funding opportunity and why did you decide to apply?

Professor Wouter A. Serdijn from the bioelectronics department informed me about it. The trust this department has put in me, as well as my desire to continue my studies at TU Delft, were the biggest factors in my decision to apply. This fund will now support me with financing my studies abroad, as it costs a lot more to study in the Netherlands than in my home country Spain.

What makes this particular project so special?

For me, being able to improve the quality of babies' lives that could present a positive change in their future is the main motivation. I take the development of this project as a personal challenge, because I started to design it from scratch. Any success or failure, from the little details to the bigger picture, are my responsibility and for that reason I feel extremely motivated.

As for this project, what are your ambitions for the future?

If everything goes as planned and no issues arise, I expect to be able to test the final prototype by the end of my master studies.

What are your personal ambitions for the future?

To be honest, I haven't really thought much about any future other than my upcoming years at TU Delft. Two years is a long time and from my personal experience, I can say that it is impossible to plan far ahead.

What is the first thing you will do in September when you arrive back in the Netherlands?

I would really love to meet my friends who are still in the Netherlands. I would like to catch up on everything that we have experienced while we weren't seeing each other on regular basis.

Delft University Fund

At Delft University Fund, we want to support talented students like Alberto to excel and inspire others to do the same. Thanks to contributions from alumni, employees, donors, foundations and corporations we support inspirational and innovative projects in the field of education and research. By doing this, we support talent at TU Delft to make a difference in the world. Would you like to know more about the Delft University Fund and how you can make a difference? Please check out our website: *www.universiteitsfondsdelft.nl* or contact us at +31 (0)15–278 64 09, *ufonds@tudelft.nl*.



Parents Day and Siblings Activity

Annemieke Brouwer

For the fourth time, the freshmen committee CHoCo organized a Parents

Day for all the applied mathematics and computer science students.

Siblings were welcome as well, and for them we also specially organized

the siblings activity some weeks later.

On Saturday may 20th, we welcomed all the parents and their children in the EEMCS building with some coffee and tea. The parents were glad to finally meet some of the fellow students of their children and for us, it was nice to get a glimpse of everybody's families. After this reception, the central opening took place in lecture hall Ampère. The chairman of the CHoCo, Henk-Jan, started off by telling a little on our committee, and he gave an overview of the day's program. Followed by Marjolein, the chairman of the study association, who told the parents all about Christiaan Huygens. Lastly, the new dean of EEMCS, Dr. John Schmitz also held a speech. Since it's his first year here as dean at EEMCS, he was very grateful for this opportunity.

For the rest of the morning, we split up the group in two. The mathematics students and their parents first got a tour through EEMCS, given by a member of the CHoCo and a member of the board. From the /pub to the committee room, we showed them around as much as we could. Unfortunately, we were not allowed to go to the rooftop, due to scientific experiments. Instead, we went to the 20th floor for a nice view of the campus and the city center. On a clear day like this one, it's even possible to see Rotterdam and The Hague from there! At the same time as this tour, teacher Otto Visser informed the computer science students and their parents more on the study itself, followed by a lecture given by Cynthia Liem. The groups then switched, and Rik Lopuhaa taught the applied mathematics. Teacher applied mathematics and honorary member of the study association, Joost de Groot, then gave a lecture on a mathematical subject. Simultaneously, the computer science group participated in the same tour around EEMCS as the applied mathematics group did before.

At lunchtime, everybody got together again in the cafeteria on the first floor. We had arranged lunch from butcher Leo, very well known in Delft for his 'broodje Leo' (sort of luxurious sandwich). After lunch, we walked to the city center with everyone to continue the program there. The afternoon started with a canal cruise through Delft, followed by some free time to explore the city. At the end of the afternoon we gathered with a smaller group of people, because some of the people already headed home, at the Markt to go back to EEMCS for a pub quiz in the pub, with the option to also order pizza. The day ended in the /pub, after some beers and some good conversations. Everyone had had a good time, and it was nice to be able to show everybody's parents what it's like to study at EEMCS, and what Delft is like. I also really enjoyed meeting all the parents of my friends from mathematics and computer science.

Besides organizing a day specially for the parents, we also prepared an event for everyone's siblings. We invited all students to come to EEMCS with their siblings on Friday evening, june 23rd. Around forty people showed up, mostly students with their siblings but also some students whose siblings couldn't make it that day. Everybody was welcome, of course. We showed them around EEMCS, round somewhat the same tour as for the parents, ending in the /pub again. Prior to going to the /pub, part of the committee already wrapped all tables in aluminum foil to prepare for the amazing fries party! All tables were completely covered with fries and snacks. After dinner, we set up a Mario Kart tournament on big screen with a wii and a beamer and aside from that there was also the possibility to game on a GameCube and PlayStation Move. Everybody had lots of fun and the games were also a nice way to interact easily with other students' siblings.

As the evening came to an end, there was the possibility for everyone above eighteen to continue to the Lustrum #Ending party, organized by the LuCie (lustrum committee). We went there with our committee, and some students took their siblings with them as well. The night couldn't have ended better, for it was a great party. Both the events we organized went exactly the way we wanted. It was a nice way to meet everyone's family, by just having a very nice day and evening.





My problem is your problem

Cees Witteveen

The study association asked me to write something about myself in this

magazine. First, I thought this would not be that difficult. For example, I

could start writing that my name is Cees Witteveen, that I have a chair in

Algorithmics at our faculty, and that I consider every problem as a nail to

use my algorithmic hammer. That's me in a nutshell.

However, I'm afraid that you would not be happy with such a minimalistic approach. On the other hand, I'm quite busy these days. I have to prepare some papers, write a couple of reports and have to correct exams. To cap it all, my daughter has planned her wedding quite soon, I offered my help in some of the preparations, and I have to write the expected perfect speech as father of the bride on a rather short term notice.

So how to find additional time to write this story, too...

Then I suddenly realised that, actually, I could save time in writing down my story! Let me explain. In preparing their wedding, my daughter asked me for help in solving a delicate problem. She and my future son-in law have invited a number of special guests for their wedding dinner, let's say 60 people. The dinner will take place in a ballroom where two quite large tables are placed. They would like to use a black and a white table. Both tables are really huge: in fact, each table is that big that all the guests could be easily placed at one table.

So why did they opt for more than one table? Well, it is rather confidential, but you should know that my family and the family of my (future) son-in-law are not the easiest ones to handle. Instead of having a fantastic wedding party, they could easily ruin the festivities if we make a wrong choice in placing them at the two tables. Just imagine that cousin John would sit at the same table as aunt Martha!

So, in order to avoid such problems, my daughter decided to ask each individual guest about her/his wishes. This is a tricky task, since in both families we have some, I must confess, quite weird persons. Take, for example, cousin Luke. His wish to sit at the same table as Marc could just depend upon the color of the

Aunt Martha's wish

* delete where not applicable** fill in one name of another guest

table he would choose! He could say that he doesn't want to share the black table with Marc, but it could be perfectly fine to him to share the white table with the same person.

