

S T U D Y A S S O C I A T I O N

G E W I S

 **SUPREMUM**

VOL 52 Nº 1

**THE
MIRACLE
EDITION**



EDITORIAL

What is a miracle? This is something that may differ a lot from person to person. For the *Supremum* committee, this edition is a miracle. Why? Well, not only because we finished editing the magazine while communicating over a long distance, but also because we all risked our lives earlier by somersaulting around, playing dodgeball and bashing into big foam blocks at a trampoline park as a committee activity. Somehow, we all survived without injuries, although half of us were already exhausted after about half an hour. Luckily, after we enjoyed the (further empty) park, we could also enjoy some cold beverages or blue slushies. So after recharging for a bit, we're happy to present this edition to you!

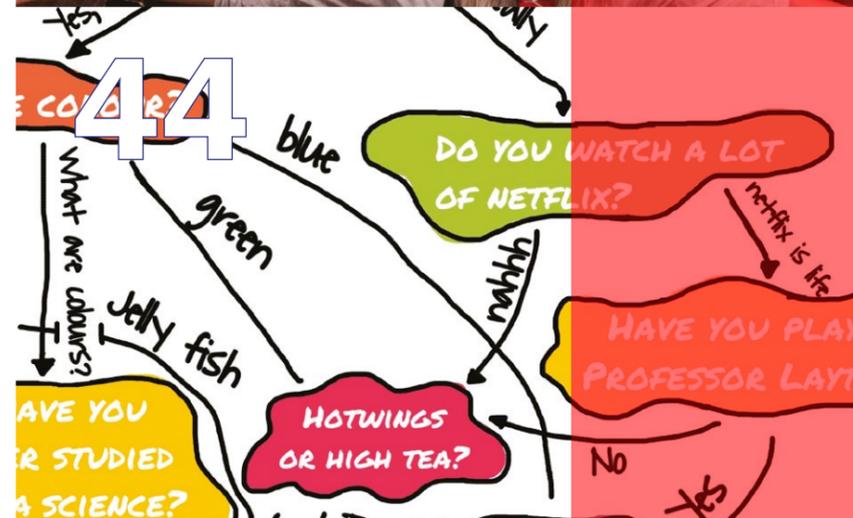
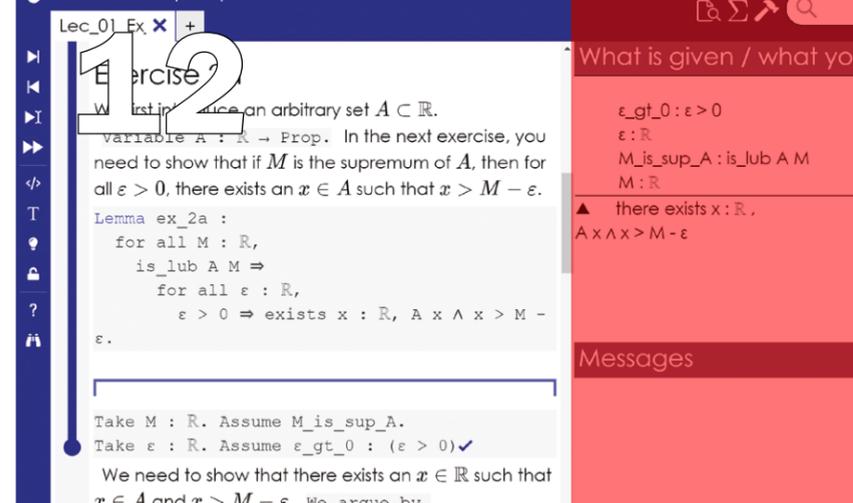
EDITOR IN CHIEF Anne Nijsten

In this edition, many others will tell about their version of a miracle. Furthermore, this time 6 first year committees will present themselves in the *Supremum*! Don't forget to have a look at the recipe of our first-time writer Ruben! He's truly a miracle chef, as I got to experience with the other board members quite often this year. Last but not least, don't forget to think about how you would define a miracle or when you experienced one, for yourself or with others!

It is truly a remarkable time, where we all need to raise our creativity to a new level. Classes, activities and communities move online, so don't be bored and explore! The TU/e community radio, GEWIS Discord and the exhibition on miracles by museum Catharijneconvent, they are all just a few clicks away! For now, let us hope for a miraculous re-encounter in the near future!

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CHAIRMAN'S NOTE

While I am writing this, the new decade just started and no disasters have happened at GEWIS between the last Chairman's Note and now, which you can call a miracle. But this does not hold for the rest of the world: we are just a few days in and big parts of Australia are on fire and we are on the brink of a war between Iran and America. This does not sound positive and there is not a lot we can do but hoping for a miracle so these disasters get solved.

TEXT Kees Voorintholt

The chances are slim, but miracles do happen. You can think about that course you passed with exactly a 5.0 on your exam when your feeling was not that good or the time you spin the wheel in the pub for the first time and win a meter of beer. When this happens to me, I am extremely happy and the rest of the day or night I feel good.

Within the board we try to share these moments when we feel good. It can be a miracle we experienced or we achieved something which makes us extremely happy and we received a compliment about it. This is a great way to keep up the motivation and gain some energy to keep on finishing tasks. With more motivation and energy a board year becomes much more fun!

“ Within the board we try to share these moments when we feel good. ”

Therefore, my advice for you is to compliment others on their accomplishments, because these compliments can feel like miracles. During my board year, I try to compliment the other board members individually if they did a good job. For example, when a board member

set up an activity for a whole day all by themselves. The whole day was organized perfectly and every participant was happy with the program and due to this great day, some international students kept coming to GEWIS. I was really proud and told this to the board member. But also when you receive a compliment you can be really proud and you should enjoy this moment.

“ ... compliment others on their accomplishments, ... ”

To conclude, I return to my introduction and I want to compliment the fire fighters and all volunteers that are fighting the fires at the moment in Australia. I hope this compliment can give them a little bit more energy and motivation to fight the bushfires. The bush fire season lasts until March, so we need a miracle for the fires to stop spreading. And we need much more miracles to solve all problems in the world. But for you, the reader, let's start with a small miracle like that exam you might have passed when you did not expect it and share the happiness of this moment with someone else!

FROM THE DEAN MIRACULOUS

I think it was in 1995. Together with a PhD student, I was at a High-Performance Computing conference in Brussels. The community was very aware of Moore's law but most often interpreted it within the context of processor speed. One keynote presentation focused on the effect of Moore's law on storage. Incidentally, I had just been negotiating disk space with the BCF of that time: if I remember correctly, for our group of about 15 researchers we were to upgrade to 500 MB, but I wanted 1GB.

TEXT prof. dr. Johan Lukkien (dean)

The keynote presentation sketched projections into the 2000s: for example, we would make only digital photos. A major problem would be how to search through our albums, or how to find on which computer the photos we were looking for were stored, or how to back up this massive amount of data. These were amazing things as digital photography was not commonly used at all and could not compete with analog; there were no mobile phones yet.

“ Just imagine what would be left of the housing problem if the building industry would innovate at the same speed. ”

Last January, at the CES in Las Vegas, resource limitations like storage capacity, processing capacity and network capacity for collecting and searching massive amounts of data are no longer the primary concern. The challenges envisaged in 1995 have dissolved into other challenges. Engineering along Moore's law has brought us amazing devices, even future devices from the past like the Star Trek Communicator (which is, of course, a smartphone).

This development in just over 20 years is truly miraculous. Just imagine what would be left of the housing problem if the building industry would innovate at the same speed.

“ ... make sure that also these developments can later be seen as truly miraculous, in a positive sense. ”

The current challenges revolve around data and machine intelligence. Many innovations shown in Las Vegas had in common that data was collected from the real (and private) world, processed and combined with other data in order to train algorithms. Algorithms that were often designed to influence people. Much more than for the amazing devices, there were concerns felt: the concern of losing control over data about oneself, the concern about unknown companies using that data for unknown purposes and the concern of algorithms influencing our behavior. It is on us, scientists and engineers, to make sure that also these developments can later be seen as truly miraculous, in a positive sense.

GEWIS
Kees Voorintholt
Chairman
GEWIS 2019-2020

GEWIS

DEPARTMENT



GEWIS

EDUCATION FIRST

MIRACULOUSLY EASY FEEDBACK

Kringgesprekken, evaluation forms, focus groups, education committees: there are many ways to transfer students' feedback to teachers or other higher-ups. Despite this, students often do not feel they are heard or that their feedback is taken seriously. On the other end of the spectrum a similar phenomenon occurs: teachers feel there is a lack of constructive feedback and are sometimes completely oblivious to the problems students deem so clearly apparent.

TEXT Bas Gieling

One of the most important aspects of a good feedback system is creating a loop. When feedback from a student is given to a teacher, this should induce action for improvement, the results of which should be looped back to the students. This way, students see the positive impact of their own actions, which motivates them to repeat these in the future. Similarly, teachers see the positive responses of students to these improvements, which motivates them to keep on improving.

Ideally, these feedback loops are as short as possible. In an ideal exchange of feedback, the student is able to give notice of the problem to the teacher at the exact moment they experience this problem. The feedback can then be based on a very fresh memory which allows it to be more constructive than when it is based on a vague memory of a couple of weeks ago. Also, the teacher can more easily see the problem for themselves, because everyone tends to remember the most recent hour of their lives fairly well. In most cases, this makes it easier to immediately tackle the problem and make improvements for next time. In the most ideal scenario, these improvements have immediate impact, which feeds the results of their criticism back to the students: the loop is closed.

The problem with our current feedback system is that it is difficult to create these short and closed feedback loops. Students often feel they have to wait for the

Kringgesprekken or the course evaluation before they can share their thoughts. Also, typically, students do a course once (unless it's Analysis or Automata) and any improvements based on the students' feedback only become effective during the next iteration of the course. On top of this, monitoring the improvements of courses over a year and showing students what has improved is still not standardized in our system.

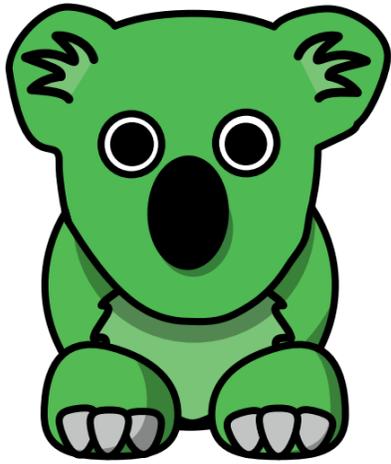
“ One of the most important aspects of a good feedback system is creating a loop. ”

There is one very simple way for students to make the feedback loop short and closed: when you see a problem, tell the teacher! Raising hands during the lecture may be too much of a disturbance, but most teachers are very open to discuss your feedback right after a lecture is over. This makes it a lot easier for a teacher to respond with potential improvements where necessary; it even urges them to take action when they are confronted with a problem face-to-face. Think about this next time you encounter a problem in a course: it's a quick and easy way to improve both your and your fellow students' life!



FYC 20-3 GESEIK





YOUR GESEIK IS OUR GEWIN

“Please introduce yourselves”. An interesting request, but not always that easy. Like reuniting with a grandma you haven’t seen once in the last five years. She will be so proud that you’ve grown so much since the last time she’s talked to you, although you only know that you’ve been growing in the width for the last two years. We have no idea what you already know about us, the people of GESeiK. This also means that we had no idea of how to introduce ourselves to y’all. After an afternoon of intensive thinking, ahem, hard work and with no distraction whatsoever, we have come up with an idea.

TEXT Natasja & Lucas - FYC 20-3 GESeiK

So, what does GESeiK mean? If you’re Dutch, you probably know what “zeiken” means, but for the more international students among us, we’ll inform you. A single translation for “zeiken” doesn’t exist. This word can be used for many different things. In the same way, we are all teamed up under one name, but GESeiK is more than just that word. Each of us gives our own meaning and contribution. Now you may still wonder what GESeiK stands for. We are ‘GEWIS’ Seker Een Idiote Klub’ which roughly translates to ‘A club of idiots.’ And of course we wouldn’t be GESeiK if we didn’t spell it incorrectly.

Let us tell you how we got together as a committee. As you might know, at the formation meeting, the room is split into groups of mathematics students and computer science students. Then groups of 4 to 6 people, that will later be matched to assure an even division of students. However, we only have three computer science students in our FYC and seven from mathematics. This is because there were still four CS students at that time. Namely Daniek, Kaz, Lucas and Gijs. You see, in the start of this year, one of these four students, Gijs, did both CS and AM. However, unfortunately the study wasn’t what he hoped it would be, so he chose to become a full time mathematics student.

Of course in our FYC we have the regular distribution of roles. Marit is our chairman and is doing a great job at it. She makes sure to keep our meetings structured, to ensure that we get through the agenda as planned. She can scream “ORDER” as one of the best, but is still waiting for us to buy her a hammer. Then we have Inge, the treasurer of GESeiK. Not only does she account for the budget of activities, but she also keeps track of our “pot”. This is a figurative jar of money that gets filled with a euro when someone either is late to a meeting, didn’t do their task before a meeting, or doesn’t show at a GEWIS activity when they said they would. We were planning to use the money in the pot to plan a nice activity, but we ended up buying beer and shots for the money that we have collected thus far. Next is our secretary, Natasja. You could say that it is a miracle that Natasja will stay a member of our FYC, since she is unfortunately planning to quit her study to start another one next year, namely the study that will be specialising her to become a mathematics teacher. She still is very excited about GESeiK and will remain with us until the end of the year. However besides this distribution, we have added some more incredibly important roles for a few of our other members. The first of which is our drinks manager, Pim. His job is to make sure that there is coffee and tea at every meeting, which most of the time is done. When he only has one thermos flask at hand, he will always choose coffee

over tea (duh....). An equally important role to be filled was the snack manager, which is done by Matthijs. He is perfect for this job, because he would rather be late for the meeting than forget to bring food (Which we all completely support). Then we have Gijs, who looks after our Instagram page. He is the one person that chooses which group photos will be put on Instagram, so no wonder that he is the only one that has no ugly pictures online. Another crucial job to be filled is the points manager. This is done by Lucas. He makes sure that all the points we earn for our FYC end up on the leaderboard. This basically means that his job is to scare the other FYC’s; “How can GeSeiK have so many points?”. When our chairman can not attend one of our meetings, Daniek shall take her place as the vice-chairman of our committee. She is doing a great job at that! We all have great respect for her talent; waiting for Marit to be ill some time. Speaking of talents, Sim always manages to close his eyes on photos. We now have a few nice pics where he hasn’t succeeded to perform this little hobby of his, but it has cost us a lot of hard work, blood, sweat and tears. The one person you will not see on our photos that much, is Kaz. We really miss his company every time he has soccer training, or is partying with his other friends in Nijmegen. This doesn’t mean that Kaz is not an important member of GESeiK. It just means that he is an even more active member of the popular *Nijmeegse* partyscene.

