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## 2019 Annual Report
Department of Computer Science, Aarhus University

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### 2 Research

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### 3 Education
Around 100 quota 2 applicants visited computer science on Saturday May 4.

Study trials 2019.

EXPO of first-year IT-product development projects.

Girls day in science.

Capture the Flag Event.

Digipipi girls uses micro:bit to build “living” creatures.

Congratulations to class of 2019.

Welcome to our 191 new bachelor students.
01
Short
2019 in Short

2019 has been yet another productive year at the department. We have graduated a total of 160 students at Bachelor, Master’s and PhD level in Computer Science and IT Product Development. Our graduates are at all levels in high demand and they easily get interesting and challenging jobs in the industry, the public sector or within research. Thus we have a growing number of company members in our Business Club and all spots are sold out at our Annual Career day (K-dag) in the spring.

In 2019 we introduced a new joint event in the spring called Digital Innovation Festival, where we co-located AUHACK – Denmark’s largest hackaton; 2 days of research workshops; a 2 day Research and Industry conference; closing with the Annual Career day (K-dag). This was a great success, that we decided to repeat in 2020.

Even though there is a high demand in society for well-educated IT specialists, we experienced a small 10% drop in the number of admissions to our studies. This is unfortunate, and partly due to a smaller population of potential students, and partly due to the admission requirements with a GPA of 7. Despite the explanation, we will intensify our campaign to recruit more students. We do, however, see a trend that our retention of students has improved as a consequence of the admission requirements. We also focus on making a better first year experience for particularly the students that arrive with little or no programming experience. Through a programming café for the 40% of the students with little or no programming experience, we managed to bring them on par with the most experienced with respect to grade average at the end of the first term.

In 2019, the quality of the bachelor and master programmes was assessed by an external panel as part of the university’s quality assurance process. Overall the panel was very satisfied with our education. Recruitment, retention and stress among the student body was proposed as the main focus areas. We are already working hard to improve all three areas.

2019 brought us yet another positive international ranking, and a record high amount of external research funding, which is described in the research section.

With respect to outreach we again conducted an Alumni day with 80 participants, we ran a series of 5 lectures in Folkeuniversitetet (the people’s university) with a high attendance, which will be repeated in 2020. We hosted training for the Robot Olympics and ran courses for the Technology Understanding courses in public schools. These are all initiatives that should expose more young potential students and their parents to the world of IT and Computer Science to recruit new students.

<table>
<thead>
<tr>
<th>STAFF</th>
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<tr>
<td><strong>Na Ree Sørensen</strong> was hired as head of secretariat and chief advisor from February 1.</td>
</tr>
<tr>
<td><strong>Henrik Wann Jensen</strong> was appointed honorary professor at Dept. of Computer Science from February 1.</td>
</tr>
<tr>
<td><strong>Peter Scholl</strong> was appointed assistant professor in Cryptography and Security group from August 1.</td>
</tr>
<tr>
<td><strong>Simon Møller Christen</strong> was hired as lab coordinator from August 1.</td>
</tr>
<tr>
<td><strong>Henriette Vestergaard Grøn</strong> was hired as office trainee from August 15 2019.</td>
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| **Julie Rasmussen** was hired as research group coordinator from October 1. |
| **Christina Gettsche** was hired as student recruitment coordinator from December 1. |
| **Hans Geellersen** was appointed professor in Ubiquitous Computing and Interaction group from December 15. |
| **Roman Georg Rädle** resigned from his position as assistant professor in January. |
| **Andreas Pavlogiannis** was appointed assistant professor in Programming Languages group from September 1. |
In 2019 there has been a large activity in acquire external funding, and especially the two new centers have a large impact compared with last year’s amount of funding. The same number of Ph.D. students has succeeded in the funding of external funding, but for a smaller amount compared to last year.

**RESEARCH PROJECTS**

In 2019 in Short.