•••	Aunt Martha's wish
•	If I will be placed at the black/white (*) table then
•	I want / I don't want (*) to sit together withPeter H (**) at the same table.

By now, I hope you are convinced that these families are not the easiest to deal with. Therefore, my daughter decided to send the complete list of all dinner guests to every guest separately. Then, in order to make sure that we know exactly the (dis)likes of every individual guest, she prepared a number of notes for each guest to take into account even the strangest preferences. Everyone received the same type of note targeted to her/him. To give a specific example, aunt Martha received a number of the following notes:

The bride and groom would like to make sure that every person could express all her/his wishes. So every guest (including the bride and groom) could fill in at most 118 notes.

To illustrate, I give you an example of just two of the notes aunt Martha returned:

This clearly indicates that Aunt Martha would like to sit at the same table as Peter H. As you imagine, the guests returned quite a lot of notes. It turned out that they addressed their wishes quite clearly. There was no confusion about the person they addressed in their wishes.

Now, my daughter asked me to answer the following questions:

1. First of all, she would like to know whether, given such a collection of notes, every guest could be seated in such a way that all his/her wishes can be met.

2. If the first question is answered affirmatively, then determine a suitable table for each guest.

If you would know my daughter, you also know that she would appreciate a general procedure to find these answers as fast as possible.

And, as I told you, I was requested to do so. Now you could save me the additional time of writing this story by telling me how I could answer these questions in a satisfactory way. I can't promise you a place at the wedding dinner, but as a consolation price, I will take a bottle of wine originally reserved for the dinner and give it to the best solution submitted. I will present the solution in a follow-up story.

PS

I almost forgot, I have a third question I asked myself: imagine that all our guests are mathematicians and/or computer science people. Then my question is:

3. Using the current version of the notes you might need 2 notes to express your wishes with respect to one single other person. How could you reduce this number to 1, while keeping a uniform format for all the notes?



Yearbook Drink

Lisanne van Wieringen

First of all we would like to say that participating in the AnnuCie was really awesome! We had a lot of fun contributing to all of the traditions this committee created over the years, like cooking a purple meal for the AnnuCie that came before us, beating them in a beer drinking contest at SJB or crafting an enormous owl as a present for the board. But all fun activities aside, we actually had to make a yearbook that was due by the end of June. And considering that in previous years CH won the price for

best yearbook, the pressure was high.

From the start we had to make some very important decisions: What will our committee drink be? Or, what is going to be the main colour and theme of the book? We wanted to have a theme that had something to do with maths and informatics, but also referred to the 12th lustrum of CH, so we came up with 'Origin'. With our colour being royal purple with a touch of gold, we created the most perfect committee drink; cassis mixed with gold strike. From there we could start to focus on the essential things. We had to find a suitable printer and design a logo, the front and the interior of the book. We had to collect quotes and photos and we made sure we got a few sponsors for some extra money, so we could add a special timeline and still be able to have an epic Annuborrel with free beer. For our own official photos we went to Huygens' Hofwijck in Voorburg, to attend an exhibition about Christiaan Huygens and some of his inventions. This trip was also an inspiration for the interleafs of the yearbook. Another critical thing that had to be done was making sure important people such as the mayor of Delft or our Members of Honour, and other committees and study associations would sent us their submissions for the book. After some pushing they all (except for one) eventually did, and we got some really creative pieces with of course many references to our theme. Next to all the words of others, we also had our own contributions to the book. Like every other year we made the Annuquete which members of CH could fill in online and we wrote some extra chapters for the Annie story. In the end, everything was spellchecked and we looked through the book one more time to make sure everything was ok, and we could send the final draft to the printer.

After months of hard work we can proudly say that the yearbook is finished! We were very excited to present our yearbook for the first time at the AV along with the gadget. Everyone reacted really enthusiastic and immediately started turning pages looking for items they had send in. A couple of days later, everyone could buy an original yearbook at the Annuborrel. Together with the yearbook everyone got an owl necklace that was also a little watch when you opened its wings. With their brand new gadget hanging around their necks, they could get all the free beer they wanted. During the night, we each had to write a personal note in the yearbook of all the members who bought one. In the beginning we securely wrote every note with much thought and good handwriting. However, various groups of CH members like committees and the board, all wanted to celebrate the new yearbook and stopped by at our table with a glass of beer for each one of us. So after a couple of beers, we did not take the notes that serious anymore. This isn't much of a problem when you need to write a note for a CH member you barely know, but when you need to write something for one of the parents of the board that becomes a different story. Also, after writing fifty or what notes, nobody had much inspiration left, so we just drew random drawings or wrote down a joke about a drummer (these were all tips we got from previous AnnuCie members when they saw us struggling). In the end we finished every last yearbook before 1:00 A.M., and against all expectations kept all the beer in! The next day we got all kinds of reactions, including some complaints, about the notes we wrote. One of us actually congratulated a freshman for being on the board next year and wished him luck.



After the Annuborrel one last thing had to be done. We delivered the yearbooks to the study associations on campus and got a shot Ketel1 for each delivery. It was really cool to see the bases of the other associations, but we got to say: CH is by far the best!

iCom 2017 - Budapest

Nelleke Scheijen

In the previous issue of the MaCHAzine you maybe have read an article

about the preparations of the exchange committee for the study visit to

Budapest. The trip has been a week ago and it was very educational and

fun. Here you can read what we've all done in Budapest.

Tuesday 13th of June

Our trip to Budapest began vry early in the morning. We had to be on Delft station at four o'clock. With the buddy system everyone was awake on time and our trip had begun. After some participants bought a quick breakfast on Schiphol and a two hour flight, around half past nine we arrived at Budapest airport. Here we immediately encountered a part of Budapest, the subway. The metro runs throughout the city and because it is still the authentic style, it sometimes seems like you're in the Efteling. In addition, the doors close very, very fast. The first stop in Budapest was our hostel. It was a very nice place, just 250m from the basilica. Everybody had some time to buy lunch and get dressed for our first university: Eötvös Loránd Tudományegyetem University.

The university was very big with many lawns and a real campus. When we arrived at the mathematics and computer science building, we were taken to a lecture room where we received different presentations. The first was about computer science bugs, followed by general talk about ELTE university. We found out that it is an incredible big faculty with 2000 IT students. It was hard to imagine, because at the moment there was almost no one because of exam weeks. We also had a lecture about floating constructions and a short tour though the building, given by a student.

After the tour we returned to the city center to end the first day in Budapest together at restaurant Most Bistro, where we had delicious dinner. Some people went into town to have some drinks, but most people were exhausted from the long trip and went back to the hostel.