Recently, we al have been able to convince Hannah to also join GESeiK! This means that she is our very first FEUT!! Hannah is already a close friend to most of us, so we are very glad that she decided to join us. A few of you have already asked us about her “ontgroening”, which has just started while I’m writing this piece. We won’t throw her in the Dommel or let her do a dropping in her underwear. No, we’re keeping it nice and simple. She’ll wear a FEUT-shirt to the borrels, on

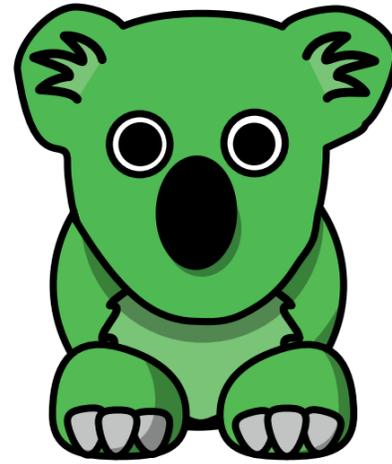
which you can all write or draw. I can’t tell you how it went yet, but when you’re reading this piece, you probably already know. I can only mention how excited we are about having Hannah as a brand new member of GESeiK!



We have done a few “team building” activities, such as going bowling and celebrating Sinterklaas by dividing presents by playing a game. We are really excited to plan an activity where we can invite everyone!

We hope you have figured out that we really are “Seker Een Idiote Klub” (if you hadn’t noticed that before), and please always remember: Your GESeiK is our GEWIN.

Yeehaw, GESeiK





TRAINING-ON-PAPER: HOW TO BFP/THESIS

Finishing a Bachelor Final Project (BFP) or thesis is a miracle on its own. You are likely struggling with your own project, as many students currently are. Whether you have problems with finishing on time, writing in academic English or communicating with your supervisor, you are not alone! This Training-on-paper provides you with tips and tricks to tackle a project like your BFP or thesis.

TEXT Sabine Geurts and Merel Pennekamp
- TRAIN

START STARTING!

What does a BFP or thesis even look like? To give you an idea, a list of all TU/e published student theses (bachelor and master) can be found on this site: <https://research.tue.nl/en/studentTheses/> (or scan the QR code on the right). This is what you are supposed to deliver in a couple of months. This is what the university expects of you. Scared? Good.

Now, stop panicking and go about this one step at the time. Step one in any big project is to choose a field of study. What courses did you enjoy? (Or: what courses were 'not terrible?') That is a good place to start! Now go and investigate (on Canvas) which professors are responsible for that field of study. This professor will help you find a supervisor. Your supervisor might have some research topics ready, or you can suggest your own. Congratulations! You are now 'BEPing' (referring to "bachelor end project") or 'graduating'.

FAILING TO PLAN IS PLANNING TO FAIL

After you find a supervisor and a topic, the planning phase commences. Every project is different, but each and every one requires some kind of planning. Not just because your supervisor likes it, but to actually help you in the process of writing your paper. The most important step is to set goals. These do not have to be specific, but should be more long term. Maybe (bi-) weekly goals combined with monthly goals is a good way to start. Think about the following questions:

- » What is your research question?
- » What research has already been done on this topic?
- » Which grade would you like to receive?
- » What information should be included in your paper?
- » When will you start writing your paper?
- » When will you finish (the first draft of) each section?
- » When will you finish your paper/give your presentation?

Don't know the answer to all questions? Don't worry! Just pick a rough estimate for now. It is easier to change a plan than to not have a plan at all. It is nice to set goals that you want to achieve during this project. These goals will change continuously during the project, but having a set of goals at the start will help guide you more than just starting with a blank page. It is good to review your planning with your supervisor multiple times throughout the process. They can help you set a realistic timeframe and it helps to make sure you are on the same page.

SUPERVISOR STRUGGLES

Supervisors are busy people. You might struggle with getting a meeting with them or getting feedback as quick as you would like. At the beginning of the process, make arrangements together on how frequent your meetings should be (biweekly/weekly/monthly) and how to contact each other. Do not settle on a 'come

by when you have questions' agreements since this will probably slow down your process significantly. Even if there is not much to discuss, go to your meeting and update your supervisor on your work. They might also have some interesting insights. Having the meeting **at the same time** every x week(s) also makes it less likely for either one of you to forget the meeting. Be proactive with setting these meetings. Supervisors are very busy and might slack off when you are not proactive. It is your project, not theirs! They already graduated :)

“ The secret of getting ahead is getting started. ”

If you encounter bigger problems with your supervisor, like not being able to reach them at all, you can go to your Academic Advisor.

A DAY OF BAD WRITING IS BETTER THAN A DAY OF NO WRITING

Do not leave the actual writing of your paper until the end of your research. This will give you more stress than necessary. The outline of the report can already be written at the start of the project. Most papers have an introduction, literature research, your own research and some conclusion and discussion. When writing any report, keep your target audience in mind. Did you write a coherent story or is it just mathematical scrambles scattered around from your notebooks? Ask a friend to proofread a section to be sure that it all makes sense.

“ Do not leave the actual writing of your paper until the end of your research. ”



<https://research.tue.nl/en/studentTheses/>





train.gewis.nl/writing

Some sections of your paper can be written while waiting for your program/simulation to run or while you're waiting for your supervisor to mail you back. When you start to write your report early on, the chronological order of the chapters can still change, but you should already aim to write your research in a logical sense. This way, you do not need to recover the thoughts or methods you had months ago. Writing mathematics in a logical way is difficult, so do not be afraid to ask your supervisor or fellow students for some examples of other papers to help you along. For help writing coherent pieces, the TU/e offers workshops and courses on academic writing, such as SFC640 - Academic Writing in English.

For further tips on academic writing, you can check out the reader of the Academic Writing workshop TRAIN gave in February 2019. The reader can be found on the website train.gewis.nl/writing

FINISHED IS BETTER THAN PERFECT

Passed your exam? Finished the course! Referee whistles 3 times? Finished the game! But when are you finished with your paper? When you're working on a project like the BFP, you can always do more and it is questionable when you're finished. When have you done enough research? When is your algorithm sufficient? It all comes back to the goals you set in the beginning. What did you want to achieve? Did you achieve this, and does your supervisor also think you have accomplished enough yet? For every person and project, the finish line looks different, so clear communication with your supervisor is essential. They will have seen more projects, and will know if the project lives up to the standards of the university. Furthermore, keep in mind what you wanted to accomplish. Was it to finish with a 6 or with a 8 or higher? It does not matter if you need to do a bit more or take some extra time to finish. But at some point you **have to finish**. So, if your supervisor has more

great ideas for your research, feel free to add them to the 'future work' section of your paper. Or if finishing a thesis was not enough thrill for you, you can always do a PhD.

The final sprint is always the hardest, but also the most satisfying. TRAIN wishes you good luck in (starting and) finishing your Bachelor Final Project or master thesis. Choo choo!

“ For every person and project, the finish line looks different, so clear communication with your supervisor is essential. ”

TIPS AND TRICKS

- » Do not underestimate the amount of work: you can get a lot done in the first few weeks.
- » Set (bi-)weekly deadlines on fixed moments.
- » Work on your project on fixed time slots, similar to going to a lecture.
- » Have a "let's-suffer-together" partner to work together. Keep each other accountable to show up at the university on time to work on your project.
- » Follow TU/e trainings like this one: ESA SFC01 - graduation group (bachelor/master)
- » Take an active break (at least once per 90 minutes), walk a bit and eat some fruit or vegetables.
- » Keep track of the time spent on the project in a spreadsheet.

INTERESTING READS

1. Getting things done - David Allen
2. Writing mathematics well: a manual for authors - L. Gillman
3. How to think like a mathematician - Kevin Houston
4. www.phdcomics.com

WANT TO PASS ANALYSIS? USE WATERPROOF!

Analysis 1 has the reputation of being one of the hardest bachelor courses in the mathematics curriculum. I've been an instructor for the course since I started at TU/e three years ago, and from my experience the main difficulty is learning a new skill: proving mathematical statements. But while I do recognize how difficult this is, I also believe that if we make some changes, many more students can step out of Analysis 1 with great proving skills. How? By using Waterproof.

TEXT dr. Jim Portegies

THE PROBLEM OF THE SUPREMUM AND THE SUPREMUM OF PROBLEMS

I've just finished grading the Analysis 1 exam. Question 1 on the exam is practically always a question about the supremum. Although the students expect this question, unfortunately, only less than 10% of them manage to solve the question on the exam. Even worse, about 70% of the answers are very far from what a rigorous mathematician would call a proof. And I think this reflects the key problem: at the end of the course, many students still struggle with what is expected of them when asked to write a proof.

The key solution, I believe, is to shift focus to learning the expectations of a proof.

HOW TO FIGURE OUT WHAT IS EXPECTED OF A PROOF?

One way to learn what is expected of a proof is to learn from examples, such as the ones you see in lectures. I imagine though, that this way of picking up the mathematical language is very much like how I unsuccessfully tried to improve my French at some point: for months in a row, I turned on channel 5 in the morning to listen to the French news. The effect? Zero. I imagine that this method is successful for some people, but there are many others for whom just hearing or seeing examples is not going to work. Another way to learn what is expected of a proof, is by studying logic. This is very much like learning a

language by studying the grammar. The advantage of this approach is that it explains the expectations, but the big drawback is that it increases the level of abstraction.

In my opinion, the best way to learn what is expected of a proof is by constructing many proofs yourself. It is certainly the intention that students gain this constructive experience in Analysis 1 by making the exercises, but the reality is harsh:

MOST STUDENT SOLUTIONS ARE NOT PROOFS

Why? First, it is only understandable that when you are new to proving, it is next to impossible to write proofs. You need feedback on things that go wrong and on how to improve things. However, currently after students hand in the homework, it takes at least a few days, and sometimes even a week before they get feedback. This is too long.

Secondly, some of the exercises are seemingly so simple, that it is unclear what is left to show resulting in student statements such as "Because A, therefore B" in an effort to prove that A implies B. Simple questions are in principle ideal for learning a skill that I think any student can master: figuring out the proof template that a mathematical statement dictates. But there is no learning effect if the answer is the same as the exercise.



DEPARTMENT





WATERPROOF

Thirdly, most of the exercises are complicated, requiring simultaneously intuition for concepts that have just been introduced, a clever insight to make everything work and a good structuring of the proof. Due to this triple-layer complexity, student solutions are often logically wrong and lack proper structure.

PROOF ASSISTANTS TO THE RESCUE

A possible solution to all three issues comes from programming. Programming is a lot like writing mathematical proofs. A proof in which sentences are in the wrong order, or in which variables are undefined, is a lot like a computer program that simply does not compile. And indeed, in programming it is often the compiler that gives immediate feedback.

The equivalence between writing mathematical proofs and writing computer code can be made very precise, and it is at the basis of many proof assistants. Proof assistants are software applications that help the user to construct a proof. In the end, they can verify that the end product is indeed a proof of the mathematical statement. On the way, they give immediate feedback.

Although proof assistants provide the necessary technology to solve the three issues above, they are not directly suitable for a classroom environment. We needed to build a layer around them, and this is Waterproof.

WHAT IS WATERPROOF?

Waterproof started as a Software Engineering Project (SEP) in Q4 of the 2018-2019 academic year. The main goal was to transform a proof assistant into something that looks good and is fun to work with. After the SEP

was completed, Thijs Beurskens, David Tuin and I developed the software further. In particular, we simplified the interaction language of the proof assistant, so that it is better readable for humans and the resulting proofs closely resemble hand-written proofs.

In Waterproof, a teacher can create exercise sheets, with proofs that are to be filled in by students. The sheets look a lot like Mathematica or Jupyter notebooks. Users write sentences in a special language, and every sentence that they write can be checked by the proof assistant. Moreover, Waterproof keeps check of the current status of the proof: what you already know and what you still need to show. And it's highly addictive, at least to some people like myself.

HOW DOES WATERPROOF HELP?

Why is Waterproof a solution to the three issues mentioned above? First, it provides immediate feedback. Secondly, it helps figuring out what is expected in the easier exercises, because it will only accept a well-structured proof with logically consistent proof steps. As you build experience proving the easier theorems according to Waterproof's standards, you will gradually discover how to go from a mathematical statement to a template for a well-structured proof. Once you have this down, you are ready for the more difficult exercises. So thirdly, you will be able to recognize the structure of what the proof should look like in the more difficult exercises, and you can focus all your efforts on that one complicated step that requires a careful choice or clever insight.

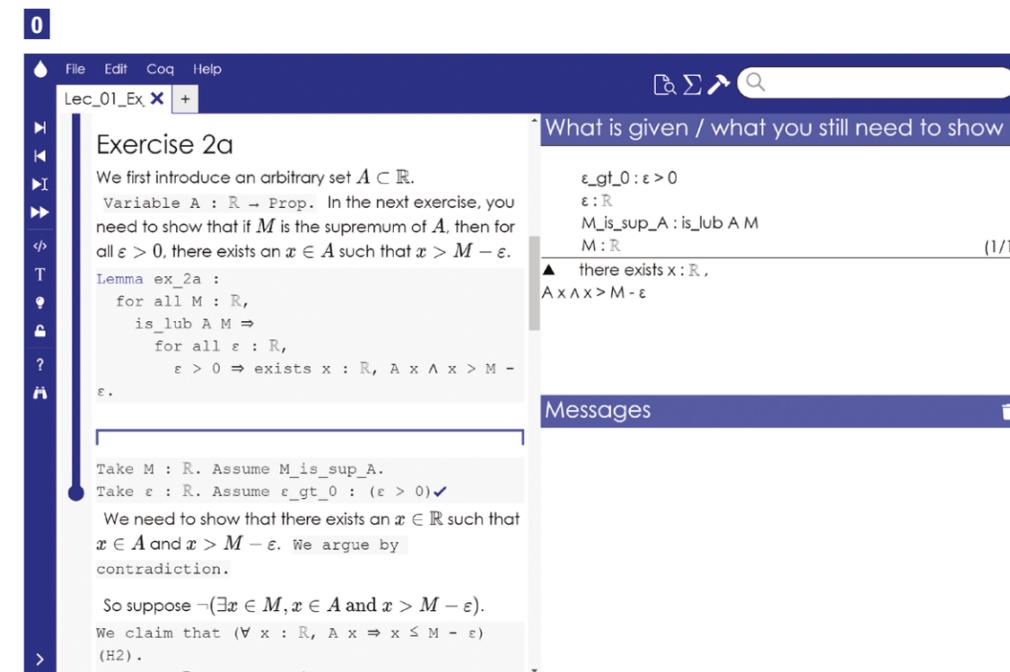
All in all, Waterproof helps with learning how to prove, because it implicitly makes clear what is expected. The rules are to be discovered, but since it gives immediate, consistent feedback when you violate them, it makes discovering them, and therefore finding out how to give mathematical proofs, much easier. And strict, consistent rules are what often make games so much fun.

You can further improve your proving skills by studying explanations of what Waterproof expects. This has the same benefit as studying logic: it explicitly explains the expectations, but rather than abstract it is concrete, so that many of the rules are much easier to understand.

Check out Waterproof by scanning the QR code or on github.com/impermeable/waterproof/

SUMMARIZING: WHY WOULD YOU USE WATERPROOF?

- » It is fun
- » You will learn what is expected of you when you need to write a proof
- » You will get a dopamine rush whenever Waterproof tells you your proof is correct
- » It will help you pass Analysis 1



*Infimum: A strange or funny quotation from a teacher, a student or faculty member.
Here you can find infima sent to the Supremum committee via inf.gewis.nl.*

Tim heeft een lege fles vast

Alex: "Kom we gaan flessenpost maken."