**Concordium blockchain Research Center Aarhus (COBRA)** - Jesper B. Nielsen, Claudio Orlandi & Bastian A.W. Spitters, DKK 48.400.000,00

**Center for Basic Research in Program Verification** - Lars Birkedal, DKK 35.390.559,00

**Center for Block chains** - Claudio Orlandi, Ivan B. Damgård, Jesper B. Nielsen, DKK 8.090.611,00

**Hospital@Night (H@N)** - Ira Assent, Hans-Jørg Schulz, DKK 6.358.492,00

**Data Structure Techniques in Cryptography and Machine Learning** - Kasper Green Larsen, DKK 6.185.861,00

**Algorithms supporting big data analysis** - Lars Arge, DKK 5.903.016,00

**Computational Empowerment for Emerging Technologies in Education (CEED)** - Marianne Graves Petersen, DKK 4.848.530,75

**Harnessing Influence in Networks** - Panagiotis Kararas, DKK 2.730.196,00

**A Unified Programming Model for Functional and Declarative Logic Programming** - Magnus Madsen, DKK 2.483.769,00

**Computational Complexity of Equilibria** - Kristoffer Arnsfeld Hansen, DKK 2.414.541,00

**AUFF PS Primitives Protocols Secure Computation** - Peter Scholl, DKK 1.500.000,00

**IT vest MGP Diversitet i brobygning** - Marianne Graves Petersen, DKK 1.328.880,00

**Intelligent solutions** - ErhvervsPHD – Ira Assent, DKK 360.000,00

**Teknologiforståelse i folkeskolen** - Ole M. Caprani & Søren Poulsen, DKK 300.000,00

**Bedre Match 2020** - Søren Poulsen, DKK 180.000,00

**Robotolympiade 2019** - Søren Poulsen, DKK 145.000,00

**IT-Camp for Piger** - Søren Poulsen, DKK 104.000,00

**IT-vest tilskudsmidler 2019** - Kaj Georg Grønbæk, DKK 94.136,00

**Stibofondens IT-rejsestipendium** - Alexander Mathiasen, DKK 50.000,00

**Stibofondens IT-rejsestipendium** - Mirzel Avdic, DKK 40.000,00

**Stibofondens IT-rejsestipendium** - Svend C. Svendsen, DKK 25.000,00

**Forskningsophold ved Stockholms Universitet** - Ida Larsen-Ledet, DKK 8.000,00

**AWARDS AND APPOINTMENTS**

**Associate professor Kasper Green Larsen** received the international 2019 EATCS Presburger Award

**Special consultant Søren Poulsen** was awarded the Science and Technology TAP Award

**Former PhD student Christoffer Quist Adamsen** has been selected for this year’s honorable mention for the ACM Outstanding Doctoral Dissertation Award
## Conferences, Workshops and Summer Schools

During 2019, the department has hosted the following events:

- **Official Opening og Concordium Blockchain Research Center Aarhus (COBRA)**, February 1 (Jesper Buus Nielsen)
- **AUHack**, April 5-7
- **Digital Innovation Festival**, April 8-11 (Søren Poulsen and Thomas Riisgaard Hansen)
- **K-dag career fair**, April 12 (Søren Poulsen and Sofia Rasmussen)
- **SpringPIT**, May 23 (Susanne Bødker)
- **Theory and Practice of Blockchains 2019 (TPBC19)**, May 27-29 (Jesper Buus Nielsen)
- **Crypto Summer Seminar**, July 4 (Ivan Damgård)
- **COBRA Summer Congress 2019**, August 5-8 (Jesper Buus Nielsen)
- **COST training school**, August 12-16 (Peter Lyle and Susanne Bødker)
- **SummerPIT**, August 14-16 (Susanne Bødker)
- **Iris workshop**, October 28 – November 1 (Lars Bird-edal)

In addition, the department’s employees have participated in numerous conferences, workshops, summer schools, and meetings all over the world.