Wednesday 14th of June

This morning we started with a cultural activity, we went on a Budapest city tour. We met our very enthusiastic tour guide at our hostel and started walking. We heard about the history of Hungary and Budapest while walking to the biggest tourist hotspots: Buda Castle and Matthias Church with happy roof tiles, Fishermen's Bastion with a great view over Budapest and the Chain Bridge with the big lions without tongue. In one morning we were very impressed by all the beautiful buildings and views Budapest has to offer. In the afternoon it was already time for the second university: Budapest University for Technology and Economics. Here the first lecture was about Quantum, this was very interesting. After that a few bachelor and master students gave a presentation about their recent project. It ranged from computer Science to Mathematics. For example there was a presentation about the generation of a

3D tree with modelling. After the university there was a free evening. I went eating with a group of ten people at a beef restaurant, here we had the most delicious burgers and ribs.

Thursday 15th of June

In the morning we went to the first company, the Budapest Stock Exchange, which was just a five minutes' walk from our hostel. It was a very luxurious building and the stock exchange was on one of the floors. We had an interesting lecture about the stock exchange and their financial strategies. It was a really nice example of a subject that is very interesting for MCS students, but is not always known. In the afternoon was our second cultural activity, the Szechenyi Baths. Budapest is famous for its bath houses and we visited their oldest one. It was a very impressing building with a huge amount of hot and cold baths, sauna's and sulfur baths. Everyone really enjoyed the nice weather and the relaxing atmosphere. In the evening I went with a group to the Citadel on Gellért Hill. Here you had a breathtaking view over Budapest in de the dark. It was definitely worth the hike to the top.

Friday 16th of June.

In the morning was our second company visit. This time we went to a bit more computer science oriented company, Keysoft. They were market leaders for accounting and payment role software in Hungary and told us interesting facts about the IT regulations by the state of Hungary. From each department a colleague came up and explained what he or she did in the company. This made it a very interesting and varied presentation. We also all got a USB and pen before we went back to our hostel. In the afternoon everyone had free time to explore Budapest on their own. Some people went to different coffee bars, some hiked up the Citadel or went to museums. Friday evening was also our last evening in Budapest, therefor we had dinner and a pub crawl with the whole group. The restaurant was very special, we had all-you-can-eat buffet for only 4,50! After the dinner we went to a 360 skybar, from here you had a really nice view. After that we went to typical Budapest' bars, very big with everywhere different stages and rooms with different music. It was a really nice ending of the trip.

Saterday 17th of June

This was our last day in Budapest. Because our plane left in the evening, we had some time left in the morning. I used it to buy some souvenirs for friends and to drink a coffee at the banks of the Donau, which was really nice. At twelve o'clock we gathered again at the hostel for our last cultural trip, a tour through the parliament. It is the second most large parliament building is Europe and very impressive. Inside it was as impressive as outside with a lot of gold and marble. The building is still used by the parliament. Around four o'clock we went to the airport to fly back to The Netherlands.

Thank you iCom for organizing this awesome study visit! 🚷



Computer Science





Reactive Programming, and how to debug streams

Herman Banken

The interset and exerptizes are very different from what they over ion years ago. Receives streams of data are comparison, and mest accely crucial exerption systems are exerpted of a tron-accelute exercised. through experiments messaging. More time a billion people visit. Fambenic per day, generating out mounts of events, while areas expert

their past to show up humodiately at their friends timelines.

As a software employee, you can use Reactive Programming (DP) handle these streams of data, such that results display at the users screen immediately. Instead of imperatively moving the data through times of cale, you declare which immediates to apply, and DP handles the rest. Even an input stream (like the upper time in Figure 3) and a given transformation (e.g. with tighyByttes) DP coeries the output stream. Amy different illumies crist implementing DP with various ideologies and in various languages. In this which we focus on the [1], available for JavaScript, Java, Scala, Rotifs, C<u>2</u>, Suift and many more languages.

With Ru you can get hold of a stream (a Manzembla) in various ways, for example by listening for actuark baffic, Il-events such as more dicks or by constructing streams from someth by using scientified events. Figure 2 shows how this is done in code. Then you can transform theory for example combine, merge, filter or deby the streams. A full list of all available marfive aparatus is available in the documentation [1], which includes diagrams such as Figure 1 to explain them. When you subscribe the stream, you can nearine the events and for example forward them over the actuark, or reader the result to the storem.

Debugging, the wrong way

For my thesis 1 interviewed developers using IP in practice and naticed that they do not use delwaggers, but instead rely on prints?-delwagging to see the values in the flow during development. Available bonks and documentation all teach this "lechnique" too. These are many problems with this method however. Anomyst other problems, such print-output because a mess of many



interleaved messages, when multiple streams are printed simultaneously. More requires an extra line of casic for every specific part of the stream we want to inspect. We can do much better, right?

RxFiddle

For my thesis I mealed Refidiller a debugger for Ru. Refidtle is available as the ordelite radiides net where you can quickly test and debug a piece cale, and as a RPA plugin to instrument your num app. Figure 3 shows a screendot of the site. The user bypes his for code on the left, and clicks "Bun". Then the figures in the middle and on the right show up. The graph in the middle shows the various streams (each colored node is a stream) and their dependencies: events happening in one stream are send along the nodes edges in downword direction. The langes and diagrams on the right show the events that happen in the flow which is selected in the graph. The green dots are events, and hovering them shows their value in a pop-up. The vertical har in the flagsam denotes the cale of one stream, while the black croaces represent an error in the others. In this case the error is explicitly thrown in the cale, while in Figure 1 the error is the result of obing arithmetic on test ("a" a 10) instead of numbers. You can play with the example in the screenshot by suring to https://guo.gl/station.

Creating RxFiddle

When the user executes the case, 'magically' the images on the right appear. In fact we are using a nice property of invaSoript to achieve this: prototypes. We extend the its timury probabyte such that it notifies the debugger every time a stream is created, and when an event occurs in a stream. This part of individue is the textormeentation. In theory this can work for any longuages JavaSoript has prototypes, the JAA has agents which can notify class-files and other platforms have similar integration points.

The instrumentation sends debugger events to the next part of Hofddlex the visualizer. From the debugger events we reconstruct which streams were created and what the dependencies are. The result of this is the factor *Farw* forpin. We must the developer to be able to interact with the graph, so we visually reader the graph using an algorithm deviced from Storyflum [2]. First we determine on which runt the nodes should show, by running a Depth-Firstlumking. Best we order the nodes such that crucsings of edges are unlosed to

```
// Grante stress from a meteoric request, 2 value
Bearwhile.from{Intch("http://scample.org/apl"))
```

```
// Grante stress of source alight
How while from Twent (sindar, "slick")
```

```
// Invalig defined stream from Figure 1
Describing(4, 0, %a*, 0)
.mp(x => x = 10)
.mteoribe(crassic.lag)
```

Figure 2: de code autorple



Figure 2: Scenesiast of Refebulicant, simulay the Code (dilux (A), the RF6 (B) and the Dynamic Markle Diagram (C)

a minimum and the selected numes appear on the right side, as a stretched out. Size. Finally we indusce the numes by optimally placing them below or above connected numes.