Tim: "Ja maar met wat dan?"

Leticia: "I have had 13 at the same time before!"

Wietske de B.: "Soms ben je een week overtijd, en dan komt het nog steeds goed!"

Susan: "Liggen er nog servetjes in het keukenkastje"
even later

Susan: "Auw, het spoot in mijn oog"

Ilse: "Jeeej, ik ben geen domme hoer."

Jesse Schardijn: "TVV, zijn dat de enquête boys?"

Roubtsov DBL App Development kickoff:

"Technically when you signed up for your study you gave away your rights."

Leon net terug met vliegtuig uit Barcelona

Leon: "Oh ja die slides heb ik gelezen in het vliegtuig"

Rink: "Kan jij lezen in het vliegtuig?"

Leon: "Ja je hebt toch gewoon ogen enzo?"

Lucy de G zit te vozen met haar prela.

Ralph: "één woord, vier letters" "kiwi"

Lucy: "ik ben allergisch voor kiwi"

Ralph: "ja, ik dus ook"

Wouter v. H.: "Ik denk er niet over na; ik steek hem er gewoon in."

Wouter S.: "Nul is geen getal, dat is een letter!"

David M.: "Ik knal wel even een pannenkoek in de oven"

Filomijn: "Als het geen pijn doet, is het niet aan het scheuren"

Rick W.: "ff knietje tikken met een betonschaar"

Berry Schoenmakers: "Zero is not a very random number."

Nobody:

Levi P.: "ik hoorde poly-amorisch, ging het over mij?"

Tijdens 30 seconds

Samuel: "Die ene die bij Eva hoort, ... en Eva"

Loek: "Simon!"

Roy: "ga je dan een kastje aan haar hangen alsof ze diabetes heeft?"

Bij het bedenken van een blauw groepskostuum.

Romy: "Zullen we als treinstoel gaan?"

Bouke: "Nee, ik ben eerste klas."

Terwijl hij een foto van een LEGO giraf laat zien

Gijs: "Kijk eens, wat een mooie olifant!"

Jeroen van O.: "Ik snap wel waarom ik niks zie op mijn telefoon..."

Jeroen van O.: "Misschien moet ik hem omdraaien!"

Wouter: "Ik wilde een mooi fascistisch logootje maken, maar het werd een stopbord."

Rink P.: "het gemiddelde iq van Amerika is 100. Het gemiddelde gewicht is ook 100, dat is toch hoe we de kilo vaststellen?"

Anne: "Hoe zoom je uit?!"

Bart S.: "Yes, we hebben een Cute-Cute plot!"

Ava ziet een 34 op het doelenbord van Ruben.

Ava: "Waarom heeft Ingmar dit getekend? En waarom weet ik dat het Ingmar was?"

Ruben ligt onder de tafel bij GEWIS om kabels te fixen.

Ava: "Misschien kun je ook analoge infrastructuur gaan doen."

Sako: "De laatste keer dat ik in Spanje was spraken ze daar nog buitenlands"

Stiefvader van Vinz: "Wat is dat toch met die toeters?"

Liselotte: "Ik ken twee Pokémon: Pikachu en Kirby."

Prot bestuur tegen 38: "Ik denk echt dat jullie het meest inefficiënte bestuur ooit zijn"

Leon: "Ik ga morgen naar Groningen! Nou ja, ongeveer, Enschede."

Lars: "Ik zit nu op dat punt dat mijn slush puppie alleen maar ijs is omdat ik alle limonade eruit heb gezogen."

Bouke: "Jij zuigt ook hard."

Leon(in joggingbroek op de AV): "Je kunt port toch ook in pak kopen, of is dat alleen wijn?"

Iris (tijdens Analyse 3): "Je moet wel een smooth D hebben anders kan je niet Laplassen"

Sanne: "Kan je google scholar sorteren op moeilijkheidsgraad?"

Op woensdag

Rick W.: "De vrijdagmiddag is vroeg vandaag"

Tobin: "Paarden hebben echt een fijn leven."

Bas tegen Robin in de college zaal: "Als je serieus genomen wilt worden, moet je schoenen aan doen."

**Tijdens een Supremum vergadering trekt Bouke een nietmachine in plaats van zijn telefoon uit zijn broekzak **

Bouke: "Hé, dat is de verkeerde."

Bas G. kijkt in een broodtrommel van de free for all:

"Ik dacht dat het een keukendoekje was, maar waarschijnlijk is het een boterham."

Lucy G terwijl ze aan het paaldansen is: "Dit is meer mijn formaat paal!"

Bouke tijdens een college Algorithms in zijn

bestuursjaar: "Oooh, dus TSP in het GEWIS-lied staat voor Traveling Salesman Problem"

Tijdens het mexen

Semi tegen Tim H.: "ja, jij was laag!"

Tim: "Ik heb nog niet gegooid..."

Silke: "Als het niet gedefinieerd is kan je er maar beter gelijk mee stoppen... of je moet het definiëren."

Ralph: "Viagra is hét nieuwe XTC!"

Ruben tijdens bussen: "Als je toch al tegen mekaar zit kun je het beste palen."

Kostek: "Ik friendzone gewoon elke man die ik tegenkom"

Bas: "Ik vind het niet erg om eerder klaar te zijn"

In the slides: `Girl.getName();`

Op de terrorflup 3.5 staat er klassieke muziek op:

Spouwsjaars: "Hey! Ik probeer hier in de bus te zitten"

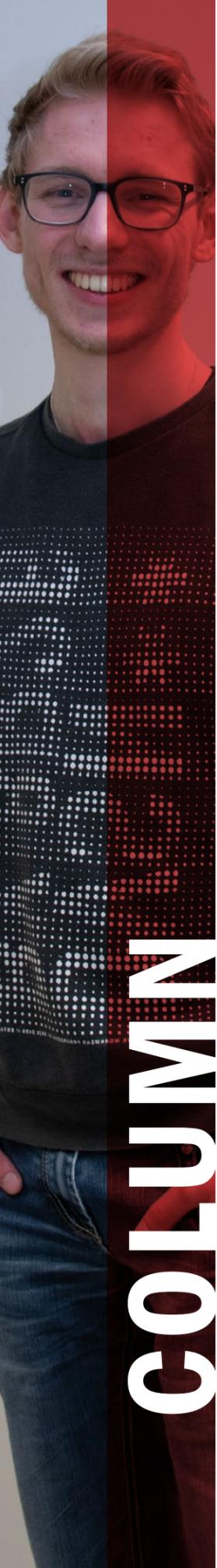
Wout: "Weten jullie trouwens hoe hoog het dommeltunneltje is?"

Wout: "Een man, plus een tuba... minus 10 centimeter"

Niels: "Dat is mijn telefoon, en mijn zusje"

Ralph basht op sjaars Ricks cursus.

Rick: "Mijn cursus heeft ten minste praktische toepassing. Dat kun je van jouw Getal & Ruimte deel 5 niet zeggen..."



ME, MYSELF AND I

I can almost hear you think "Wow, this guy must be really full of himself!" Don't worry. I do think it is a good thing to be positive about yourself, but I am not that self-absorbed. Oh, and that title, we will get to that.

TEXT Erik Takke

Yes, the theme of this edition might be cheesy, but I'm sticking with it. To me, it is a miracle that I have been as single as a pringle for as long as I have. When seeing my author picture it probably surprises you too ;), but in the off-chance it does not, maybe the fact that I was in my first "marriage" at the age of 6 provides you the necessary insight. Oh, and yes, that is a story for a different time.

Although they are always welcome, I am not looking for a mental band-aid, Valentine's rose or a pitying "aaaaaaaawwwwww". In the words of an old Volvo advertisement, "I have had my ups and downs, my fair share of bumpy roads and heavy winds. But hey, "[it] has made me what I am today," **0** and overall I have really enjoyed being single. There are too many reasons why to discuss here, so I will only make a start and tell you about all the things that I still possess because I'm single.

FREEDOM

First and foremost, as a single person I still have all my freedom. Taking the law as a given, I can do whatever I want, whenever I want, however I want. Study every night? Drink all till the sun comes up? Going for a stroll through the city at the strangest hours of the day? Play video games for nine days straight? Done, I don't drink, done, and ... that is simply not healthy, man! OK, my definition of freedom is probably different from most of you, but I hope these examples are good enough to get my point across: I get to YOLO **1** all day!

MONEY

Second, I can keep all my money – which I have to pay back to Uncle DUO in due time – to myself. There are no dinner bills, no city trips and no we-have-been-together-for-2³⁰-seconds gifts that I have to pay for – actually, that last one is quite a feat that I *would* like to celebrate one day, but we are getting off-topic again. I won't deny that I am a bit of a cheapskate, which likely skews my impression of how expensive a relation actually is. Still, as a single guy I get to spend my hard-earned coins on what I deem important.

SANITY

This isn't actually true: if you are in a relationship and realized you would lose your freedom and money prior to entering in it, you didn't have your sanity in the first place! But sure, if you did, went through with it anyway and are now (mentally) yelling at this ridiculous paragraph, you have actually proven my point for me. All jokes aside, I'm not saying that there isn't something to losing these things. I can imagine that having somebody to share all of your greatest (and worst) moments with can be great. The takeaway is that everybody is in a different place in their lives, and that is perfectly fine. For the time being I will have *me* all to *myself* and will enjoy this miracle while it lasts.

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Volvo Trucks – The Epic Split feat. Van Damme (live test) <https://youtu.be/M7Elvfx5J10>. Last accessed 12 Jan 2020.

1

Look! It's a meme that rose from the dead. It is a miracle!



THAT ONE FYC YOU HAVEN'T HEARD ABOUT

“**L**iever te dik in de kist dan een feestje gemist”, that’s where it all started. In English it literally translates to “I’d rather end up overweight in my coffin than miss a party” which honestly sounds pretty ridiculous now I say it out loud... and I have to admit, it probably is.

TEXT FYC20-0 GEKIST

Because what the writers of this (otherwise genius) song forgot, were academic expectations. For example, the manner in which this article is written is typical for this dilemma. It was largely written while I was working at my local supermarket, multitasking like I do with almost all of my responsibilities. I need to pay off ‘Ome Duo’ somehow, right? But I would’ve also like to introduce ourselves as a FYC (and maybe explain why we are dead last in the ongoing FYC race :)), so writing this article is also quite important. As new students, we are basically juggling academic expectations with our social life, overall health, and other responsibilities while also trying to find our footing.

While for many of us succeeding academically is the main priority, it’s of course important not to forget about your mental and physical health. Assuming you do some kind of sport during the week, we are only left with mental health. So on Thursday evenings, during the borrels, we get to forget about all these academic expectations for a brief moment. We get to relax and hang out with our newly-found friends, and that’s where our FYC comes in.

Gezamenlijk Een Krankzinnige Studententijd, or ‘GEKIST’, is derived from the song we referenced in the subheading. Wand while it might sound mad at first, let us explain. If our only goal is to relax on Thursday evenings, and forget about all things concerning our studies, why not give it our all? In Dutch we say “Als je het doet, doe het dan goed”,

meaning “If you do something, do it right”. So that’s our objective during the borrels, even if we sometimes maybe do it a bit too ‘right’... This would at least explain our nickname; GEKITST.

As of this moment, we, as a FYC, are dead last in the ongoing FYC race. With 17 points, we have less than half of the points of the second to last FYC. And for us this doesn’t matter. Honestly we couldn’t care less. While this may sound lackluster, we can assure you it didn’t originate from the lack of motivation or vitality, the opposite in fact. Because we are so focused on our studies, we find it hard to attend GEWIS activities other than the borrels, which are of the highest importance. For us, being in a FYC is all about the social aspect; participating is more important than winning. And this philosophy is perfectly in line with the philosophy of the fantastic song our FYC was founded upon. So while our placing does not reflect this, we can confidently say we are definitely not the most boring FYC.

I hope I have now successfully conveyed our philosophy concerning GEKI(T)ST. Otherwise, all my efforts would be in vain, meaning I should have put my time and energy in my Discrete Structures assignment instead, something I’d rather not think about too much.

So, while one might call people a fool who say things like “I’d rather end up overweight in my coffin than miss a party” a fool on a normal day. Let’s from now on, just not do that on Thursday evenings, and instead collectively sing our new version of this beautiful song:

*Jalalalalala jalalalalala
Jalalala jalalalala*

*Ja, elke donderdag, dan is het raak
Dan is er weer een borrel
En daarna ga ik een kapsalon halen, bij Hizmet in de stad
En als ik ’s nachts naar huis toe ga, nog even Stratum in
Dan is het ’s maandags echt weer tijd voor een lecture vol tegenzin
En weet u wat m’n professor zei:
Liever te dik in de kist
Dan weer een borrel gemist
Het maakt niet uit, je hoeft hem zelf toch niet te dragen
Liever te dik in de kist
Dan weer een borrel gemist
En achteraf, dan zul je mij niet horen klagen*

*Jalalalalala jalalalalala
Jalalala jalalalala*

*Op vrijdag begint m’n dag met delletjes en energy
En als ik dan weer honger krijg nog even langs de SPAR
En daarna naar m’n tutor uur, ik heb mijn huiswerk niet af
“Ik ben pas slim na vijf bier”. Ja, dat vindt u maf
En weet u wat m’n tutor zei:
Liever te dik in de kist
Dan weer een borrel gemist
Het maakt niet uit, je hoeft hem zelf toch niet te dragen
Liever te dik in de kist
Dan weer een borrel gemist
En achteraf, dan zul je mij niet horen klagen*

*Jalalalalala jalalalalala
Jalalala jalalalala*

*Op zaterdag word ik thuis wakker, zo rond een uur of twee
Ik heb spijt van al het eten en de dingen die ik deed
Ik kijk dan in de spiegel, het is echt geen gezicht
En ik denk dan bij mezelf: “Je bent te kort voor jouw gewicht”
En weet u wat m’n ouders zeiden:
Liever te dik in de kist
Dan weer een borrel gemist
Het maakt niet uit, je hoeft hem zelf toch niet te dragen
Liever te dik in de kist
Dan weer een borrel gemist
En achteraf, dan zul je mij niet horen klagen*

*Jalalalala jalalalala
Jalalala jalalalajalalala*





MIRACLES OF THE STUDENT TEAM LIFE

When I was asked to write about my student team experience at Blue Jay Eindhoven (for those who are unfamiliar: Blue Jay is a student team at the TU/e creating a personal drone assistant) for the next Miracle-themed Supremum my mind immediately made a connection, but I couldn't put my finger on what it was. Now, at the time of writing this, I realise what my big miracle of last year was.

TEXT Thijs Jenneskens

Firstly, my choice to join Blue Jay wasn't motivated by really wanting to experience being a part of a student team. After three years of studying for my bachelor's degree, I was unsure what to study next, so I decided on a gap year. But I did still want to do something with my gap year, so I decided to join a student team. This is the first miracle: of course I expected it to be a great year, but it exceeded my expectations. The rest of this article will highlight a few of the miracles that made the year my best year yet.