## Research Dissemination

The department has arranged the following colloquiums in 2019, where the series were dominated by local researchers, due to fortunate situation that we have celebrated many inaugural talks:

- **In Pursuit of Optimality** (Kasper Green Larsen, Inaugural Lecture, 22 Feb)
- **Are smart devices really smart? An algorithmic road towards smartness** (Davide Mottin, Inaugural Lecture, 15 March)
- **Zero - Knowledge Proofs and Their Applications in Modern Cryptography** (Claudio Orlandi, Cryptography and Security Group, 26 April)
- **Modern Type Theory and Secure Blockchains** (Bas Spitters, Inaugural Lecture, 10 May)
- **Computational Complexity in Life, the Universe, and Algorithmic Game Theory** (Kristoffer Arnsfelt Hansen, Algorithms and Data Structures Group, 6 September)
- **The challenge of program verification (and a bit of biology)** (Andreas Pavlogiannis, Inaugural Lecture, 4 October)
- **What you should know about declarative programming** (Magnus Madsen, Peter Scholl, Inaugural Lecture, 22 November)

Additionally, we held our annual Computer Science Day on 24 May, where all research groups from the department gave a talk on selected activities.
OUTREACH AND RECRUITMENT ACTIVITIES

The department is involved in a wide range of activities for high schools and elementary schools from all over the country. The activities are organized locally at CS in collaboration with ST, AU and external partners. Among other things, we have been involved in the following activities:

Study-related events:
- U-days.dk
- Study trials for elementary schools (Erhvervspraktik)
- Study trials for high schools (Studiepraktik)
- Visitor service for elementary and high schools classes
- University on Wheels (Det rullende Universitet)
- Student for a day
- Master and More Germany – fair for International Students
- Two-day visit for prospective international students
- Robot Pirates for elementary schools (Robotpiraterne)
- Tech for Girls (Teknologi-leg for piger)

Competitions and camps:
- First Global Competition 2019 - Danish Robot Olympiad Qualifier
- First LEGO League Aarhus
- IT-Camp for girls

Focused talent development programs:
- Supervision of high school student projects (SRP/SOP)
- Math Masterclass
- Biotech Masterclass
- University days for the Academy for Talented Youth (ATU)

Research dissemination to the general public:
- Lectures at The Danish University Extension (Folkeuniversitetet) about digital technologies of tomorrow (Fremtidens digitale teknologier)

In total more than 1.300 students from elementary schools and high schools visited our department during 2019.

STUDENT ACTIVITIES

The department’s two student associations, DSAU and SOFA, contribute to create a good study environment for our approx. 700 students. Among the many excellent activities are:

- Katrinebjerg LAN 2019
- Social Coding - coding Night event
- Danish Championship in Programming
- North - Western European Championship in Programming in Linköping, Sweden.
- AU Hack 2019
- Many additional activities were organized by UNF, UNITY and Regnecentralen

STUDENT ENTREPRENEURSHIP

HatchIT Lab is an experimental innovation lab based at the Department of Computer Science. The lab is for CS and IT students who wish to explore the business potential of their projects and ideas. The majority of the companies in HatchIT Lab are supported by external funds and programs like Innovation Fund Denmark, EU funds, or other private/public investment companies.

Hatchitlab.au.dk

STUDY PROGRAMMES

The department has two bachelor programs and two Master’s degree programs. In addition, we have a diploma degree program and a Master’s degree program (continuing education) as well as a PhD degree program.
Admissions

In 2019, the department saw a drop in applicants to both Computer Science and IT Product Development. Accordingly, this resulted in a small drop in intake of new undergraduate students. The department is focused on getting more applicants to the Bachelor and Master programmes. As part of the Digitalization Initiative several outreach activities towards high schools have been initiated.

The department’s admissions to the Bachelor’s degree programmes are illustrated below:

During 2019, the department has produced the following number of degrees:

Kaj Grønbæk
Head of Department
Research
Research - Looking back at 2019

The department has in 2019 undergone a research evaluation by an international panel. This evaluation confirmed that the department is doing very well on an international scale both with respect to research and societal impact of the research. The positive assessment was confirmed by the fact that THE World University Rankings in their 2020 ranking, ranked the Department of Computer Science at Aarhus University as number 100 of 749 computer science departments in the world. Being the only Danish Computer Science department on top 100 in the world makes us no. 1 in Denmark. We are proud of these recognitions.

On the fundraising frontier, 2019 has also been a very fruitful year where we received ~125 M DKK in funding for new research projects. The biggest grants being Concordium Blockchain Research Center Aarhus (COBRA) with 48.4 M DKK, from Concordium Foundation, and Center for Program Verification (CPV) with 35.4 M DKK from the Villum Foundation, both centers are five-year efforts. This extensive external funding leads to growth in the number of both PhD students and Post Docs at the department.