When a flow of connected streams is selected, by clicking on the nodes in the graph, we show diagrams per streams the *Dynamic Ambia Organa*. These diagrams update five when new events happen in the running program. When howeving the events you can see their data values and the time they occured. If you click an event the selection changes to show the streams where the event, originated from, and the graph animates to reflect the changed selection.

Evaluating RxPiddle

In see if Ruffielde can improve debagging for developers we can an experiment, with 111 developers. The experiment is available colline, was announced on Twitter and was re-tweeted by care contributors to Ro. The developers first self-access their experience with programming and then solve four programming tasks. Hatf of the subjects was given the Dirame Debagger to debag the tasks, while the other half used Infiddle.

The results, shown in Figure 4, show that, using IbFiddle, developers can significantly faster debug some tasks, such as 13 and to some external 14 in our experiment. The first two tasks were short and simple and the developers cavid quickly debug them using objectever method. This shows that ReFiddle helps especially well for more complicated lik programs, where the extra overview of Insfiddle helps.

Future work

Of course licitialitie is still for from perfect, and I already unde plans to extend it. In casure the graph remains asable for larger programs we need to be able to filter nodes and combine andes which come from the same file or function. That way the developers keep an overview, and can diff. down to see more detail. Incologists are mother matted addition. By allowing users to specify roles to match events we can show a motification when a specific event accurs,



Hypere & Results of experiment

apinting the UL to select that event's stream and share its Aarbie Diagram. Adding different visualizations such as graphs, histograms and fast fourier inastimus (HT) to the streams allows the user to quickly regain overview when reviewing streams with large manuals of data.

The future of Reactive Programming is bright, and we hape that its fiddle will play an important role in shedding this fight when debugging its. For more information on Refshile please check and its Prinklin ...not or read my full paper at [3]. 🔞

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Tracking Copenhagen's elusive cyclists with Machine Learning

Technolution

The strength of machine learning and of neural networks lies in the ability to recognize patterns and classify objects. At Technolution, we use machine learning to improve our software platform for traffic management for instance. It's perfectly possible to teach an AI system to distinguish between pedestrians, cyclists and cars in photos or video images, but things get more complicated when it needs to identify individual objects multiple times in the data. Can an AI system learn to follow individual cyclists across images from city traffic cameras? It's a simple question, but the answer is far from simple.

Copenhagen: smart city

Let's begin with the context: the City of Copenhagen has asked us to improve traffic flow in the city, especially for cyclists and public transport. We're implementing a traffic management system and are realizing projects that contribute to reducing emissions and improving safety and quality of life in the city. All these projects are slowly transforming Copenhagen into a smart city. Technolution is working on further innovations together with the City. At the moment we're developing dynamic route information panels specifically for cyclists. They provide information about the amount of traffic, incidents, the best cycling route through the city, and the time until the next traffic light turns red. But Copenhagen wants to do even more for cyclists.

Tracking cyclists is hard

While we were looking for innovative solutions for the cyclists of Copenhagen, we discovered that there's actually not a lot of available data on bicycle movements. This isn't only the case in Copenhagen. Even in the cyclists' paradise of the Netherlands, data about cyclists is surprisingly rare; motorized traffic has been mapped much more extensively. There are good reasons for this of course: motorized traffic is more predictable and more measurable than bicycle traffic.

In the city, cars usually travel at the same speed evenly spaced along single or double lanes, which means it's easy to determine the average speed. Cyclists travel along the same cycle paths with varying speeds, and constantly overtake each other. Number plates make it possible to follow an individual car's journey across the city with traffic cameras, and in addition cars often have navigation systems which can be used to collect travel information. One thing you can do, of course, is to simulate bicycle traffic. We built a simulator for Copenhagen which is able to give a good approximation of cyclists' travel times on the basis of real-time radar measurements, the states of traffic lights over time, and a normal distribution of speeds. The city's traffic management system uses this information to monitor the flow of cyclists and to control the traffic. If the volume of bicycle traffic is unexpectedly high on a sunny day, this causes bicycle traffic jams, and travel times increase. The system can then adjust the program selection of the traffic lights so that cyclists have more green time, which in turn reduces travel times again.

The bicycle simulator will have to prove its worth in the immediate future. But simulations are not reality. How do things works in real life? We've been looking for other ways to determine cyclists' travel time and route choice for the City of Copenhagen.

The search for bicycle traffic data

If you want to have reliable statistical data about bicycle movements, there is really only one option: you have to register and record the routes and speeds of individual cyclists over a longer period of time. This is not an easy task. It's a big challenge to identify individual cyclists so you can follow them through the city.

We were thinking of machine learning, but to do that we'd have to overcome a few formidable obstacles. We decided instead to look into three less complex alternatives first.

- The first option was to follow cyclists' mobile phones through BlueTooth and WiFi, using their MAC addresses, or from transmission masts using triangulation. But it turned out to be impossible to distinguish between phones in cars or buses and phones in cyclists' pockets.
- A second option involved using the GPS data provided by GoBike, Copenhagen's electric bike sharing plan. But when this data is broken down into every possible cycle route in both directions on every day of the year, it provides access to less than half a percent of all bicycle journeys. Because bicycle speeds vary so strongly, this is not enough for use as live information.
- We had the same problem with a study where we distributed RFID tags to five hundred cyclists. The signal from the tags was read by devices placed along the side of the road, enabling us to determine the cyclists' speed and chosen route. This study did not generate anywhere near enough information: the diversity of the cyclists' routes was too great and the total number of bicycle movements too low.

Re-identification

Back to machine learning. Copenhagen has a network of traffic cameras, meaning that every cyclist is filmed by multiple cameras during his journey. Would it be possible to teach the computer to recognize individual cyclists in the images produced by the various cameras that they pass? If so, we'd also know those cyclists' most probable route and their average speed. We know it's technically possible to distinguish cyclists from other road users, such as cars or pedestrians, using pattern recognition. But the real challenge is: can you distinguish individual cyclists from each other using pattern recognition, and this in such a way that you can recognize them multiple times in images from different cameras (re-identification)? Even people find it difficult to recognize unique cyclists in video images, all the more so if they are moving in large groups, which happens all the time in Copenhagen.

Machine learning

At Technolution, we've built up a lot of knowledge in the field of machine learning and neural networks. Armed with this knowledge, we want to teach computers to identify cyclists, and we're going to use different technologies to do it. We're going to use existing neural networks trained with ImageNet, a large image database that is used as a benchmark for image recognition. These networks are very good at pattern recognition. We'll be partially stripping them, and then rebuilding and training them. We'll be using Yolo (You Only Look Once) to localize cyclists in video images; a neural network that can identify objects at high speed. We've created our own database of images of thousands of different cyclists. And we'll also be using TensorFlow, Google's open source software machine learning library, on which we'll be running Keras, an API that can be used to compose neural networks.

From class to individual

Once the technology has been realized, the re-identification training can start. The image database consist of thousands of photo pairs: two different photos of the same cyclist. We'll then offer the system two random photos from the database and ask it whether the cyclist in photo 1 is the same person as the cyclist in photo 2.