Unsurprisingly, the best thing about being part of a student team is being part of a team. Remember that saying "Great teams are forged in hot fires"? Me neither, probably because I made it up. Anyhow, it does apply very well to the student team experience. With a dedicated group of both full-timers and part-timers with zero experience, you start the challenge of first coming up with a worthy impossible goal and then achieving it. The only downside of this team bonding I can think of is the summer blues that followed.

This challenge was another great experience. Although I don't like to spend all my time on just one project, even with some hobbies on the side, having just one main goal (albeit comprised of smaller subgoals) instead of three or four courses in each quartile makes focusing a lot easier, and it allows you to really give it your all.

Lastly, a great change was having a fixed workplace that, for the year, also functioned as a kind of living room for me. It didn't take me long to move my breakfast and lunch from my room to the office. Of course, this isn't possible in a real office, but that just makes it even more special. There is something very satisfying about being able to hop on your bike for a ride to work directly after showering in the morning, and then slowly transitioning from having breakfast to doing work in the same room, especially if you know friends will be joining you there shortly.

“ Great teams are forged in hot fires ”

The food was followed by a guitar in the Christmas break, which in turn was quickly followed by a rule prohibiting me from playing between 8:30 and 12:30 and 13:30 and 18:00. As a result, I started getting up earlier to get in a bit of practice in the morning. Looking back now, that drive to get up early in the morning I had just half a year ago is a miracle for me; being a master student with an irregular schedule makes consistently getting up early a lot harder.

Of course, all these examples are very specific, but I suppose there's a moral to this 'story' nonetheless: miracles abound for those who find themselves in new situations.



FYC20-5 LOREM IPSUM

LOREM IPSUM

“ *>Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...*”

TEXT FYC20-5 Lorem Ipsum

We are the members of Lorem Ipsum; the sixth first year committee (FYC) of study association GEWIS. This year, GEWIS counts six FYCs who will compete for the greatest number of points at the end of this year. These points can be achieved by organizing activities and by being an active member of GEWIS. The purpose is to learn all the ins and outs of a committee's tasks and how to organize an activity.

We started this year by forming groups and come up with a name. Lorem Ipsum contains nine mathematics and computer science students. Our name is actually a little inside joke as it does not really mean anything in Latin. Lorem Ipsum is simply a dummy text of the printing and typesetting industry, but we just thought it sounded cool.

From the moment of the formation of our little group, the battle between the committees would rage on. No sooner had the battle begun than we gained a head start. Unfortunately, it did not take long before we lost the first position to another committee. However, not all hope is lost for the era of activities is yet to begin. These activities can range from skydiving to a chess tournament or in our case, Throw Throw Burrito.

In our experience, the first year committees mean a lot more to the students than we initially thought. As a group you develop a strong connection and even between the committees friendships are formed. We do a lot of fun stuff together, like ice skating or a field trip to the Efteling. This is very valuable for the young students as moving to a new and unknown city can be quite daunting. For some of us, for example, this experience has had a major impact on our personal development as a whole.

Not only do you learn what role best suits your personality, but you also get a grasp of a lot of self improvement. Take our chairman Daan as another example; nominating him as overseer of our group quickly became unanimous, which he handled with excellence. However, he did have some issues structuring the meetings and maintaining order. Nonetheless, with the unified help of the group, he swiftly adopted this feedback into his management skills which was pleasantly noticeable in the meetings that followed. Cheers Daan!

We hope to have created a more vivid image of our experience being a first year committee and that you can appreciate the effort GEWIS puts into organising this competition as much as we do. And for the time being, on to a brand new period full with plenty of points to gain and fun activities to plan and attend.

"To give you further insight in how our FYC operates, we would like to quickly introduce each of our 9 members to you."



BORIS MULLER

Hi everyone, my name is Boris and I am the snack manager of our FYC. This means that I am responsible for making sure that we have something to eat and something to drink during our meetings. I study computer science and I am an active member at GEWIS. During my free time you can probably find me at the foosball table together with Mick.

MICK VAN DE WAUW

Hi everybody, I am Mick, the secretary of Lorem Ipsum, which means that I am responsible for the minutes of our meetings and for the emails. I also study computer science. During my free time you can find me at the foosball table together with Boris.

MEES VAN LEUSDEN

Hello everyone, my name is Mees. I am the vice snack-manager of Lorem Ipsum. My job is to be the snack manager together with Boris to make sure there are snacks for the meeting even when one of us isn't able to or forgets to get snacks. I recently decided to quit CS but you'll often still be able to find me at GEWIS and at the weekly borrels.

GIJS PENNING

Hey everyone, I'm Gijs. I study applied mathematics and computer science. I love crunching numbers, or, even better: letting Excel crunch numbers for me (yes, I'm a computer scientist at heart). As you could've guessed, I'm the treasurer of Lorem Ipsum. That means I draw up our budgets and provide Boris and Mees with snack money.

LUCY DE GRAAF

My name is Lucy and I am the creative manager of Lorem Ipsum. I am nineteen years old and I study applied mathematics. My job as creative manager is to invent all the cool stuff we could do. Sometimes I do a little extra, like writing this article for Supremum. I hope you like it!

LÉNIÉK MAAS

Hi! I'm Léniek, "PR-manager" of Lorem Ipsum. I study computer science and like it very much! So, I manage things like social media (our instagram account; @lorem_ipsum_fyc, follow us ;). I also designed our poster for our first activity idea (Karting :D)

RICK OVERMEER

Hi, I am Rick, I am a first-year computer science student. Furthermore, I am honored to be part of Lorem Ipsum. I am the "chameleon" at our FYC, which basically means that I take over someone's role if he/she is not present or help other people out where needed. Fortunately, this has not happened yet. You can often find me at GEWIS, or in the lecture hall.

LÁSZLO ROOVERS

Hey guys, my name is Lászlo and I'm the vice-chairman of Lorem Ipsum. I study computer science and mathematics, and in my free time I like to judo and go out with friends. My role within our FYC is to help Daan out whenever I can and to come up with new ideas. Hope to see you around!

DAAN VERKADE

For the people who haven't read the first Supremum, let me introduce myself. My name is Daan and I'm a first year computer science student. Next to this I am also the one and only chairman of Lorem Ipsum, which mainly means that I try to plan out what still needs to be done to plan our activity and also try to keep my fellow members on schedule. Next to, of course being the best chairman ;), you can almost always find me either at GEWIS or somewhere pretty close to it.



A MIRACLE CALLED THE NWERC

The world is full of obscure products, hobbies and communities you probably never heard about, but which are a lot bigger than you would think. I experienced this myself about 2 years ago, when I was first introduced to the world of ICPC, the International Collegiate Programming Contest. That year, over 45.000 students from almost 3000 universities around the world participated in these contests, which are about finding the ones who could solve the most and hardest algorithmic problems.

TEXT Rick Wouters - GEHACK

During the fall of 2017, I first got to experience those international contests by taking a way too early train to Amsterdam for the BAPC (Benelux Algorithmic Programming Contest) and flying to Bath, United Kingdom, for the NWERC (North West European Regional Contest). After having seen those two large contests up close, it was time for us to organize our own, the NWERC 2018 and NWERC 2019.

WHAT DO YOU NEED?

First, what do you need for an NWERC? The basics are very simple:

- » Computers
- » A network
- » Problems to solve

Well, unfortunately, there are also humans participating in the NWERC, and not just some artificial superintelligences. Humans need stuff to stay alive and feel at home, namely:

- » Food
- » Drinks
- » Entertainment

With ICPC contests, it is a tradition that you get a helium balloon when you solve a problem and participants are allowed to print stuff during the contest, so you also need:

- » Balloons
- » Helium
- » Printers

The last missing components are probably the most important:

- » Volunteers
- » Sponsors

When you look at it this way, it seems pretty easy to organize all of this. However, I forgot to tell two details: there are over 500 people coming from 12 countries and it is a convention that you do not ask them any money. So, how have we approached this? Read on!

THE BEGINNING

We first started with getting the basics done. A jury was quickly formed under the guidance of dr. Kevin "coach" Verbeek, so problem sets were being worked on. For the computers, we went to our trusty laptop rental party Flex IT Distribution, who were able to provide us with two pallets(!!!) of HP ProBooks.

The checking of solutions is done automatically by a machine called the "judge". Our judge at that point was only used for the EAPC, but was held together by the computer equivalent of duct tape. Therefore, we needed a new machine, which the GMM allowed us to buy after using some very irresistible puppy eyes. Parts were ordered, the machine was built and "calca/kwik" was ready to perform its first jury duties.

Then we had to take care of the network. For the backbone infrastructure, IT services allowed us to use

the internal network of Auditorium after some e-mailing and gave us permission to use the TU/e printers. As for the network in the contest rooms itself, we found EventInfra, a non-profit organization from Amersfoort who supplied us with a lot of "blah-switches" and so much ethernet cables that it almost didn't fit in Mart's 1988 Fiat Panda.

HOW TO PAY FOR THIS?

Then the biggest hurdle came: sponsors. Preliminary calculations already pointed out that we needed quite some sponsors, so we already started looking around in 2017. We thought of some nice sponsor products, put them into attractive packages and sent the document outlining the sponsorship possibilities to every company that owned at least one computer. And then...

Nothing. Well, not absolutely nothing, but it took a while before we were able to sign the first sponsorship contract. And with "a while", I mean "the first sponsor was found 6 weeks before 500 people arrived in Eindhoven". When talking about miracles, this was the miracle of NWERC 2018: Prodrive Technologies agreeing to sponsor when we really needed it. This also proved to be the catalyst for the rest of the companies that had been approached with the help of Ilse, then external affairs officer of GEWIS, because in two weeks, IMC, ASML, Huawei and the TU/e also joined as sponsors, which in the end was enough to run the event.

TICK, TOCK, TICK, TOCK,...

And this puts us at four weeks left until d-day. We had received some quotes already, but we needed to approve them and make sure all orders came through correctly. Luckily, we had another Kevin as our warehouse manager who took care of all this stuff, and everything came in correctly. 5 cylinders of helium, 1500 balloons, 500 notepads, a "rolco" full of water bottles, mugs: all in all a full "OGO-room".

Then food and drinks had to be arranged. Because the event took place in Auditorium, we had to work with the former caterer, Eurest. Unfortunately, this was

quite costly and took up a lot of our budget. To save money, we came up with an idea to order lunch at Hubble. This all went great, until unfortunately Eurest found out and we had to pay a fine. The following year this went a lot better and everyone was happy with the food we got.

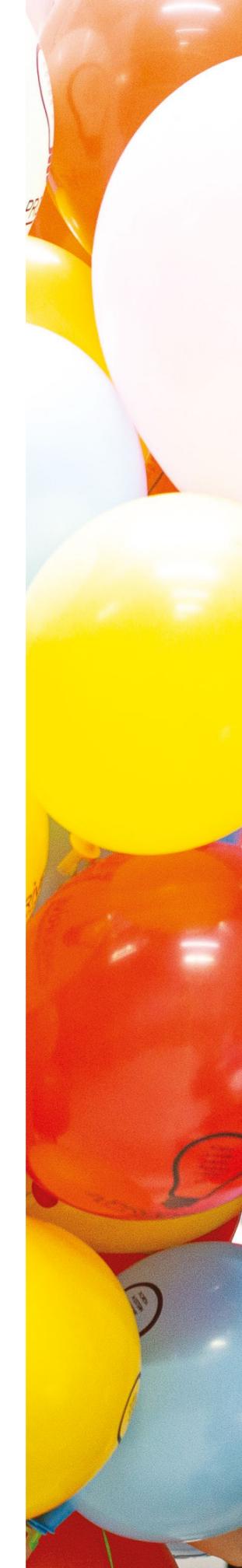
HOW MANY FAST FOOD RESTAURANTS ARE THERE IN EINDHOVEN?

So, all necessary preparations were done, it was time for the week before the NWERC where all last preparations needed to be done. As usual, this cost more time than expected. Because of this, we spent an entire week from 10.00 to 23.00 in our room on the university. Because we did not really have time for food, we managed to try out a lot of the fast food restaurants in just one week and the average amount of sleep we had as committee members was about 6 hours per night.

THE RESULT

In the end, everything went really well. All participants had a great time, the volunteers enjoyed themselves and people had a great weekend! It is quite surreal to see everything falling into place after 2.5 years of preparation, and it also leaves you with quite a void in your life.

Coming back in the GEWIS room after cleaning up everything, we had most of the 30 Sunday volunteers waiting for free beer and food, which was certainly earned. Beers were opened, and after 10 minutes all volunteers and committee members were munching on a nice kapsalon from Hizmet and drinking a well-earned beer. It was all done.



FLASH! FLASH!

Here, a visual report of the NWERC in 2018 and 2019! Of course, you can look at the entire collection of pictures on www.gewis.nl/fotos/

PHOTO CREDITS: Max Langerak



PI IS EVERYWHERE – ALSO IN MANAGING RISKS

Life is full of risky decisions. Everybody takes risks of varying degree in all we do: deciding on the means of transportation, buying lottery tickets, beginning that start-up you and your college friends are dreaming about, etc. Coming up with situations in which we take risks is not that difficult. By contrast, defining risk mathematically is much less straightforward.

TEXT prof.dr. Dirk Broeders & Dr. Michael Kurz, Risk Managers at De Nederlandsche Bank

Readers may think of risk as the probability of a loss multiplied by the size of the loss. In risk management practice we call this the expected loss. Another way to express risk is in terms of variability of outcomes, both good and bad. In statistical terms this is defining risk as volatility. This approach is very common in economic applications. Think about that start-up as a risk: it may end up unsuccessfully, but it may also be your big break-through.

Although both risk definitions are commonly used in practice, as risk managers we often use another way to define risk: it is the price you would have to pay for getting insurance against some negative outcome. That is, transferring the risk to a third party. It is in the transfer price that π remarkably shows up. Let us show you how and furthermore also explain why.

Capital markets are all about transferring risks from one market participant to another. Suppose you need to pay a fixed amount of X euros to someone, T years from now. The risk-free interest rate in the capital market is r . To finance this future liability, you buy risky stocks (S_0) in the amount of the present value of the future liability. In mathematical terms this equals $S_0 = X e^{-rT}$. So, if the stocks earn an annual return of at least r , then you can sell them after T years and get X euros – enough to fulfil your liability. You might even make a profit if you can sell the stocks for more than X. Although stocks in expectation indeed earn a higher return compared to the risk-free rate,

you don't have to be a financial wizard to see that is a rather risky financing strategy. At maturity, the stocks may easily be worth less than the liability you have. The question is just how risky this is actually? Well it is the price of the insurance contract that makes sure that you can always pay your liability. This insurance contract pays out exactly the difference between the liability and the value of the stocks in case the stocks fall short in meeting the liability. In financial economics such an insurance contract is called an "option" and the price of such an option can be derived with the famous Black-Scholes-Merton (BSM) formula. This formula has had an immense impact on risk management and earned its inventors the Nobel Memorial Prize in Economic Science in 1997. If you are interested to learn more, Black and Scholes' seminal paper "The Pricing of Options and Corporate Liabilities" from 1973 is still an excellent read.