Finally, we have had three calls for new faculty, resulting in contracts with two new full professors - Hans Gellersen and Ioannis Caragiannis (starts August 2020) - and three Tenure Track Assistant Professors Peter Scholl, Andreas Pavlogiannis, and Amin Timany (starts April 2020). A warm welcome to our new colleagues!

Kaj Grønbæk
Head of Department, Professor
Computer Science at Aarhus University is #1 in Denmark!

We are proud to announce that QS World University Rankings has ranked the Department of Computer Science at Aarhus University as the number 1 Danish Computer Science Department in their 2019 listing. The department is ranked in top 100-150 in the world with a Danish top score on all 4 parameters measured.

THE World University Rankings agrees, and has ranked the Department of Computer Science at Aarhus University as number 1 in Denmark, in their 2020 ranking. Overall, Computer Science at Aarhus University is listed as number 100 of 749 in the world – making Aarhus University the best place in Denmark, and fourth best in Scandinavia, to study computer science.
Blockchain collaboration is a dream scenario for cryptography

It’s not far from theory to practice for Jesper Buus Nielsen and the rest of the team from the Concordium Blockchain Research Center Aarhus, also known as COBRA. They just have to cross the road to have their cryptographic proofs implemented in practice. Across the road from COBRA is INCUBA where Concordium ApS is based, the development department of the Concordium Foundation. Since the start of the collaboration in February, they have held weekly meetings to address some of the challenges facing blockchain technology.

The short distance means that there is not far to go if the developers have any questions about the theory, or vice versa.

“It’s a great way to work, and it helps to export our research, which has otherwise comprised a lot of very basic research. We’ve built up a whole load of techniques without them being applied in practice. Now they’re being inspired by practical problems and are helping to create better solutions,” explains Professor Jesper Buus Nielsen, who is head of COBRA.

Blockchain is a sort of register that everyone can write in. This means that everything is done in ‘plain view’. Therefore, it is important to balance the fact that there is some data some people need to see but that others should not see. This also presents a number of challenges. And this is the motivation behind the Concordium Foundation. They have realised that blockchain technology is no where near finding the right techniques yet, and that success must come from research.

“We’re far from knowing how we should do things, but for us, this is a dream scenario. Because that’s what the cryptography has been designed for. Blockchain technology is crying out for the techniques we have been researching since the 1980s. Not so many fields of research can say the same.”

More efficient and less energy
Something they have been working on is what is called the ‘consensus challenge’. The foundation of large,
open blockchain networks is that they are peer-to-peer, and everyone can send a transaction that everyone in the world can see within a few milliseconds. However, the transactions come in different sequences at different locations in the network. For this reason, consensus algorithms are used to bring order to the chaos. In existing blockchains this is hugely energy-intensive and inefficient.

This is what has made bitcoins famous, because they consume just as much energy as the whole of Denmark, and yet with fewer than ten transactions per second.

“It’s a disaster on all parameters, and we’ve been working to create better algorithms that are faster and use less power, but are also more secure in situations where the existing algorithms are not. We’re already ready with the first versions of the algorithms.”

In reality, it is not a particularly interesting problem, explains Jesper Buus Nielsen. But it’s the very foundation, and it needs to be solved once and for all. It is a bit like today’s Apache server, where more than 50 per cent of all web traffic ends on an open source server. In the same way, these algorithms have to be placed at the bottom of all blockchain networks to make sure that they can process billions of transactions per second.

They are also working with what is known as ‘sharding techniques’.

“We solve this with cryptographic techniques.” They are also working with identification techniques to identify whether someone is doing something illegal. You cannot do this today. The creators of blockchain focused exclusively on ensuring transparency in the digital data blocks, and not on giving the authorities access to users in the event of suspicious transactions.

“If an account in a bank pays for something illegal, the authorities must be able to ask whose account it is. This is not possible today, and therefore we’re working with cryptographic techniques to balance these things out. An account can remain hidden until it has to be opened. We’re making sure that several parties are required to open the identity.”

Part of the project is also working with smart contracts, by which, if you have an account on a blockchain, you can assign a program to act on your behalf. For example, it may transfer money if the dollar drops.