Neural networks are very good at classifying objects in photos, and they can easily distinguish cyclists from pedestrians. Convolutional neural networks are usually used to process images. These networks translate local patterns into ever higher and more abstract levels of features, and can thus recognize the type of object: the category. But re-identification is not about classifying the type of object, but about recognizing individual instances of the same category in different images. This means the way existing, pre-trained networks have been trained is all wrong for re-identification. The challenge we're facing is to turn this around.

Skewed distribution and overfitting

Another challenge in re-identification is the skewed distribution of matches and non-matches. If you have a hundred photo pairs of cyclists, you have ten thousand combinations, of which only a hundred match. A self-learning system will soon conclude from this skewed distribution that there is no matching combination of photos. This is an accuracy rate of 99 %, a fantastic result, except that in fact the system is useless. There is also the risk of overfitting. Because there is only a limited number of photo combinations available to train the system, it will quickly get to know the database of training photos. The system will then deduce a match from previous training data. It will conclude immediately that there is a match, without looking at visual characteristics. The system won't generalize the model to combinations of photos it hasn't seen yet. In this case, the system learns too little.



'Four cyclists on eight images. Even for the human eye, some of them are hard to re-identify.'

Cutting edge

It should be clear by now that it's not that easy to answer our initial question: 'Can an AI system learn to follow individual cyclists across images from city traffic cameras?' Re-identification is one of the big challenges in machine learning and the conundrums identified above haven't been solved yet in a satisfactory way. The Copenhagen study is cutting-edge research, and is very close to scientific research. This is what makes it so exciting. It's also exactly the kind of thing we do at Technolution: it's about data that is in great demand, it's difficult to get the data, but it's potentially viable. That's the kind of thing we like to do!

What do you think?

Has this story inspired you as an information technology or math student? Do you have personal experience with machine learning, have ideas you'd like to share, or think you could do your final project on a related subject? Then we'd like to get in touch with you. Send us an email or ring Technolution at the number below; also if you'd like to know more about us.

Contact

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Drinks and Burgers

Given that:

- 1 bottle of drink + 1 bottle of drink + 1 bottle of drink = 30
- 1 bottle of drink + 1 cheeseburger + 1 cheeseburger = 20
- 1 cheeseburger + 2 glasses of drink + 2 glasses of drink = 9

Try to find the answer to this:

1 cheeseburger + 1 glass of drink × 1 bottle of drink = ?

Birds in Trees Puzzle

There are 2 trees in a garden (tree "A" and "B") and on the both trees are some birds. The birds of tree A say to the birds of tree B that if one of you comes to our tree, then our population will be the double of yours. Then the birds of tree B tell to the birds of tree A that if one of you comes here,

then our population will be equal to that of yours.

Now answer: How many birds in each tree?

Four kind of a puzzle

In two decks of cards, what is the least amount of cards you

must take to be *guaranteed* at least one four-of-a-kind?



Mathematics





Variable selection and shrinkage in the Cox proportional hazards model

Ruth Koole

In many medical applications, people are often interested in the time until an event happens. In medicine, the event is then often seen as death and the time until the event is known as the survival time. This

is one of the many applications where survival analysis can be used to

analyze what characteristics of this patient have most influence on the

survival time of the patient.

The Cox proportional hazards model

In order to know more about the distribution of the time until the event, we use the survival function and the hazard rate function. The survival function is defined as: G(t) = D(T + t)

$$S(t) = P(T > t)$$

and describes the probability that a patient survives until time t. The hazard rate function describes the probability that, given that a patient was still alive at time t, the patient experiences the event in the interval $[t, t + \epsilon]$, for $\epsilon > 0$ su ciently small. In a mathematical way, this function is defined as:

$$\lambda(t) = \lim_{\epsilon \downarrow 0} \frac{P(T \in [t, t + \epsilon] | T \ge t)}{\epsilon}$$

Suppose there are n patients observed, which all have p characteristics, such as the diagnosis age or the blood pressure. These characteristics are known as the explanatory variables of a patient. According to the Cox proportional hazards model - which is one of the most famous models in survival analysis - the probability that an event happens in the interval [t, t + ϵ] is dependent on the explanatory variables of the patient. The Cox proportional hazards model defines the hazard rate function as:

$$\lambda(t|X_i) = \lambda_0(t)e^{\beta^T X}$$

where the explanatory variables for the ith patient are represented by a vector Xi. According to the Cox proportional hazards model, the hazard rate function is also dependent on the baseline hazard rate function $\lambda O(t)$. The baseline hazard



rate function describes the probability that every patient has to experience the event within this small interval. This probability is often diffcult to determine.

In order to fit this model to available survival data, the regression parameters $\beta = (\beta 1, \ldots, \beta p)$ should be estimated by using maximum likelihood estimation. The likelihood function can be found by computing the joint density function of the model, which gives that the likelihood function equals:

$$L(\beta) = \prod_{i=1}^{n} \frac{\lambda_0(t_i)e^{\beta^T X_i}}{\exp\left(\int_0^{t_i} \lambda_0(s)ds \ e^{\beta^T X_i}\right)}$$

Note that for computing this likelihood function the integral of the baseline hazard rate function should be computed. This could result in an unbounded likelihood function which causes problems using maximum likelihood estimation. Because of this disadvantage and the fact that the baseline hazard rate function is difficult to determine, Sir David Cox, the inventor of the Cox proportional hazards model, introduced the partial likelihood function.

The partial likelihood function

For computing this partial likelihood function, the patients in our data should be ordered according to their event times. The partial likelihood function can then be found by computing the probability that exactly patient 1 experiences the event at time t1, patient 2 experiences the event at time t2, and so on.

The probability that patient i experiences the event at time ti (see figure 1) equals the conditional probability (Jongbloed [2015]):

$$P_i(\epsilon) = P\left(T_i \in [t_i, t_i + \epsilon] \mid \{T_k \in [t_i, t_i + \epsilon]\}$$

for exactly one $k = i, \ldots, n \} \cap \{T_k \ge t_i \forall k = i, \ldots, n\})$

Using that only one event can take place within the interval [ti, ti + ϵ], there follows that whenever patient i experiences the event, all other patients that are still at risk for experiencing the event (patients i + 1, ..., n) must have an event time bigger than ti + ϵ . Rewriting gives that this probability equals:

$$P_i(\epsilon) = \frac{P(T_i \in [t_i, t_i + \epsilon] \mid T_i \ge t_i)}{\sum_{k=i}^n P(T_k \in [t_i, t_i + \epsilon] \mid T_k \ge t_i)}$$

Now using the definition of the hazard rate function, as in equation 1, gives that this probability can be written in terms of the hazard rate function, which gives that:

$$P_i(\epsilon) = \frac{\lambda_i(t_i|X_i)}{\sum_{k=i}^n \lambda_k(t_i|X_k)} = \frac{\lambda_0(t_i)e^{\beta^T X_i}}{\sum_{k=i}^n \lambda_0(t_i)e^{\beta^T X_k}} = \frac{e^{\beta^T X_i}}{\sum_{k=i}^n e^{\beta^T X_k}}$$