If you do that you will notice that the BSM formula is a bit tedious. A mathematics teacher once said that "Math is for lazy people!" and because risk managers do a lot of math we always try to come up with easier solutions. Instead of using the BSM formula we get the price of the option, let's call it p , using the following

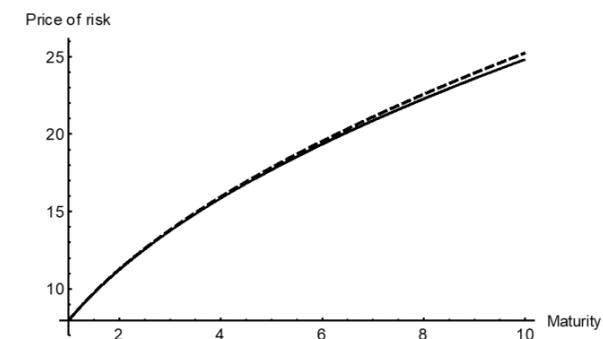
$$\text{simple approximation: } S_0 \sigma \sqrt{\frac{T}{2\pi}}$$

Where S_0 is the current stock price and σ is the volatility of stock returns. The figure shows for maturities up to 10 years that the true BSM price (solid line) and the approximation (dashed line) are very

close. So, as you can see, we simply use 2π and get the price of an insurance against a loss quite accurately.

Now the question arises why π appears in this risk formula? The answer, as it is often the case with π in unexpected places, is the Normal Distribution. The inventors of the BSM formula assume that stock prices are log-normally distributed. Therefore, the logarithm of the price is normally distributed. The normal density function contains the term $1/\sqrt{2\pi}$ and when we derive the above approximation of the BSM formula we actually use a Taylor series expansion that involves taking the derivative of the normal density with respect to its random variable. This, after some more arithmetic, leaves us with the above approximation.

That's not really a satisfying answer, is it not? Why use the (log-) normal distribution in the first place? And have you ever wondered why the normal density contains $1/\sqrt{2\pi}$? Let us start with the latter point. The Normal Distribution should return probabilities, meaning that the integral over the normal density from $-\infty$ to $+\infty$ should equal 1. This requires multiplication with $1/\sqrt{2\pi}$. This is because $\int_{-\infty}^{\infty} e^{-0.5x^2} dx = \sqrt{2\pi}$. Therefore, $\int_{-\infty}^{\infty} 1/\sqrt{2\pi} e^{-0.5x^2} dx = 1$. You can convince yourself that is true by doing the following. Denote $\int_{-\infty}^{\infty} 1/\sqrt{2\pi} e^{-0.5x^2} dx$ and show that $A^2 = 1$. Since $A > 0$ by definition $A^2 = 1$ implies $A = 1$. Now, when evaluating A^2 use a change of variable when evaluating the integral and write all coordinates in a Cartesian coordinate system as polar coordinates (Hint: Interpret x in the integral as a point in the Cartesian coordinate system.)



0

The price of risk for different maturities assuming $S_0=100$, $r=0.03$ and $\sigma=0.2$

Despite the heroic status of the BSM formula in risk management, it has some flaws because it relies on the Normal Distribution. In risk management we only use the Normal Distribution as a simple, analytically convenient starting point to develop basic theoretical structures. Risk management applications rarely stop at the Normal Distribution. For example, loss theories such as Value-at-Risk often make use of the Pareto Distribution instead of the Normal Distribution as the latter performs badly in capturing rare, worst-case events. Also, the equation above for the price of our insurance contract is only a starting point. Often, we introduce elements such as a stochastic process for σ for instance or jumps in the stock price process. However, every analysis needs to start with some simplistic assumptions so one can come up with a generalized model. In concrete applications we then proceed by incorporating more complexity by removing simplistic assumptions one-by-one. That is the way physicists and mathematicians approach an analysis and risk managers and economists do the same.

By the way, economists are a confusing bunch, we like to give π multiple meanings. While above we obviously meant by π Archimedes' constant 3.1415926535... etc., you will find the symbol π in many economics textbooks also being used as a variable for either the rate of inflation or profits of a manufacturing firm. Pi indeed is everywhere!



I DISCOVERED FALLING ASLEEP, AND LOST MYSELF IN IT

Once you start developing a certain taste for music, it becomes harder and harder to get surprised by any new releases. Everything will be compared to what you already know and what you feel like is good music. I am no different in this case. Last year, I had been in some sort of music limbo; there was no new energy to be found anywhere and even my favorite bands did not add anything new to my palette anymore. But this drab period came to a close once I discovered the beauty that is "WHEN WE ALL FALL ASLEEP, WHERE DO WE GO?" by Billie Eilish: the most interesting musical flavor explosion I have witnessed in a long time.

TEXT Lars Verstraelen

My introduction to her music was not a smooth one, I must admit. Well... it started off smooth. At work, I heard from my colleagues about this new artist Billie Eilish, who supposedly made something that they had never heard before. But to be fair, these people were those people you would see at the front of any festival you could think off; everything is special to them, new to them and thus they are very easy to please. Logically, I did not take their words for granted. However, it took one afternoon of studying, where Maureen basically forced me to listen to "bad guy" (including its video clip).

What I heard was, indeed, very fresh sounding. To believe that today it is actually very popular is quite unimaginable to me. It is not very poppy, it has a rather dark sound, and it is not sappy or melancholic. In fact, it almost sounds demented: EX-ACT-LY what I find incredibly interesting. I asked Maureen whether Eilish' music was all like this and she told me that her debut album sounded very diverse, yet still coherent. So as you guys can guess already: we will delve deeper into Billie Eilish' debut record.

To just shortly come back to "bad guy": it is an incredible opener. It kind of puts you on the wrong foot as well. It makes you believe that the whole record will be filled with these wacky sounds, but it isn't. It is somewhat unfortunate that this song is her most popular effort of this record, since there are so many pearls on this one, like "xanny". The way this song is balanced is great. It starts off very mellow and calm, singing critically about other people's judging behavior. But then a smirky ugly bass distortion smashes the calm to pieces as she suddenly sings about herself not needing a Xanax pill to suppress her anxiety. To accompany this message with these strange undertones and noises really enhances the meaning in my opinion. It continues with hopping from weird wagon to calm chamber, which makes the balance amazing.

"you should see me in a crown" is a very haunting song for some reason. Hearing a knife being sharpened through the song kinda puts you in distress. This is actually one of the older songs on here; produced and released about 9 months prior to her debut record. The gradient in her changing from a dream poppy sound to this more dark and trappy sound is really remarking.

It basically creates this perfect bridge to "all the good girls go to hell". A song that starts off with a quite devilish introduction telling you that her Lucifer is lonely, and then moving into this strange almost classic song structure. You are quite on guard and are almost anxious to hear what she will be singing or talking about. And man.. that chorus.. It reminds me of GTA music, being very gangster and stylish; basically like the devil would be if he would chill out.

Moving over to "wish you were gay", we get pulled into some sort of ballad. It uses some synths and trappy beats, but it is mostly a soothing steel guitar. Credits to this change of style, but it's really the lyrics that make this song awesome. Being so deeply in love with someone that you would just wish that he/she would be homosexual, is some really deep romantic misery. It gives "consumed by love" a new meaning. With this powerful effort we move over to "when the party's over": HO-LY SHIT! This song made my jaw drop when I first listened to it. This song has such a powerful melody and lyrical setting already, but it is the patience and calm with which this song is delivered that really makes it something else. It is a bit like Alan Rickman's acting: it contains many pauses to enhance the drama of the moment, but without it being annoying or unnecessary. It makes it beautiful and incredibly overwhelming. If you cannot get through the first few songs of the record, please, at least listen to this song; it's a good one (;

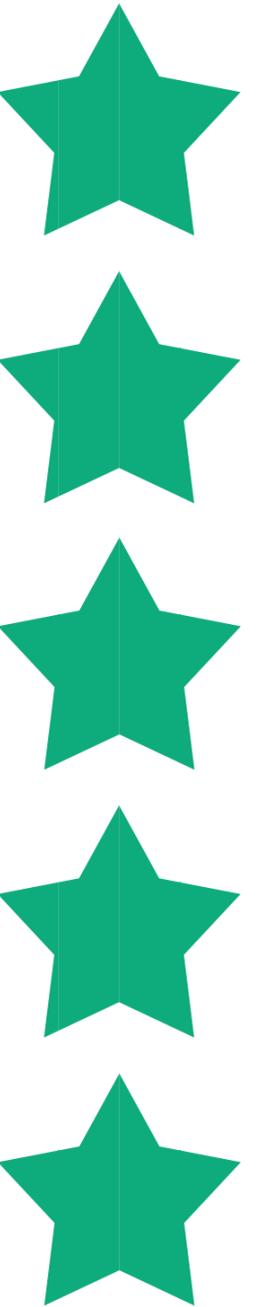
"8" and "my strange addiction" are kind of a calm down place on this record in terms of musical composition. They are both easy to listen to. "8" being a ukulele song with cutesie 8-year old vocals over it and "my strange addiction" reminding you a bit of "all the good girls go to hell", telling you that the record is still dark and captivating. But, let's just consider these songs as a calm before the storm that is called "bury a friend".

This song is everything that I had been looking for in this period of my musical discoveries. It is beyond dark, giving a tribute to her friend who passed away a very black and demented image. It zooms in on the almost sleep paralysis-esque feeling you get after the

death of someone. It's like some sort of paranoia that grows in you, which Eilish shows in great detail here. The whole song is weird, noisy, pungent and oh so dark. Withstanding this darkness rewards in the ever so cute "ilomilo", a song named after a videogame. This explains why you hear many videogame synths in the background. This combined with some very spacy sounds, a melancholic xylophone and lyrics about wanting to get together without "losing lives" makes this song a rather strange but incredibly powerful song.

"listen before i go", "i love you", "goodbye"... The words and songs with which this record comes to an end may be the finest and most overlooked ones on this record. This powerful three-piece gives me goosebumps every time. These songs contain so many references to mistakes, apologies and tears that it is hard to not feel Billie's emotions. I think this will connect to everyone in a different way regarding the loss of a relationship, a loved one or life opportunities. It is a melancholic trip of endless sorries and last possibilities to say you love someone. It really gives a new meaning to 'end'.

To put this into perspective: this record was released in the same year as the great comeback of TOOL; my all-time, no nonsense, favorite band. Even though I believe that their latest release is incredible in its own right, I turn my back on my favorite band when I say that 'WHEN WE ALL FALL ASLEEP, WHERE DO WE GO?' is my favorite record in a long time. It might even be the most important one I have listened to regarding my inspirations in my own music. This record is not just a collection of music; it is an entire experience. Now, let us all fall asleep, and watch where we go.





FACING FEARS

Quelque chose qui vous permet de faire ou de faire quelque chose que vous avez fait ou ne pouviez pas faire avant.

TEXT Joy Wip & Undéfined - Défi

Counting a decent 58 meters, we were standing on top of Vertigo looking down on our destination, the bottom. Together with approximately 120 other members of GEWIS we faced these meters from where we started. Together with the ESAC we organized our greatest activity to date. Also, this activity would be the one that would tip us over from a fraternity in foundation to officially being "Dispuut Défi".

I saw the faces of fear, joy, a little bit of regret turning into excitement; I saw some tears that dropped down the cheeks of someone who was proud to have found the courage to do it. The faces that were proud of what

they had organized for so many. Seeing these faces in turn made me proud of how far we came with Défi.

Nearly a year before it started with the faces of disgust when a bit of blue cheese on top of pineapple entered the mouth of blinded people. The faces of confusion when the surprisingly nice taste of caramelized chicory filled with goat cheese entered their mouths. There was a variety of faces during our very first activity.

I will never forget the expressions of everyone with paint on their faces during our Finger painting wall



activity. Although not as extreme, people were feeling new emotions while splattering paint all over the wall, and each other. I remember this one face of concentration from someone working on a Bulbasaur painting.

As a Défi Founder, I am happy to see how far we have come. It is really nice to talk to people who enjoyed the activities. Définitely when people feel like they have even overcome fears. Now that Dispuut Défi is in official existence, I hope we can help more people overcome fears, and let them push their boundaries.

We have seen many faces and will continue to see many more.

LIFE AS DÉFI FEUT

At Défi, it is a protocol that when someone wishes to become undéfined, this person does something which shows that they want to be part of it. This can be anything: from writing an extensive letter to setting yourself on fire. As for me, I chose to do the latter.

When I was told that I needed to do something to show that I wanted to belong to Défi, I still had a month to come up with my idea. As we all know, Défi wishes to challenge the members of GEWIS, broaden their comfort zones and push their limits. This is what speaks to me most about Défi, and therefore I had decided that my big entrance at Défi would contain one aspect: it would be outside my comfort zone. Then a month followed which was full of brainstorming, making a decision, realizing that the idea was not good enough, brainstorming even more, etc. It became even harder as I had realized that not only did I want to do something which pushed my limits, but I wanted to do something which pushed the limits of all Défi members – especially our veur (chairman). For those of you who do not know our veur Jealy: she does not fear anything! I had asked all of her friends the same question: what is outside Jealy's comfort zone? But none of them could think of an answer. So eventually, I talked to Jealy. When I asked her what pushed her limits, she agreed with everybody else: she had no

idea. But we did start making jokes about which things I could do – she suggested I get a piercing, I friendly declined. But at a sudden moment, she said: "if you would breathe fire, that would be awesome".

The next day, I started researching various ways to breathe fire, and I came across one method which seemed like something clumsy me would be able to pull off:

1. Pour a shot of sambuca in your mouth;
2. Dry your lips very carefully;
3. Tilt your head upwards and open your mouth;
4. Set the sambuca on fire;
5. Wait about two seconds while there is a fire inside your mouth;
6. Close your mouth and swallow the sambuca;
7. Hope that neither your lips or your palate are burnt because this will hurt for days.

As it turns out, this was a good performance with which to enter the undéfined part of my life: only Jealy dared to try it, but she did not tilt her head enough so it went a bit wrong and she had to spit it out before the sambuca was actually on fire. My goal was achieved: not only was it outside my comfort zone, but it was also outside the comfort zone of all members, including our veur!



Are you good at

- Designing?
- Mailing?
- Writing?
- Spellchecking?

Then the  **UPRENUM** wants you!

The Supremum committee is looking for new members, if you are interested please contact us at: supremum@gewis.nl

PRODRIVE TECHNOLOGIES 2020 PUZZLE

PUZZLE

Requested is a matrix of $n \times n$ integers ($n \geq 4$) filled with the integers $1..n \times n$. The goal is to maximize the number of times the equation $|a-2b+c=d|$ is satisfied.

This can be done in all 8 directions, as long as a, b, c and d are contiguous and on a single line

For example, $n=5$:

```
7  8  10  22  17
14 12  3  25  4
13 15  19  9  11
18 16  6  2  1
23 5  24  20  21
```

$|7-2 \cdot 12+19| == 2$

$|1-2 \cdot 11+4| == 17$

$|5-2 \cdot 16+15| == 12$

$|20-2 \cdot 24+5| == 23$

$|20-2 \cdot 2+9| == 25$

$|21-2 \cdot 20+24| == 5$

For this puzzle the values of n are 5,10,...,125.