“Clearly if you make programs that move money around, you need to be absolutely sure that they’re doing the right thing. Therefore, Bas Spitters and his group, who are part of the project, are also working on tools for mathematical proofs that the programs are doing what they should.”

Jesper Buus Nielsen plans to have an operational network up and running in the course of 2020.

“The first versions are ready to be implemented. But it’s a process and we’re being inspired by practice, while Concordia ApS is being inspired by what they need, for example use cases. Sometimes, it’s off-the-shelf products, and sometimes not. But it’s an iterative process until there’s no more research in it, and until it’s pure engineering.”

**FACTS:**

The Concordium Blockchain Research Center Aarhus (COBRA) is anchored at the Department of Computer Science, and Professor Jesper Buus Nielsen is the head of centre. The center is funded by the Concordium Foundation, a non-profit foundation developing the Concordium Blockchain Network, which is a new blockchain generation that focus on user identification and transparency. The foundation is supporting COBRA with just over DKK 10 million (EUR 1.3 million) a year over the first five years of the centre’s lifetime.

Read more about the Concordium Foundation and COBRA here:

https://concordium.com/
https://cs.au.dk/research/centers/concordium
New Villum Investigator at the department

VILLUM FONDEN has selected Professor Lars Birkedal to become a Villum Investigator. With this honor comes a grant of DKK 35.4 million to set up the Center for Basic Research in Program Verification (CPV) at the Department of Computer science, Aarhus University.

Lars Birkedal has received DKK 35.4 million to create and run an internationally leading Center for Basic Research in Program Verification (CPV) over the next six years. The center will employ approximately 8 PhD students and 7 postdocs. CPV will build on Birkedal’s recent breakthrough results in program verification for modern software systems. Software systems are an integral part of modern society, and software errors and security breaches pose enormous costs and risks. CPV will develop new mathematically based models and logics that will improve correctness and security of software systems.

It is the second time the VILLUM foundation selects researchers for the VILLUM Investigator program, which acknowledges researchers who, for 10 years or more, have demonstrated international, cutting-edge research of the highest scientific quality. “It is important for the VILLUM foundation to support research that meet the demands of the world,” says Chairman of the board from VILLUM Fonden, Jens Kann-Rasmussen.

What began as a field of 80 applicants to become the next VILLUM Investigators, has ended with 11 leading science and technology researchers who – in total - will receive DKK 410 million from VILLUM FONDEN. Of the 11 VILLUM investigator five are from Aarhus University. On December 18, the University celebrated their five new VILLUM Investigators with an opening event and reception at Aarhus Institute of Advanced Sciences (AIAS). The five VILLUM Investigators each gave a short presentation of the work they will be taking on over the next five years. This includes developing safer software for smart cars (Prof. Lars Birkedal), or reducing the amount of waste in pharmaceutical productions all over the world (Prof. Karl Anker Jørgensen, dept. of Chemistry).

Congratulations to Lars Birkedal (Department of Computer Science), Yong P Chen, (Department of Computer Science), Bo Brummerstedt Iversen (Department of Physics and Astronomy), Karl Anker Jørgensen (Department of Chemistry), and Henrik Stapelfeldt, (Department of Chemistry).

ABOUT THE PROGRAM:

• The VILLUM Investigator Programme was created for experienced and internationally recognized scientists who have the potential to make a significant contribution to developments in science or technology at a Danish university.

• VILLUM Investigators can receive six-year grants of up to DKK 40 million. After a period, it is possible to apply again in competition with other applicants.

• New VILLUM Investigators are selected every other year. The inaugural group was selected in 2017. The third will be selected in 2021.

• The program received 80 applicants to be selected as part of the current group.

• 28 applicants, incl. five women, were shortlisted for peer review and interview in 2019.
Claudio Orlandi challenges cryptographers from all over the world

The Picnic team, which includes Associate Professor Claudio Orlandi has made it to the next round of the competition started by the US National Institute of Standards and Technology (NIST), where cryptographers from all over the world are competing with novel ways to safeguard communication between individuals and organisations on the internet if, or when, quantum computers become a reality.

Claudio Orlandi is part of a group of cryptographers who have developed the Picnic algorithm. Picnic has been developed in collaboration with researchers and engineers from Aarhus University, AIT Austrian Institute of Technology GmbH, Graz University of Technology, Microsoft Research, Princeton University and the Technical University of Denmark.