Now using independency of the event times there follows that the partial likeli- hood function of the model equals:

$$L_p(\beta) = \prod_{i=1}^n \frac{e^{\beta^T X_i}}{\sum_{k=i}^n e^{\beta^T X_k}}$$

Now that the partial likelihood function is known, the function can be used for maximum likelihood estimation in order to estimate the regression parameters β . Instead of maximizing this partial likelihood function, one can also minimize the minus-log-partial-likelihood function $\ell p(\beta)$. Then the following optimization problem should be solved:

$$\hat{\beta} = \min_{\beta} \ell_p(\beta) = \min_{\beta} \sum_{i=1}^n \left(\ln\left(\sum_{k=i}^n e^{\beta^T X_k}\right) - \beta^T X_i \right)$$

Variable selection and shrinkage

In many medical applications, there can be many many explanatory variables involved. There may be so many explanatory variables involved, that the model might become over parameterized and difficult to interpret. Therefore regression models can be used in order to prevent this. One method that can be used is the Least Absolute Shrinkage and Selection Operator (also known as the LASSO, Tibshirani [1997]). This method is a combination of variable selection and shrinkage. In order to apply this method, one should add the constraints of the L1-norm to the minimization problem in equation 2. This gives that in order to estimate the regression parameters β , the following optimization problem should be solved:

$$\hat{\beta} = \min_{\beta} \ell_p(\beta) \text{ subject to } \sum_{j=1}^p |\beta_j| \le s$$

This can also be rewritten in the Lagrangian form:

$$\hat{\beta} = \min_{\beta} \ell_p(\beta) + \alpha \sum_{j=1}^p |\beta_j|$$



Figure 2: LASSO-plot

Here, the variables s and α are shrinkage parameters, which determine how much shrinkage there is applied.

Simulation study

In my thesis I applied the LASSO and the Cox proportional hazards model on a dataset of 144 breast cancer patients. For all patients there where 5 clinical variables and 70 DNA based variables observed (van 't Veer et al. [2002],van de Vijver et al. [2002]).

The 11 variables that have most influence on the probability that a patient dies within a certain interval, are shown in figure 2 From this figure, we can con- clude that the diagnosis age suffers the least from the shrinkage and is therefore the variable that has most influence on the survival time of a patient. I decided to take a closer look at the survival times of the patients, according to their age. The survival plots can be found in figure 3.

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Figure 3: Survival plot based on age

Mathematics

The favourite puzzle of **Ank Voets**

W D P F W D S E K C V S O J N N O N Y T X I S S E D E L F T M L Z B U J W B D J Q M C M M A I R C O Q Y G L U A E C C J R F U G E X E V N N N F X O N R A S X E E X C H T U N F X O J C J C J C J C J C J C J																		
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APPLIED BARNOWL CHRISTIAAN COMPUTER DELFT HUYGENS HOLIDAY MATHEMATICS SECRETARY

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AIRCO

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FACULTY

LUSTRUM

SCIENCE

SUMMER

DEAN

Mathematics



Miscellaneous





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. For this issue, we added some lighter topics for that summer mind.



Last month allot of business around the world (in more than 64 countries) were hit by the so called Petya malware. First considered as ransomware, as victims were asked to pay a sum of money to get back their encrypted data, researchers think otherwise. Even if victims payed the ransom –some have already payed over \$10.000– they probably will not get their data back. The researchers call the malware a "wiper", meaning it was created to destroy data instead of just encripting it for money. [1]

The perfect smile

Want to impress the many people you will meet during your vacation? A smile is one of the things that could help in making your first impression even better. So how do you make the perfect smile? A computer program developed by researchers at the University of Minnesota may help you. They researched how different kind of smiles are interpreted by over 800 volunteers. They discovered a range for the "perfect smile". With this program they wish to help those that cannot produce a sufficient smile (that is not perceived correctly) due to medical conditions. [2]



Figure 1: Printscreen of the program for researching smiles[2]



Figure 2: An example of a (Toroidal) polyhedron[5]

Become an Origami-sensei

Want to get creative this summer? And want to do it with origami? MI researchers might have written an algorithm that could help you. After finding the figure you want to fold, the program converts it to a polyhedral. It ther finds a way to map its faces onto a piece of paper so you can actually fold it You do not have to cut the origami paper in any way and your final piece o art will look seamless as well. [3]

A new light detector

Light detectors are used to distinguish between different colors of light o heat. They are applied in satelites used for studying vegetation and land scapes on earth or in medical imagers to distinguish healthy and cancerou: cells. A new kind of detector has been developed using two kinds of technolo gies: nanophotonics and thermoelectronics. The former manipulates light on a nanoscale, the latter translates temperature differences into electron voltage This detector can not only distinguish visible wavelengths of light (colors) bu infrared ones as well at high resolution. It also operates 10 to 100 times faste than current comparable devices. Because of the detector's potential, it car improve the efficiency in solar cells and imaging devices. More info can be found in the source. [4]

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Historical person: Edsger Wybe Dijkstra



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Arthur Breurkes

Edsger Wybe Dijkstra was one of the most influential members of the founding generation of computing science. He contributed to both the theoretical and the engineering perspective of the, at that time new, discipline and identified several problems and concepts that are now standard in computer science. We all probably know him best from "Dijkstra's algorithm," which is an algorithm used to find shortest paths between nodes in a graph.

Dijkstra was born on May 11th, 1930 in Rotterdam. His father was a chemist and his mother a mathematician. Despite Dijkstra's consideration of studying law, and hoping to later represent the Netherlands in the United Nations, he studied mathematics, physics and theoretical physics at the University of Leiden because his parents had suggested it.

The studies his parents suggested were closer related to the profession he was later to practice. However, Dijkstra becoming a computer scientist was rather a coincidence. In fact, he met the director of the computation department of the Mathematical Center Amsterdam, Aad van Wijngaarden (considered the founding father of computer science in the Netherlands), who offered him the job opportunity to become the first programmer in the Netherlands.

To quote Dijkstra on meeting Van Wijngaarden:

"After having programmed for some three years, I had a discussion with A. van Wijngaarden, who was then my boss at the Mathematical Center in Amsterdam, a discussion for which I shall remain grateful to him as long as I live. The point was that I was supposed to study theoretical physics at the University of Leiden simultaneously, and as I found the two activities harder and harder to combine, I had to make up my mind, either to stop programming and become a real, respectable theoretical physicist, or to carry my study of physics to a formal completion only, with a minimum of effort, and to become...., yes what? A programmer? But was that a respectable profession? For after all, what was programming? Where was the sound body of knowledge that could support it as an intellectually respectable discipline? I remember quite

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vividly how I envied my hardware colleagues, who, when asked about their professional competence, could at least point out that they knew everything about vacuum tubes, amplifiers and the rest, whereas I felt that, when faced with that question, I would stand empty-handed. Full of misgivings I knocked on van Wijngaarden's office door, asking him whether I could 'speak to him for a moment'; when I left his office a number of hours later, I was another person. For after having listened to my problems patiently, he agreed that up till that moment there was not much of a programming discipline, but then he went on to explain quietly that automatic computers were here to stay, that we were just at the beginning and could not I be one of the persons called to make programming a respectable discipline in the years to come? This was a turning point in my life and I completed my study of physics formally as quickly as I could."