Assume you are the first to submit a solution for $n=10$ with a score of 30. Since this is the only submission for $n=10$, it is also the best score currently submitted for $n=10$, resulting in a subscore of 1.0 points.

Another contestant submits a solution for $n=10$ with a score of 34. Now your subscore is reduced to 0.88 ($=30 / 34$).

Your total score is the sum of all of your subscores. This means your total score is between 0 and 25. The goal is to maximize your total score. **Note** that your total score is not fixed! As other people submit solutions your total score might drop, so keep an eye on the submission page.

SUBMITTING

You can submit the matrix as a comma separated list of the integers, e.g.:

1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,21,18,22,20,23,25,24

You can submit multiple solutions at once, by separating them with a newline. A newer solution for a value of n replaces the older solution for that n , but only when it is better, i.e. when the number of reversals is larger. This means that in a new submission you only need to submit the solutions for n where your solution is better than before.

SCORING

For each n , you will get a subscore between 0 and 1. The subscore is calculated by dividing your best score by the best score of any contestant.

To see the current standing, deadline and to submit your solution, go to:

<https://puzzle.prodrive-technologies.com/gewis>

 **PRODRIVE**
TECHNOLOGIES



BACK TO THE FUTURE

It can happen to any of us; you are enjoying your one, small beer at the social drink, and all of a sudden, somebody asks you if it is your phone lying on the floor. A little startled you pick it up, hoping that your screen is still in one piece. At first sight, all seems fine, your screen is still intact so you carefully place it back in your pocket. But then, as you try to make a Snapchat, all of a sudden you are dialing your mother on FaceTime. Sounds familiar right?

TEXT Tim Meeles

This happened to me a couple of weeks ago. My screen survived the flight to the floor, but apparently some beer entered my phone, which completely mixed up my touchscreen; thinking I pressed buttons I did not, and not reacting to the buttons I did press. Luckily, there is a solution; one I had learned some months ago after a rainy bike trip, namely, turn off your phone and hope for the best two days later; and so I did.

“ Of course, I am a big fan of technology, of taking steps forward... ”

Of course, one can use Facebook Messenger and not replying to Whatsapp messages for a day or two is nothing out of the ordinary, Snapchat streaks might even survive it, so one can manage, but all hope disappeared when my phone gave the same vertical stripes over the touch screen after the long two days. But, civilian as I am, buying a new phone would not be a problem, or at least, that is what I thought. Since the right side of my touch screen was broken, I could not pass the logon screen (digit code), nor activate my sim card, which thus remained locked.

Add to this that my bank, the ING, is actively trying to improve the protection of their online banking services,

increasing the importance of your mobile phone and identification through it. Buying a new phone would require some money from my savings account, so I was trying to log in to the online platform in the web browser. Logging in requires confirmation through the app; the app I could not access. But there is hope, other services are offered: ING can send you a text message, but that could never arrive as I could not activate my sim card anymore. As a final resort, ING can call you, but hey, similar issues there...

This results in me having to go to the physical ING office to get my own money from my savings account to my checking account; having to explain that I could not use my internet banking services anymore, to finally be able to buy a new phone (when the trouble of trusting the app on my new phone started). Of course, I am a big fan of technology, of taking steps forward in protecting my money even better, but please do not make us dependent on one single part of technology, that may actually break down. Please, in design, always also consider, quite pessimistically, all possible failure modes, and mitigate these. Having to go to a physical office, of which fewer and fewer are visible in our street scene, feels like taking one step forward in protection, but also two steps back in user interface. And, as GTA San Andreas has taught us, nobody gets too far like that.



WHY FYC 20-1 IS |FUN|

As a group of eleven, FYC |FUN|, ABSolut FUN with capitals A, B and S and without the e, can be lots of things. Sometimes it is an ABSolut chaos or it may be an ABSolut mess, but we also have moments where we can laugh with or because of one another. So, here are four things that make our FYC |FUN|.

TEXT FYC20-1 |FUN|

THE ORGANIZATION WITHIN |FUN| IS ON POINT

The number one reason for the success of our FYC is the organisation that takes place behind the scenes. **Léticia**, our secretary, is the one who makes spreadsheets for literally everything. Nobody is more enthusiastic about taking minutes than her. But in order to share this joy, she set up a rotation for taking minutes. Every week, another member of our FYC takes minutes alongside Leticia. This sometimes leads to funny moments when the minute taker cries out in stress, because we talk too fast for the person to keep track. Additionally, we have a similar system for bringing snacks to the meetings and an organized way of keeping track of presence during GEWIS activities, so we do not miss any points.

Furthermore, we also have a strike system. Our FYC has the most international students of all the FYCs. In order to make them feel as welcome as possible, we aim to keep everything in English. To ensure this, we award strikes for speaking Dutch during the meetings and via Whatsapp. On top of that, one can be punished with a strike for being late, being absent for an invalid reason, not communicating possible absence 24h beforehand and not letting the rest know 24h beforehand if you won't be able to do your action point(s). When a member has a total of five strikes, it means this person has to buy a round during the borrel for the whole FYC. Luckily, especially for our social media manager and most frequent Dutch speaker **Liselotte**, it is possible to deduct the number of strikes by throwing a 'strike' when out bowling with the FYC.

WE ORGANIZE |FUN| ACTIVITIES

In the near future, we will organize several activities for GEWIS members. But we already organized some internal activities. Our FYC started off as a group of eleven people divided in two. On one side there were the Computer Science students, while the mathematics students formed the other side together with **Bartjan**, the double bachelor student. So, the aim of these activities was to bond with each other.

To begin with, we wanted to cook and eat together. **Saskia** and **Teun**, who do not mind helping out often, offered to arrange the dinner and cooked the best five-star pesto pasta with chicken. After dinner, we were all ready to go to Stratum. Leading the way was **Joris**, always ready and excited for another night at Stratum. You will usually find us at the karaoke bar Ameezing singing our FYC song 'under the sea'. You also may stumble upon **Linh**, one of the international students, who will sing you 'Hij Is Van Mij' from beginning to end in Dutch or you can find **Bartjan** on the stage in his white blouse just like Zanger Kafke.

Next up, we challenged ourselves to really think about each other in the holiday season. **Amy** came up with the idea to celebrate Sinterkerst by buying presents and by writing poems in which we roasted each other.

OUR MEETINGS ARE SUCCESSFUL AND |FUN|

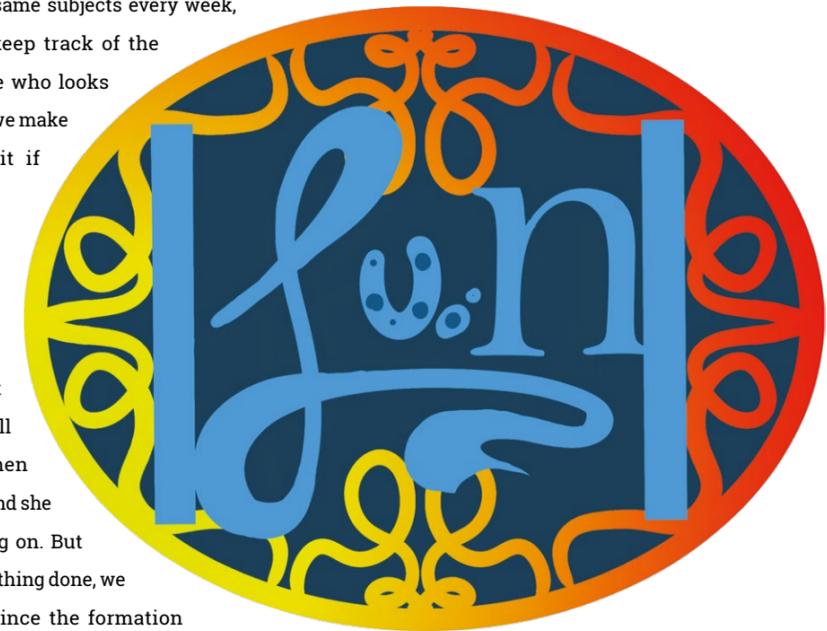
Just like any other FYC, the first few meetings were a big chaos. But despite a difficult start, the meetings have become a place of consultation, discussion and decision making. **Jasper**, our chairman, is the guy who can make us listen to each other. He arranges the agenda and guarantees we discuss every point on it. He often makes it to the meetings, but in case he doesn't, **Victoria** will take his place. She might be the smallest of all, but she comes with some big ideas. She doesn't officially have the title vice-chairman, but we all think she does a great job. There are moments where we get too enthusiastic and interrupt each other. We might talk about the same subjects every week, but it ensures that we keep track of the progress. **Amy** is the one who looks critically at the decisions we make and will comment on it if necessary.

On the other hand, there is **Lieke**, she enjoys arranging little things within our FYC as our vice-secretary, but from time to time she will look up in confusion when someone drops her name and she has no clue what is going on. But when we really want something done, we ask **Bartjan** and **Joris**. Since the formation meeting, there was an idea of arranging stickers. This idea got tossed in the corner, because we were working on our ideas for activities. But when **Joris** collaborated with our treasurer **Bartjan**, they ordered the stickers after discussing the design during the meeting and they received the stickers before the end of 2019.

THERE ARE MOMENTS OF CHAOS AND DRAMA

Of course, moments of chaos and drama and most importantly laughter cannot be missed. Some may think chaos is not enjoyable, but since we are |FUN| the modulus stripes ensure that chaos is still a lot of |FUN|. And, those moments occur in the most different situations. For example, our group picture from the Christmasgalaborrrel misses **Jasper** and **Teun**, which we didn't realize at the time. **Victoria** had to visit the first aid when she fell with her bike on our way to dinner with our FYC. And **Léticia** was the first one to get her hoodie brassed.

Luckily, there are also moments of laughter. We had a lot of |FUN| writing random facts about each other, so **Liselotte** could write introductory post on each member for our Instagram page. But you should be cautious of **Linh**, he may seem like a quiet guy but at four in the morning, he will roast you to hell.



Infimum: A strange or funny quotation from a teacher, a student or faculty member.
Here you can find infima sent to the Supremum committee via inf.gewis.nl.

Rink: "Ik heb het internet gemaakt, want iemand had een tennisracket op de switch gelegd"

Ralph basht op sjaars Ricks cursus.

Rick: "Mijn cursus heeft ten minste praktische toepassing. Dat kun je van jouw Getal & Ruimte deel 5 niet zeggen..."

Penno van Pattern (Daan) komt de stofzuiger van GEWIS terug brengen.

Daan: "Nou we hebben de stofzuiger gemaakt! Je kunt bij ons nu weer van de grond eten, nouja dat kon eerst ook, er lag namelijk genoeg op de vloer."

Naomi proeft wijn

Naomi zegt iets fancy over de wijn

Naomi: "kut ik klink als I.V.V"

Rink tijdens potje hints: "Chlamydia was goed!"

Ruben B.: "Peking is Beijing?"

Sunny: "ja maar mijn lengte compenseert voor iets anders. Namelijk mijn ego..."

Bolletje: "Ik dacht dat je het over iets anders had..."

Sunny: "Jij pervers persoon!"

Bolletje: "Waar denk jij nou aan? Ik bedoelde je grote hart."

Ralf: "kunnen we wel binnendoor lopen please?"

Tobin: "hoe bedoel je 'binnendoor'"

Ralf: "ja ff door De Hoek"

Random girl talking about miss universe: "Yah maybe but she is not playing games based reality"

Sunny: "like the sims?"

Regenachtige maandagmiddag aan De Tafel

Erik: "Ik heb een loophole gevonden waardoor ik meer vakken kan volgen dan ik eigenlijk mag!"

Thijs: "Casual conversation of a nerds group"

Suus wil graag een keer oesters proberen en is benieuwd naar de smaak.

Bram: "Het is een beetje alsof je Wout likt, zo zout"

Roy: "ik identificeer me meer als groente."

Mattijs: "Na genoeg bier voelen ze toch hetzelfde!"

Anne: "Wat gaan we doen?"

Romy: "Ik heb gewoon al een mooi lijstje gemaakt!"

Anne: " Waar?"

Romy: "Ja, hier. Hij is gewoon nog leeg!"

Bouke: "Als je ergens begint moet je er ook mee eindigen."

Bouke: "Dus wanneer ga je nou dood?"

Joy: "Wat is die saté doek in je zak?"

Dave: "Dat is een pochet"

Sanne W.: "Wij deden het met de middelbare school ook altijd met de dorpslet."

Over Carnaval

Dylan V.: "Komt er dit jaar ook nog een inschrijflijs voor de maandag naar Groningen."

Sjaars Rick: "Fietstassen zijn echt de shit, je kunt ze vullen met allemaal shit."

Dave: "Als je er snel vanaf wil, moet je het atten"

Tijdens een reclame voor een wasmachine

Bouke: "Nu wil ik die vaatwasser wel hebben"

Susan: "Die gele onderzee unit"

Bouke: "Spongebob"

pratende over een fiat multipla

Martijn M.: "Ik ken ook iemand die lijkt op een fiat multipla, die heeft ook van die biertietjes!"

Joy op maandag: "Ik dacht dat het vandaag zondag was"

Romy loopt naar haar fiets met een mixdrankje in haar hand

Romy: "Oh nee, het regent, nu wordt mijn mixje minder sterk!"

Joy tegen een BAC feut 3: "Waar is jouw Défi doolhof?"

Kees: "Dierentuin in Rotterdam?"

Bouke: "Feyenoord"

tEun verliest een drankspel: "Ik krijg echt ziektes van dit spel..."

tEun steekt een sigaret op

Ralph: "Ik wil even een verzoeknummertje aanvragen. Het gaat zo: *zoengeluiden*, en het gaat over jullie twee"

Filo: "Nee, ik weet niet wat multithreading is."

Ralf: "Het is net als dat je getowerbridget wordt."

Tijdens 30 seconds

Tim: "Bier merk"

Alex: "Heineken"

Tim: "Met voornaam"

Alex: "Albert Heineken"

Marcin opent z'n beugel

Damaris: "Ah ik voel me aangerand, die witte spetters op m'n gezicht"

Wouter S.: "Ja ja, de wiskundigen gaan programmeren."

Wouter S.: "Oh, het is LaTeX."

Jet vdB over André Kuipers: "Hij is heel down to earth"

Anne: "Wat is Engels voor pinapparaat?"

Ruben: "Cash"

Vinz: "Salmonella is gewoon een mening"

Laura: "ja kom maar over me heen Floris!"

Floris: "weet je dat zeker?"

Laura: "ja graag!"

Ralph: "Toen ik het pinapparaat aan het verbinden was met mijn telefoon, heb ik perongeluk een Dieszitting kaartje betaald"

Floris Tulner laat de spoelbak vollopen.

Landa: "Waarom doe je dit?"

Floris: "Ik wil kijken hoe veel kubieke liter nodig is om het glas in de spoelbak te laten drijven."

Sjaars: "Werkt Aquarius echt?"

Iedereen: "Ja"

Sjaars loopt naar de koelkast en pakt aquarius

Sjaars 1 gaat eind van de pauze richting Analyse 1

Sjaars 2: "Moet je niet je meelopers meenemen?"

Sjaars 1: "Oh ja!"

Mark R.: "Mijn begeleider reageert ongeveer even snel als het gemiddelde edelgas."