Picnic is a digital signature algorithm designed to protect against attacks from quantum computers as opposed to classical computers. The core of Picnic is a new and more efficient way of implementing zero-knowledge proofs, combined with classical symmetrical cryptography (hash functions and block ciphers).

“A zero-knowledge proof (or protocol) is a cryptographic method that can be used to prove knowledge of a secret without revealing the secret itself,” explains Claudio Orlandi. “Zero-knowledge protocols are one of the most important inventions in modern cryptography, and the first time you hear about them, they sound a bit like magic. However, zero knowledge can be used to improve security in many IT systems. For example, you can use a zero-knowledge protocol to prove that you know a password without actually revealing the password. This can help combat phishing for example.”

The Cryptography and Security research group at Aarhus University, where Claudio Orlandi and his colleagues work, has decades of experience in studying the foundations of zero-knowledge protocols. “It’s great to see that the basic research we’ve been involved in for so long has been useful in such an important area,” continues Orlandi.

Brian LaMacchia, distinguished engineer and head of the Security and Cryptography group at Microsoft Research explains. “Basically, public key cryptography forms the foundation of essentially all modern cryptographic security protocols, including those that protect Microsoft customer data and business operations. For over five years Microsoft Research has been working on quantum-resistant cryptography to replace the existing algorithms threatened by future large-scale quantum computers. Working with academic and industry partners around the world, Microsoft submitted four proposals to the US NIST Post-Quantum Cryptography Standardization effort, including the Picnic digital signature algorithm co-submitted with Prof. Orlandi of Aarhus University. We are very pleased that Picnic has been chosen as one of nine signature algorithms to advance to Round 2 of NIST’s process.”

Greg Zaverucha is a software developer and cryptographer at Microsoft, and he has been working on improving Picnic for three years. “I love that the design is very elegant and modular, the way it assembles a set of well understood crypto primitives, giving a signature scheme that performs well in practice. With so much uncertainty around quantum computing, I think only relying on the security of block ciphers and hash functions is another important part of the Picnic design.”

Picnic is one of the nine signature algorithms to have gone on to the second round (out of 26). Besides Picnic, 17 encryption algorithms (out of 59) have also gone further. In contrast to previous NIST competitions (such as the AES or SHA competitions), the NIST Post-Quantum competition is not expected to identify one single winner, but rather it will to identify a set of “good choices” that can be used securely. The process is expected to end in 2022.
Department of Computer Science has received DKK 20 mio from Innovation Fund Denmark for a collaboration with Systematic and the university hospitals in Aarhus and Aalborg. DKK 6.5 mio will go to Department of Computer Science.

In “Hospital@Night”, the need for more efficient task scheduling for on-call physicians in after hour clinical settings is addressed through state-of-the-art machine learning and visual analytics methods. The idea is to improve the often arcane and complex manual scheduling practices through phone and pager calls currently employed in clinical task distribution. More often than not, the inflexibility and heterogeneity of current practices overburden and interrupt on-call physicians with requests that do not match their competencies, their current location, or simply their need for personal down time to perform at their best in the high-stakes, high-stress clinical scenarios to which they are called. With Hospital@Night, health IT specialists from Systematic, computer science researchers from AU, and clinicians from the University Hospitals in Aarhus and Aalborg set out to change this status quo through data-driven methods that automatically distills situational and domain knowledge on clinical task scheduling in a knowledge graph, which can then be used as a basis for improved task distribution.

The role of the department lies in the investigation of methods to automatically capture situational and domain knowledge in the knowledge graph structure (Data Intensive Systems, Ira Assent) and to visualize the knowledge graph to enable its interactive tailoring to the specifics of a particular hospital or ward (Ubiquitous Computing, Hans-Jörg Schulz).