— Edsger Dijkstra, The Humble Programmer (EWD340), Communications of the ACM

After becoming the Netherlands' first programmer, Dijkstra married Maria Debets in 1957. As part of the marriage rites, he was required to state his current profession. Since being a programmer was no official profession at the time, the authorities did not accept it to be stated as his job. However, he received his PhD from the University of Amsterdam for a thesis entitled "Communication with an automated computer" two years later (1959). The thesis was devoted to a description of the assembly language of the first commercial computer developed in the Netherlands.

Dijkstra published a three-page article, "A note on two problems in connexion with graphs" that same year. In this article, he included the algorithm to find the shortest path between two nodes in a graph, now known as "Dijkstra's algorithm." Its impact since being published is enormous. Since 1959, all theoretical developments in single source shortest paths for general undirected graphs have been based on Dijkstra's algorithm. This is also the algorithm he's probably best known for.



Partner in advanced molecular diagnostic solutions

DDL Diagnostic Laboratory

In this interview Wilco and Eva will tell more about their jobs, DDL as a

company and their connection with the bioinformatician work field.

Wilco Knetsch started working at DDL in January of this year as a Senior Scientist and Project Manager. As a Molecular Bacteriologist, he is responsible for all microbiome activities at DDL. His expertise lies in data analysis and interpretation of single bacterial genomes, metagenomes, genotyping, phylogeny, and comparative genomics. Previously, he worked at the Leiden University Medical Center, where he obtained his PhD at the department of medical microbiology under supeWvision of prof. E.J. Kuijper.

Eva van der Veer works as a Senior Scientist and Project Manager at DDL. She started working at DDL Diagnostic Laboratory BV (DDL) in 2011 after working as a Molecular Biologist at several other companies. Her expertise lies in the setup, validation and implementation of new assays and technologies within DDL.

How would you describe the company profile of DDL?

Eva and Wilco: DDL Diagnostic Laboratory is a state-of-the-art laboratory specialized in molecular diagnostic testing on behalf of pharmaceutical companies (preclinical throughout phase IV clinical trials) and clinical laboratories. DDL also designs, develops, and validates novel diagnostic assays, with a strong focus on next generation sequencing assays and data analysis. Currently, we are involved in sequencing projects for multiple international sponsors (including more than 10 of the worldwide Top-20 pharmaceutical companies). Current sequencing projects have a strong focus in virology, but applications within the field of bacteriology are emerging rapidly. At the moment DDL is actively working on applications within the field of metagenomics, for instance microbiome analysis of different body sites (respiratory, skin, gastro-intestinal, genital).

Which role plays bioinformatics in your day-to-day activities?

Eva: As a scientist working on next generation sequencing projects, I interact with the bio-informatics department on a daily basis. A few years ago, bioinformatician Joachim Boers started as a TU Delft intern on a project regarding the implementation of a new NGS sequencing technology for viral resistance testing. For this project I provided the scientific input while he provided knowledge with respect to programming and data analysis. Unfortunately, the quality of the data generated in this specific project turned out to be insufficient so we discarded the technology. Luckily, we were able to offer Joachim a position at DDL after finalisation of his bioinformatics masters. My experience is that the equal input of scientists and bioinformaticians on our NGS projects provides natural synergy in generating successful results. Bioinformaticians in our team should be able to work with both GUI-driven commercial software packages as well as command line algorithms. It highly depends on the project whether there is a need for development of novel algorithms or the clustering of already available pipelines.

Wilco: Bioinformatics is in my day to day routine extremely important. Without Bioinformatics I would not have been where I am now. I am not a hard-core bioinformatician, nevertheless I know my way around on a terminal and know what tools are available to do NGS data analysis. I was very lucky to be trained by very talented bioinformaticians at the Wellcome Trust Sanger Institute in Cambridge (UK). This really boosted my research resulting into a cool Science paper that is currently under review. This was all done in my previous job at the medical microbiology lab at the LUMC where I got acquainted with NGS data analysis during my PhD. Starting with simple comparative genomics using Blast and gradually moving towards more complicated SNP typing analysis, building phylogenetic trees, doing pan/ core genome analysis and microbiome analysis. Especially on the latter area I am expanding the diagnostic services here at DDL. Microbiome research gained quite some attention lately and one of the mainstream techniques used in this field is DNA sequencing followed by data analysis. As Eva mentioned, we are at the stage of selecting the most optimal approach for microbiome analysis and within that context there are several bioinformatics challenges that we need to deal with. So any help with that is very much appreciated.

What would be the future in bioinformatics with respect to next generation sequencing assays?

Eva: We see an increased interest towards the use of single molecule sequencing, a technology that does not require nucleic acid amplification and fragmentation prior to sequencing. However, the challenge of using this technology within virology lies in the high error rate, having an effect on accurate characterization of nucleotide composition. The usability of these nucleotide sequences is highly dependent on bioinformatics approaches that filter out low quality data. There are highly active user communities discussing these challenges, increasing the commitment of bioinformaticians in these cutting-edge sequencing technology related projects.

Wilco: In addition to what Eva mentioned is the portability of these single molecule sequencing devices, we are moving towards the phase where we bring the sequencing technology towards the DNA molecule, while it's usually the reverse. This also means a further increase in DNA sequencing applications





which results in more data to analyze, big data!!! I guess the real challenge is not to produce large data sets, since that is easy nowadays, but to make sense out of this large amount of data.

This also relates to another fundamental question in terms of company investments; where should we invest in? Should we invest in new sequencing platforms, bioinformaticians or should we train technicians in data analysis and let them get more involved in NGS data analysis. The latter was recently postulated by Prof. Alexander Friedrich at the Dutch scientific spring meeting (NVMM). He suggested to invest in a new lab, the so-called E-lab, which should be organized in addition to the more traditional microbiology laboratory.

I find this idea appealing since it emphasizes the need for good bioinformaticians which are to supervise the so-called E-labs, furthermore it also provides a dedicated place for bioinformatics within the organization.

Finally, I see an enormous challenge in integrating all the big data sets. Here we discuss only genomics, but there are other disciplines as well which produce big data such as proteomics and metabolomics. At some stage we need to integrate these datasets with genomic datasets (also called integrOMICS). To do so we definitely need to expand our team of talented bioinformaticians.

How would you describe the work environment at DDL?