Er worden camerabeelden teruggekeken voor een verloren tas.

Liselotte: "Tip: zet de tas de volgende keer in beeld"

Wouter tegen Illeen: "Ik zou rennen Illeen, er staat een man met een bijl naast je"

Lars praat over een existentiële crisis

Amber: "Wil je erover pra.. Nee laat maar.."

Bouke B.: "Echt belachelijk hoe vaak ik tussen de infima sta!"

Yanelle: "Dus je hebt zwarte pietten en binnenstebuiten zwarte pietten?"

Mattijs: "Ja en die noem je Sinterklaas."

Vincent B.: "Wat is Jan Cees van der Meer?"

Naomi H.: "Te veel dagen bij ouders en schoonouders triggert allergenen best veel."



CHOCOLATEY MASTERPIECE

At times, you don't want to eat something healthy and you are just craving something with a lot of chocolate. Then, we have got you covered. It will, however, be a miracle if you are not a few kilos heavier after eating this chocolatey masterpiece.

TEXT Leon Vreling - GETAART

LIST OF INGREDIENTS:

CAKE:

- » 190 grams of dark chocolate
- » 150 grams of butter
- » 6 eggs
- » 225 grams of sugar
- » 75 grams of flour

GLAZING:

- » 150 grams of dark chocolate
- » 120 grams of coffee cream
- » 30 grams of butter
- » Honey (to taste)

The cake we are going to present to you is not just any ordinary cake. It is a very special recipe, kept as a family secret over multiple generations in the family of one of our members. In the many years, there have been some modifications to the recipe. It has now been perfected, and therefore ready to be shared with the rest of the world. So hereby we present to you, the best chocolate pie you will ever eat, and if not, then please share that miraculous recipe with us!

The first step is to preheat the oven at 200 degrees Celsius. Next, grease the sides of a 28 to 30 inch cake tin and set it aside.

For the pie, you will start by melting 190 grams of dark chocolate. This is done in a bowl over a pan with boiling water, also known as au-bain-marie. Make sure the bowl does not touch the water in the other pan, so the

chocolate does not burn that easily. Stir the chocolate every once in a while. When the chocolate is completely melted, stir 150 grams of butter into the chocolate. Let the mixture cool until it is lukewarm.

In a second bowl, whisk 6 eggs and 225 grams of sugar until you get a white mix. Using a spatula, stir through 75 grams of flour and afterwards the chocolate-butter mixture. Divide the batter equally over the cake tin and bake the pie in the center of the oven for 30 to 40 minutes. After the cake is done in the oven, let it cool down in the tin. It may still be a bit moist, this is no problem!

For the glazing of the cake, melt 150 grams of dark chocolate using the same methods as described above. In another pan, heat 120 grams of coffee cream and 30 grams of butter until the boiling point. Take it off the heat and add the melted chocolate. You may add some honey at this point. Be careful that the mixture does not split when you mix the hot ingredients, this could be the hardest step of this delicious recipe. If little chunks start forming, continue stirring and they should dissolve. Wait for the mixture to cool down, and then add it over the pie. Give the cake some time to let the glazing cool down and settle, this will also improve the taste.

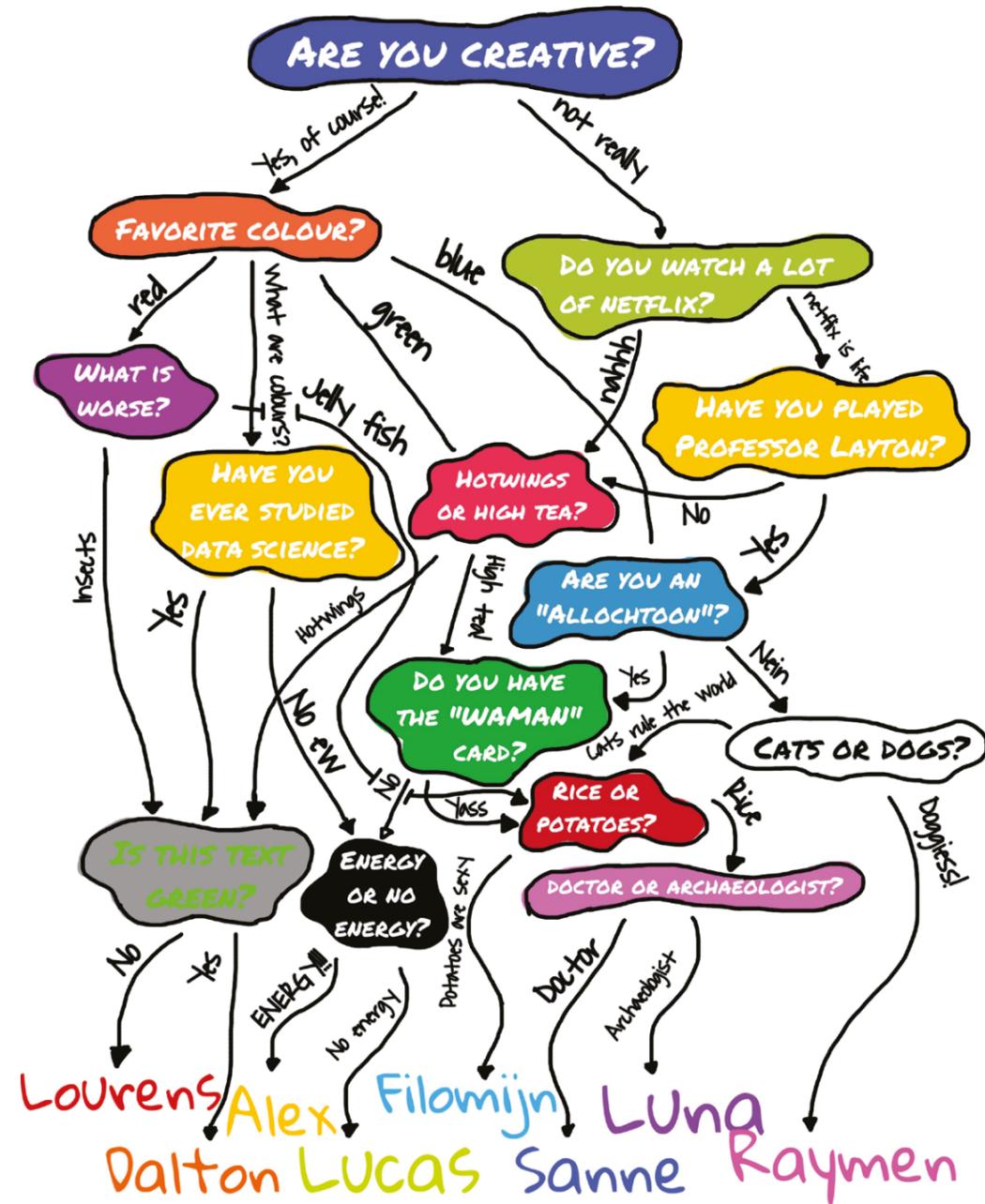
At this point, your chocolatey masterpiece is finished. It does not need any fancy decoration, as the taste is already amazing. If you would like to do so anyways, you could add more chocolate over top. The cake can also be served as a dessert, with for instance ice cream or chocolate mousse.



FYC 20-4 SP!R!TS

WHICH SPIRIT ARE YOU?

TEXT FYC20-4 SPIRITS



SANNE You are SANNE! Sanne is the chair of SPIRITS. She likes everything Asian, like nasi goreng and beating others with slippers for example. Even though she is the oldest member of SPIRITS, she is not always the most responsible, especially at times when she is Babs (her drunk alter ego).



DALTON You are DALTON! Or are you his twin brother? No idea. Anyway, Dalton is the trusty secretary of SPIRITS. Subjectively speaking he has a great sense of humour, and some of his likes include pizza, meerkats and playing the guitar. His biggest wish is a lap dance from Raymen.



FILOMIJN You are FILOMIJN! She is the treasurer of SPIRITS. However she is more known by her alias Filo, or her second alias Suikerspin. Some of her hobbies include writing things (such as this article), drawing and reading. But she also makes a very good landmark if you ever need to meet up with a group, since you only need to look for pink hair.



LUNA You are LUNA! As the most artistic member of SPIRITS, Luna is our graphic designer. Some of her work includes the SPIRIT logo, the SPIRITS New Year's cards, and the stickers she put on her laptop. Before coming to the TU/e, Luna travelled the world for a year, gaining great wisdom, which is seen in quotes such as "No, but yes."



RAYMEN You are RAYMEN! Raymen, as a snack himself, is the glorified Snack Manager of SPIRITS. Some of his likes include watching Netflix, and watching some more Netflix, and playing Professor Layton. Besides his great talent of always bringing the right food for the situation, it has been rumoured that he gives great lap dances.



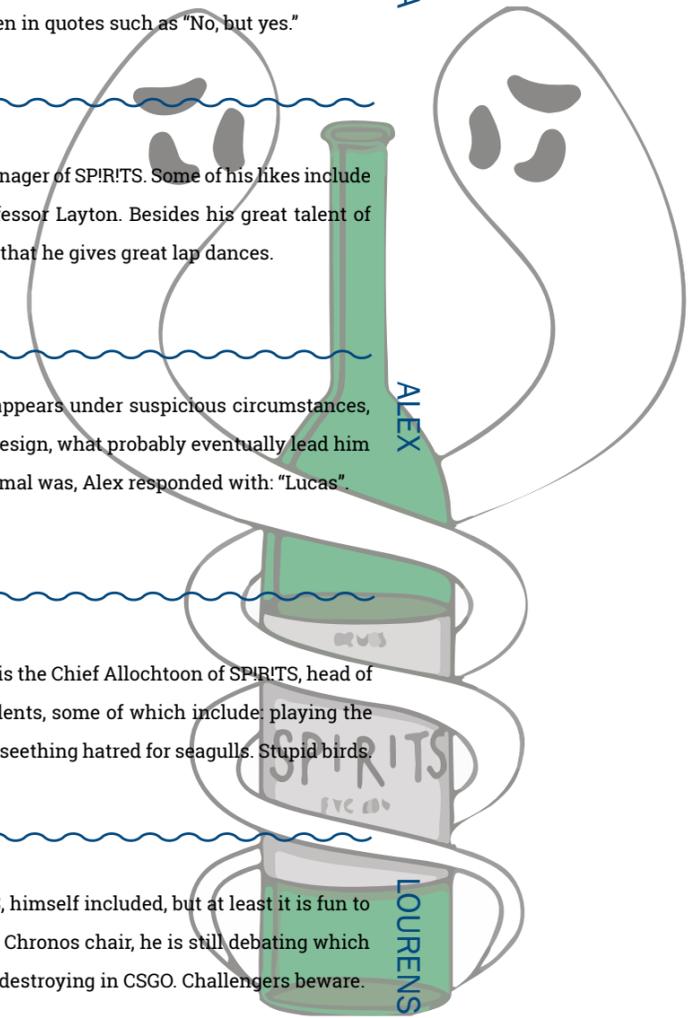
ALEX You are ALEX! Alex is the vice-chair of SPIRITS, so if Sanne ever disappears under suspicious circumstances, you'll know who to blame. As a child, Alex really wanted to do Game Design, what probably eventually lead him here. So, thanks Game Design! When asked what his least favorite animal was, Alex responded with: "Lucas".



LUCAS You are LUCAS! Lucas is the nicest, quietest dude you'll ever meet. He is the Chief Allochtoon of SPIRITS, head of business regarding the internationals in SPIRITS. Lucas has many talents, some of which include playing the guitar, yelling at Alex, and learning Dutch really quickly! He also has a seething hatred for seagulls. Stupid birds.



LOURENS You are LOURENS! No one really knows what Lourens does in SPIRITS, himself included, but at least it is fun to have him around. His favorite colour is either red or green, but, as the Chronos chair, he is still debating which is which. Apart from destroying people in debates, Lourens also likes destroying in CSGO. Challengers beware.



HI THERE!

When the supremum committee approached me whether I could write a piece about cooking, I got really excited! As someone who loves to cook and share the cooked goods with friends, sharing a whole recipe with all of you is even better. My roommate and I really like to cook, so much so that we even started on our own recipe book. It is a big work in progress, but whenever we find something we like, we add it to the list. I was thinking about what I should write about and what I would like to share with you guys. After thinking for a bit, I think I have found the perfect recipe. It is quite a nice hybrid that can be very quick, easy and of course, tasty. One could call it a small miracle! You should be able to make the dish in no more than 20 minutes. The first time might take a bit longer though. And quite important too, it is very budget friendly! It will cost you around 12 euros for 4 servings. It is very quick to make, but if you have some more time on hand you can use that to make it even better. I made this for the board a couple of times and everyone liked it so hopefully you will do too.

TEXT Ruben Brinkman

Well no more talking, lets get cooking! We will be making udon noodles. As I said before, this recipe is extremely easy to make. It requires exactly 1 pot.. First let's get to the ingredients.

INGREDIENTS FOR 4 PEOPLE:

- » 270 grams udon noodles
- » 400 grams thai wok vegetables
- » 200 grams bimi (asparagus broccoli)
- » 400 ml coconut milk
- » 500 ml cooking water
- » 110 grams red/yellow curry paste (koh thai)
- » 400 grams chicken thigh fillet (cut into 1x2cm strips)

Want a veggie version? Swap the chicken for either 400 grams extra vegetables or about 300 grams of tofu (more on that at the end though!).

Let's talk about the ingredients a bit. All the amounts are indications, a bit more or less never hurts if you

cannot find the specific sizes or amounts. For the udon noodles, make sure you get good ones. I usually go for Hakubaku as they're quite tasty and not too expensive. The vegetables you can simply get pre-cut at your favourite grocery store if you're in a hurry. Otherwise, you'll need some white cabbage, leek, green bell pepper, red onion and red chili. Make sure to chop them up in nice bite sized pieces. For the curry paste I like to go for Koh Thai, you can make this dish 2 or 3 times with one jar and stores forever in the fridge. Depending on how much heat you can handle, you can either get the red or yellow one (yellow is less spicy). And even then, you can use either half or a third of the jar. Just taste a little bit of paste and you can decide. I usually go for half a jar of red and if it needs to be less spicy I will just take a third.

Now that we have the ingredients all sorted, let's talk instructions. As I said this is quite easy and believe me, it really is.

1. Get a nice big wok pan. Put a bit of oil at the bottom (vegetable/olive/canola) and put the chicken thigh in first. Now, put the amount of curry paste you

decided to use on top. Next, put the noodles in (I like to break them in half for easier stirring). And put the remaining ingredients in any order you like.

2. Turn on the heat at medium-high. Let it sit for a good minute and start stirring slowly. This will feel a bit awkward because of the noodles are not cooked yet and still stiff. Don't worry about it, just keep stirring slowly. Stir everything around every minute or so until the water-coconut milk mixture is just starting to cook. Turn down the heat such that it will not get to a hard boil and keep on stirring. Keep it at this stage for about 10 minutes while stirring every minute or so.
3. Assuming you followed the two steps above dinner (or lunch/breakfast, I don't make the rules), I think you should be ready! You can check if the chicken is not raw anymore and if the noodles do not have hard bite anymore. If this is case, it is time to plate!