Congratulations to Ira Assent and Hans Jörg Schulz, who are part of the new Hospital@Night project, which is funded by Innovation Fund Denmark.
While emerging digital technologies are rapidly transforming our everyday lives, investment in educating children about their impact and potentials has just begun. A substantial part of these investments prioritizes a focus on coding skills and computational thinking over quality of life, empowerment and democracy. CEED will address the societal and educational challenges and opportunities of emerging technologies through providing teaching activities and toolkits that allow children to unbox emerging technologies such as machine learning and IoT. More specifically the project will deliver toolkits that allow young people to de-mystify current black-boxes through designing, constructing, evaluating and thinking with emerging technologies. CEED will contribute to establishing a language that allows for meaningful conversations and reflections around emerging technologies in secondary education, and it will provide exemplar teaching activities and tools that support computational empowerment in secondary education. The ambition is to support youngsters in becoming competent citizens in a digitized society.
Associate Professor Kasper Green Larsen receives Sapere Aude grant to boost his research

Congratulations to Kasper Green Larsen, who is one of 35 outstanding Sapere Aude research leaders, whom the Independent Research Fund Denmark has pointed out as being the most capable young researchers. Kasper receives DKK 6,185,861 for his project “Data Structure Techniques in Cryptography and Machine Learning”.

Data structures is a central field in computer science that studies how efficiently data can be stored and searched on a computer. The field is very mature and many strong techniques have been developed for both designing new data structures, but also for proving mathematically that the current data structures are optimal, i.e. they cannot possibly be improved. A recent line of work has successfully, and quite surprisingly, used data structure techniques to settle long-standing open problems in cryptography and machine learning. This project will push that line of work much further by designing provably optimal algorithms in cryptography and machine learning via applications of data structure techniques.
ALICE is the new network, focusing on women in tech at Aarhus University. ALICE – Alliance for Women in IT, Computing and Engineering at Aarhus University – has been created by students and employees from the Department of Computer Science, and the newly founded network seeks to promote, support, and strengthen women in computing sciences, engineering, and technology. ALICE invites both students, faculty, and alumni who are interested in computing to join, regardless of gender or exact field of study. Furthermore, are individuals from the surrounding community and those from companies that are interested in sponsoring ALICE’s activities also welcome.

The goal of ALICE is to create a community for women in computing. ALICE’s primary mission is to provide an environment to encourage educations and professional development, raise awareness about issues women face in the field, and organize activities to inspire women to pursue careers in computing.

On October 8, ALICE hosted an afternoon event celebrating both Ada Lovelace, women in STEM, and not least the launch of ALICE.

ALICE - Alliance for Women in IT, Computing and Engineering at Aarhus University
Distinguished and best paper awards

- **Daniel Gratzer** - Best junior researcher paper at Formal Structures for Computation and Deduction 2019 for the paper: Cubical Syntax for Reflection-Free Extensional Equality

- **Christoffer Adamsen** – Honorable mention for the ACM Outstanding Doctoral Dissertation Award for PhD thesis: Automated Testing Techniques for Event-Driven and Dynamically Typed Software Applications

- **Daniel Gratzer** – Distinguished paper award at ICFP 2019 for the paper: Implementing a Modal Dependent Type Theory.


Grants

DFF GRANT TO GERTH STØLTING BRODAL AND LARS ARGE

Congratulations to Gerth Stølting Brodal and Lars Arge, who have received DKK 6 mio from the Independent Research Fund to develop new algorithms that efficiently utilize the block transfers in modern memory hierarchies, and thus can more efficiently process large volumes of data.

DFF GRANT TO MAGNUS MADSEN

Congratulations to Magnus Madsen, who has received DKK 2,5 mio from the Independent Research Fund to investigate a unified programming model for functional and declarative logic programming.

THREE PHD STUDENTS RECEIVE STIBO TRAVEL GRANTS

Congratulations to PhD students Svend Christian Svendsen, Mirzel Avdic and Alexander Mathiasen who have all received travel scholarships from the STIBO Foundation to cover their stay abroad.