Eva: In my experience, the work environment at DDL is very stimulating. The projects that we perform are quite diverse regarding used technologies, requirements and applications. Internal communications are informal which really helps when working in multi-disciplinary teams. Our customers are open to our proposed solutions, which motivates pro-active thinking. This is also the case with the work that is currently being performed by DDL's bioinformatics team; our customers really appreciate the added value that DDL can offer with our specialized data analysis.

Wilco: I started here at the beginning of this year, so I'm relatively new here. The work environment is very informal and open. Anyone is willing to assist you if needed. We work with multidisciplinary teams on various projects what makes DDL a varying working environment, every day is different. Internal and external communication is of utmost importance at DDL. The employees who are working for DDL are highly skilled and therefore know what they are doing. The focus is on providing the best quality possible for customers. Finally, at DDL there is a good balance between work and social live. It's inspiring to work with such an enthusiastic team.

Which questions do we think bioinformatics doesn't have the answer to?

Wilco: A little teaser at the end of this interview.... One of the most commonly asked questions in the field of microbiology is whether NGS approaches are going to replace the more traditional microbiology laboratory. The answer is probably NOT! We can do a lot with NGS and bioinformatics but it is primarily on a level of prediction. We can predict gene functions, we can predict antimicrobial resistanWce profiles, we can predict virulence but it does not provide a phenotype yet. The predicted phenotype needs to be confirmed by traditional microbiology approaches, such as culturing. The last couple of years, many microbiology laboratories have invested in genomic approaches, but now we see a new movement arising in which high throughput culturing of samples (culturomics) is revived again. The combination of both approaches can be extremely powerful.





Ilse Bakker

On the 7th of June, when the night fell, EWI in Concert performed a

spectacular show at the International Festival of Technology. A concert

performed by 40 people exclusively from the TU Delft faculty EWI took

over the evening. Within the theme 'James Bond' students, teachers,

barista's and even the new dean from EWI created a show full of exciting

music and interactive light projections.

Susan, Merel, Redmer en Ilse from the EWI in Concert committee will share their experiences with the MaCHazine.

Susan Veldkamp

Hi! My name is Susan and I'm a freshman mathematics student. I joined EWI in Concert because there were always musical projects in high school, but I never joined them and I have since regretted that. So I tagged along with EWI in Concert, and I'm glad I did, because it was one of the best experiences! I especially liked working with all the enthusiastic musicians. It's just so awesome when you have this magical musical cooperation and everything sounds right together. It made my day sometimes!

Of all the musical acts that were performed at the concert, I liked participating in We Are Number One the best. It was just so crazy and fun, and I loved acting like a mad villain with my companions Ilse, Merel, Roos and Redmer. However, I thought that the Bond Intro sounded the coolest. I'm happy EIC started and ended with it, because I can't get enough of those violins at the calmer part!

Now that EIC has performed at the International Festival of Technology it's back to exam stress and regular university activities. But who knows, EWI in Concert might return next year...

Merel Toussaint

My name is Merel and I started helping the organising committee of EWI in Concert around mid-April. I'm actually an Applied Physics student, I did my Bachelor in Mathematics, and some of you may know me as member of Board 57. The most important tasks I had at first were: 'Fix everything that has to be fixed'. This later evolved into making a detailed planning of everything that had to be done around the concert, making sure we had oil barrels to do our awesome percussion act on, promoting the event on Facebook (Yup, that was me ;)) and, of course, being part of the backing vocal group. I did sing for audiences before, but performing with a group of such talented and musical people was fantastic. A few days before the concert we weren't at all sure how many people would be there to watch our show, but eventually our Bond square was full with enthusiastic people. I think everything went well, we have an awesome show to look back on and who knows, maybe we can do something like this again next year?

Redmer Aarnink

My name is Redmer Aarnink. I am a second year Applied physics Bachelor student and I live in Delft.

The best thing about EWI in Concert was seeing how everything we (the organisation and all members participating) had been organising came together in such an epic way! The crowd was huge and enthusiastic, the stage looked amazing and every single act was surprising and of high quality.

The fact that the night of EWI in Concert was one we will not forget is of course something to be extremely proud of. What I will personally take with me is where we started from and what we were initially aiming for. We began this project around November with just a vision. A careful vision in which we would perform a few songs that we hadn't chosen yet on some stage at some point in June!

Because of the everglowing ambition and enthusiasm of everyone involved EWI in Concert has reached heights we wouldn't have dared to dream of in November. I have learned so much from this concert but most of all that you should not be afraid to fall and keep on climbing, the sight will be ever more beautiful!

Ilse Bakker

I'm Ilse, second year mathematics student. Before this I studied music and worked as a music teacher. After my first year of challenging my brains with equations, I realized I missed making music with big groups of people. So I initiated EWI in Concert. They always say that 'beta' and music have some sort of parallel, and after organizing EWI in Concert I really think this statement must be true. What I liked the most, is that everybody was welcome to join. A big group of students, teachers, employees, a barista and even the new dean joined! Because of this, the group was extremely varied with many different musical styles and talents. This resulted in an exciting blend of musical acts, and VJ Vera Tan gave the show an extra dimension.

Most important to me was that all of a sudden we were BONDed with 40 individuals from EWI. I love being part of this group.

I want to thank all musicians for their wonderful music, Vera Tan for the beautiful projection, Timo, Patrick, Rik and Hans for their arrangements, and EICie for their effort.







The favourite puzzle of **Board 60**



Miscellaneous

The favourite puzzle of **ETV**



We have a classic electrical engineering problem. Imagine an infinite field of ideal 1 Ω resistors, such as the one in the schematic on the right. What is the equivalent resistance between two neighboring nodes (n1 and n2 in the schematic)?



Miscellaneous 37





Any card drawn will be a A,2,3,4,5,7,8,9,10,0,0, vr K, so there are 13 possibilities each time a card is drawn. The number of decks is irrelevant; the answer is the same if one or one-hundred decks are used.

which provides the solution, is to first draw 13 three of a kinds, and then one more card. The fastest way to draw a four of a kind is if the first four cards all have the same "value." The slowest way,

Since 13 x 3 + 1 = 40, if 40 cards are drawn it is guaranteed that those forty cards contain at least one four

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The solution is 7 and 5. Birds in Trees Puzzle

A on tree A, and 5 on tree B γ

Drinks and Burgers

From the 3rd: glass of drink = 1 (5+2x1+2x1=9) From the 2nd: cheeseburger = 5 (10+5+5=20)From the 1st: bottle of drink = 10 (10+10+10=30)

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Puzzles Answers



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Calendar



Faculty Dinner

To celebrate the lustrum with the faculty, Board 60 organized a BBQ for all the teachers and staff of the applied mathematics departments, computer science departments and the staff of the faculty!



Freshman Weekend

Every year at the beginning of the academic year, an introduction weekend for freshmen students is organized. During this weekend, the new freshmen will get to know their fellow students in an informal way. Several teachers, faculty staff and academic counselors will be present this weekend, so that they can already get familiar with some of them.

July

- 3-7 Exams
- 6 Faculty Dinner
- 7 Last day of acadamic year



18-20 Freshman Weekend