I like to eat this from a bowl but that's just personal preference. Now it's tasting and tweaking time. Find it too spicy? Less paste next time then. Find it too coconutty? Use 1 packet of coconut milk less and 200 ml water extra. Wanted it to be the same amount of spicy but have more curry taste? Take a less spicy paste and add more! That's what recipes are all about, a baseline you can tweak to personal preferences.

Let's talk about those preferences a bit more. During the week, I mostly like to eat dinner without meat in it. With this recipe that can achieved quite easily. You can either leave the meat out completely and add more vegetables. In that case I would take 200 grams thai wok vegetables and 200 grams of bimi extra. However, you can also make this recipe with some tofu. Between the amount of time you have and how you like your tofu there are a few options I will list.

You can just get a big block of tofu, cut it up into 1x2cm pieces and add it instead of the chicken. Personally, I do not really like this but it does keep the dish very quick. You could also bake the tofu first and add it in when everything is almost ready or when plating the meal. For this, there are also a couple of options. You can either just bake it in some vegetable oil, but to get it a bit crispy is quite hard this way. It will still be a

quick dish though. If you want you tofu crispy and have a bit of extra time I suggest doing the following:

1. Press the tofu dry. To press it dry, just put it between a clean dish towel and something like a cutting board on it such that you can press hard on it. Make sure not to squish it though. Press it a couple of times, you should see that the dish towel sucks up quite a bit of liquid.
2. Cut the tofu into the desired sized pieces and coat them in some cornstarch.
3. Heat up a bit of high heat oil (I like canola) to a very high temperature and put the coated tofu in. Bake until each side is crispy and put aside.

I would add this crispy tofu about a minute before the dish is done or even when plating such that it stays crispy. The above method can be used for tofu in general of course. If you want to add some extra taste to it you can marinate it but then be sure not to introduce it to too much liquid again (as we just pressed that out). I have a really nice stir fry with this but since there is not too much writing space left, maybe I can write about that another time or if you're interested just send me a message and I will hook you up!

Hopefully, you found the recipe tasty and just as easy to make as me! I have really enjoyed typing this out and would love to hear if some of you liked the recipe.

TL;DR: Get everything from ingredients list. Put it all in a big pan and turn heat on. Stir every minute until just cooking. Put heat low and keep stirring once about every minute for 10 minutes. Plate up and eat.





A LETTER FROM THE END TO THE START

Dear 13-year old Yoram, if you're reading this, it means that some mystical woo-woo happened and you probably need to sit down, take a glass of water (instead of soda, which you should stop drinking, seriously!) and read what I am bestowing upon you carefully.

TEXT Yoram Meijaard

Let me begin by saying that the longer the decade runs, the better it gets. In particular, be relieved that nothing you will do this decade is worse than second grade of middle school. School will become bearable as you ditch all liberal arts and language classes. Spoiler alert: it turns out that they were useless anyway (you still cannot read notes nor French). Sports will become a large part of your life, it will happen in small steps, each of which is inconsequential and near unnoticeable, until it is too late and you are at the track all the time.

There will be changes to our life, friends found and lost, interests gained, explored and forgotten. Some you can imagine, some will be a bit out of left field, and there is one change which I know that you could not possibly have foreseen. It will come upon us slowly, akin to our physical endeavours, and it will change our life for the better.

To understand, we need to go three years into your future when our middle school organised a "career fair". It was mandatory (of course, you would not have gone otherwise) and consisted of talking to a bunch of semi-ingesjaakte (you will learn this word, just like "dichtgetikt", "adten" and "super-'vo") professionals. We ended up talking to this programmer, who we asked what we should learn if we were to study computer science. We thought he'd confirm our existent belief that mathematics was the only useful subject, so we could go on ignoring all boring courses at school. Instead he answered: "Doesn't really matter, just don't

ignore your languages." We left, thinking in our teenage arrogance that he must be joking.

Yet, it is called a programming *language* for a reason: there is a grammar, following a syntax to express semantics. Which is something you would have known if you didn't hate your language classes so much.

I know reading got ruined by The List, a carefully curated bunch of dreadful books from which a mandatory number needs to be read. The people who invented this with the expectation that it would stimulate teenagers' interest in reading, probably never met their audience and definitely never had fun in their live. We never read our books, but we did gain an almost affectionate hate of all things linguistic. Which was stupid.

To hell with The List! We will end this decade sitting on our couch reading a magnificent book after we spent the afternoon in the boulder gym. Somewhere, somehow and somewhen in the last decade you will open a book, a simple book, and you will start reading. It will not be long until you realise that books are the best language teachers, and are the most enjoyable too.

Reading and sports improved our decade. Now it is time to close it and see what these roaring twenties have to offer.

In libris libertas, Yoram J. Meijaard



FYC20-2 G.E.K.

CRAZINESS WITH G.E.K.

“**M**aak Me Gek”, or “Make Me Crazy,” the song by Gerard Joling, has come to be known as the one and only anthem of FYC 20-2 G.E.K. You may have heard some of our members enthusiastically singing along to this song, or at least attempting to. However, if you know us a little better, you will know that most of us aren’t even keen on Dutch music. Yet it is this Dutch song that we have now come to love.

TEXT FYC20-2 G.E.K.

From this, questions emerge. What does knowledge about an FYC, for instance its anthem, say about its members? And what does knowledge about members say about an FYC? How much does G.E.K. influence its members as its members influence itself? These are important questions when deciding how to introduce your FYC.

The belief that the personality of the individual defines the identity of the group quickly brings us to the idea introducing each of us separate. But we think that’s foolish.

So what do we do? Do we argue why G.E.K. in its entirety is the best FYC? No, we want to sell G.E.K. as a unique experience, because that way you will be actively learning about us. Furthermore, we agree that the best way to get to know us is to talk to us in person.

We started our FYC just as all the others, 3 or 4 people invited some more people who wanted to join, and we soon had a complete FYC. Within the first 10 minutes we found out all of us are a little bit more G.E.K. than the other FYC’s members. For instance, Koen, our chairman, had an amazing time during the FLUP activities, and also during the GELIMBO party. This can really be seen on the GEWIS page, where he has multiple pictures showing how G.E.K. he can be.

Another example, which might not be as obvious as you think, is the strength of the girls in our FYC. Although the boys have a lot of muscles, some of our

female members are way fitter than the men can handle. We didn’t have a conflict yet, which I’m really glad for, but I think the chances will be somewhat equal.

Beside us doing G.E.K.ke things, and some of us being really strong, we also have our really smart people, like all the other FYCs of course. Because some of us are really smart, they like to do games, especially card games. Within our FYC, we’ve got 3 card game specialists. One in toepen, one in love letter and one in crazy eights. We also have a lot of football players within our FYC, so please feel free to ask us for a challenge.

“ We admit it, we do many G.E.K.ke things ”

We admit it, we do many G.E.K.ke things, but we also became a really close group. We do activities together, and we think about what we want and need. The easiest example is the switch from Dutch to English, and back again to Dutch. We’ve got an international member in our FYC, who started learning Dutch. In the beginning, we did everything in English. But since he is learning Dutch, he’s able to say plenty of things better than some of our FYC members (mostly the people from Brabant and Limburg). That’s why he asked us to just talk Dutch if we have normal conversations, so he can improve his Dutch even more.

I know what you’re thinking, we are G.E.K., but we can be very “normal” as well. We all love drinking beer/wine, we all study a lot and we all struggle around exams, just like several other students at GEWIS. We just have some other stuff we don’t see a lot of other people do on a regular basis.

Have you ever tried licking your own nose? Or trying to do a handstand, or a head roll? We have a member, who can do all of this, while being drunk. She doesn’t need much drinks to get tipsy, so there is a chance you will see her doing head rolls, before 7PM.

Our FYC members do have some bad habits. Some of us don’t show up to meetings, or are late to these. It became such a big problem, we had to assign the role of law enforcer to Aniek. She checks if everybody who was late, or didn’t show up without a good reason, does what she tells them to do. Luckily our ‘Lul’ had an easy challenge, and had to wear a hat with ‘Lul’ written on it for one ‘Borrel’.

Now, since the experience to really get to know us has to be both different and crazy we present to you: Crazy 88, only eight times easier! Is it a coincidence that 11 is known as the “crazy number?” And that we have exactly 11 members? We think not! That’s why we’ve put together 11 different challenges that, to some extent, represent the characters of each of us. We dare you to do the challenges with one of us, have a chat, and maybe have a drink together as a reward.

- » Let the member who likes to have his face painted, paint your face
- » Have a dance battle with our best dancer
- » Have a chug contest with our newest G.E.K. member
- » Win a game of love letter from our love letter lover

- » Do more push ups than our fittest member
- » Win a game of crazy eights (“pesten”) from our newest driver
- » Make a cup of coffee for our coffee lover
- » Find the member who can touch her nose with her tongue, then try it yourself
- » Learn our Greek member a new crazy Dutch word
- » Perform a “lullepot” to the member that forgot our very first meeting
- » Learn our busiest member a new meditation technique



Perhaps we have not convinced you yet of the use of our FYC and perhaps the crazy 11 won’t convince you either. Maybe it is because of the fact that we have no clue of what we are doing. In that case, the answer lies in the wise words of Joling; “We know what is to come, just not yet how.”

COMMITTEES & FRATERNITIES

GEWIS is built on top of committees. Besides, Study Association GEWIS has several fraternities which contribute to the atmosphere and organize activities.

Find out more at: www.gewis.nl/association.

FRATERNITIES

ATHENA
ATHENA



B.O.O.M.
Buitenplezier Op Onze Manier



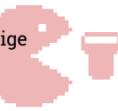
Défi
Défi



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GEWIS Ervaart Limburgse
Initiatieven Met Bewondering
en Ontzag



GEPWNAGE
GEWIS Plant Weer Nerdige
Activiteiten en Geeky
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I.V.V
In Vino Veritas



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AVICO

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BAC

BAr Commissie

BATA

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First Year Committee

FYC20-3 GESEIK

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FYC20-5 LOREM IPSUM

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GEWIS'sers Ervaren BALLen MET

Rigoreuze Precisie In

Excentrieke Kups

GEDWAAL

GEWIS'ers Dwalen Waar

Anderen Anders Lopen

GEFLITST

GEWIS Fotografeert Leden In
Toffe Situaties, Toch?

GEHACK

GEWIS Ervaart Het

Algoritmisch Code Kloppen

GEILER

GEWIS Eet Ijsjes Lekker

En Regelmatig

GELIFT

GEWIS'sers Liften

Ieder Fantastisch Traject

GEMOLD

GEWIS'ers moeten

overall leugens doorzien

GETAART

GEWIS'sers Eten TAART

GEZWEM

GEWIS Zeilt Weer Een Meter

INTRO19

Introductieweek 2019

INTRO20 ★

Introductieweek 2020

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SUPREMUM COLOPHON

SUPREMUM

The Supremum is the magazine of study association GEWIS and is published four times a year with a circulation of 900 copies. The Supremum is distributed to members of GEWIS and employees of the Department of Mathematics & Computer Science of Eindhoven University of Technology.

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Max Oerlemans (Chief)

Max Langerak

POSTAL ADDRESS

Study association GEWIS

Attn. Supremum

MF 3.155 Postbus 513

5600 MB Eindhoven

Tel: 040 - 247 2815

supremum@GEWIS.nl

<http://www.GEWIS.nl/supremum/>



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THANKS TO

All writers for their articles, our sponsors and everyone else who has helped creating the Supremum.

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MAGAZINE DESIGN

Alex Dings, Stephan van den Berkmortel

COVER CREDITS

Picture: Max Oerlemans

OTHER CREDITS

Activity pictures: GEFLITST

TECHNICAL INFORMATION

Body font: Roboto Slab

Headline font: Franklin Gothic ...

Formatting: Adobe InDesign

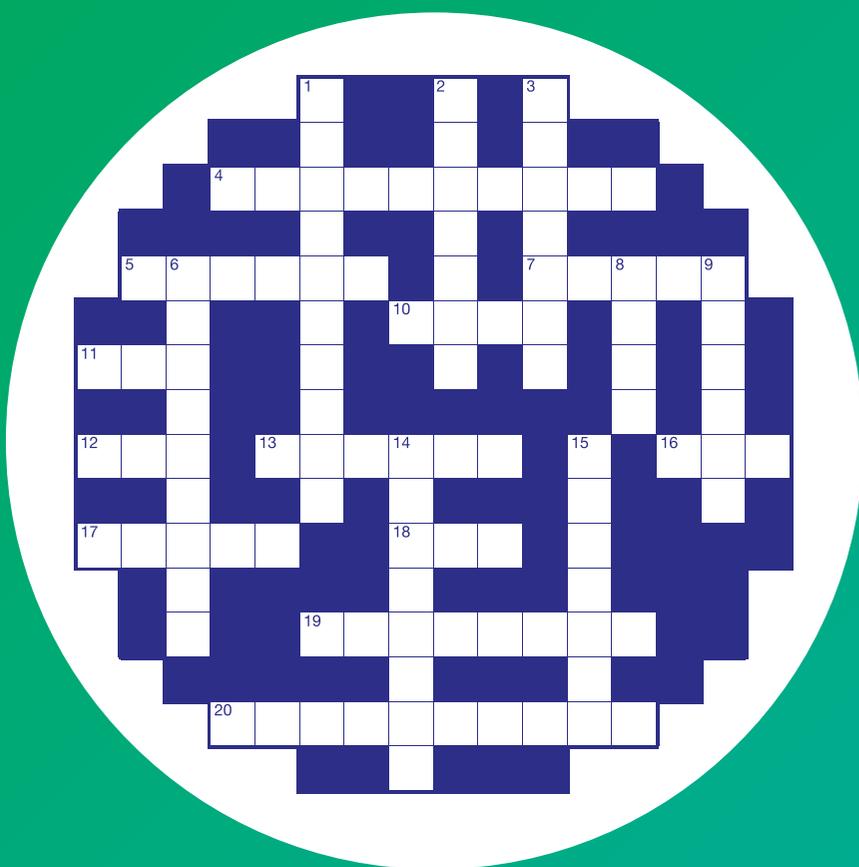
Printing: Gildeprint

Circulation: 900 units

April 2020

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Across

- 4 Alignment marks are placed here
- 5 Environment in which EUV operates
- 7 Material that wafers are cut from
- 10 Downpour
- 11 SI derived unit of electrical resistance
- 12 Compressed file archive
- 13 Location that houses the peripherals of an ASML system
- 16 Network-attached storage
- 17 Most of the optical modules in ASML's wafer scanners wouldn't work without this material
- 18 Role-playing Game
- 19 City in the US where an ASML office is located
- 20 Name of the ASML spin-off with medical applications

Down

- 1 Number of wafers per hour
- 2 The precision with which layers are placed on top of each other in chip manufacturing
- 3 The transition of the reticle pattern onto the wafer
- 6 The name of the ASML restaurant in Veldhoven
- 8 Color of the ASML tower in Veldhoven
- 9 It is rumored every plane leaving Schiphol to this destination carries either ASML equipment or ASML staff
- 14 Popular video game that won the 2019 Webby for Best Multiplayer
- 15 Plans and drawings produced to show the look, function or workings of (parts of) ASML systems

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