The STIBO foundation hands out a number of travel grants every year of up to DKK 100,000. Recipients of the travel grants are PhD students within computer science and IT.
PhD 2019

HALL OF FAME

Event-Based Flood Risk Assessment on Massive Terrains

PhD: Mathias Rav
Supervisor: Lars Arge
Date: 18.01.2019

Secure Computation Based on Oblivious Function Evaluation

PhD: Satrajit Ghosh
Supervisor: Ivan Damgård
Date: 15.03.2019
Constructions and Proof Techniques for Secure Computation

PhD: Sabine Oechsner  
Supervisor: Ivan Damgård  
Date: 28.03.2019

Correlated randomness in cryptographic protocols

PhD: Michael Nielsen  
Supervisor: Ivan Damgård  
Date: 15.04.2019

Fine-grained Access and secure Computation on Encrypted Data

PhD: Helene Haagh  
Supervisor: Claudio Orlandi  
Date: 13.08.2019

Collaborative Visual Analytics: Leveraging Mixed Expertise in Data Analysis

PhD: Andreas Mathisen  
Supervisor: Kaj Grønbæk  
Date: 14.08.2019
Characterizing Word Representations For Natural Language Processing

PhD: Manuel Rafael Ciosici  
Supervisor: Ira Asset  
Date: 08.10.2019

Alice, Bits and Bob

PhD: Mark Simkin  
Supervisor: Ivan Damgård  
Date: 22.10.2019

Enforcement of Timing-Sensitive Security Policies in Runtime Systems

PhD: Mathias V. Pedersen  
Supervisor: Aslan Askarov  
Date: 23.10.2019

Comparison and Construction of Phylogenetic Trees and Networks

PhD: Konstantinos Mampentzidis  
Supervisor: Gerth S. Brodal  
Date: 24.10.2019
Automated Techniques for Creation and Maintenance of TypeScript Declaration Files

**PhD:** Erik Krogh Kristensen  
**Supervisor:** Anders Møller  
**Date:** 31.10.2019

Automatic Program Verification

**PhD:** Kristoffer Just Arndal Andersen  
**Supervisor:** Lars Birkedal  
**Date:** 13.11.2019

Formal Reasoning about Capability Machines

**PhD:** Lau Skorstengaard  
**Supervisor:** Lars Birkedal  
**Date:** 14.11.2019

Graphene-based Interaction Design for Constructive Play: Tangible Music-making Technologies for Children

**PhD:** Kasper Buhl Jakobsen  
**Supervisor:** Marianne Graves  
**Date:** 03.10.2019
STAY UPDATED WITH SELECTED NEWS, EVENTS, RESEARCH PROJECTS, JOB-OPPORTUNITIES, AND ACADEMIC ACTIVITIES AT THE DEPARTMENT.

linkedin.com/company/cs-au-dk
New Professors

Ioannis Caragiannis

(hired in 2019, starts his employment in 2020)

Ioannis Caragiannis will join the department as a professor in August 2020. Currently, he is a professor at the Department of Computer Engineering and Informatics of the University of Patras, where he also serves as the Director of its Division of Foundations and Applications of Computer Science and a member of its Board of Directors (since 2017). In the recent past, he held visiting research positions at the Computer Science Department of Carnegie Mellon University (USA), LAMSADE Laboratory of University Paris-Dauphine (France), the Department of Computer Science of the University of Salerno (Italy), the Gran Sasso Science Institute (Italy), and the Shanghai University of Finance and Economics (China).

His research interests include design and analysis of algorithms (including approximation and online algorithms), economics and computation (computational aspects of fair division, voting, matching problems, auctions, and congestion games), and foundations of machine learning and artificial intelligence. He has published more than 160 papers in conference proceedings, scientific journals, and books, and has participated in basic research projects funded by the European Commission and the Greek state. Currently, he is involved, as a member of the management committee, in the COST Actions CA15210 “European network for collaboration on kidney exchange programmes (ENCKEP)” and CA16228 “European Network for Game Theory.” He regularly serves as a program committee member in conferences at the interface of theoretical computer science, artificial intelligence, and economics, such as ACM Conference on Economics and Computation (EC) and the International Joint Conference on Artificial Intelligence (IJCAI). Recently, he was program co-chair of the 15th International Conference on Web and Internet Economics (WINE 2019). Ioannis Caragiannis is a member of the Association for Computing Machinery (ACM, SIGACT, SIGECOM), the Association for the Advancement of Artificial Intelligence (AAAI), and the European Association for Theoretical Computer Science (EATCS).

Hans Gellersen

On December 15, Hans Gellersen joined the department as a professor. Hans started his career at the University of Karlsruhe, where he completed a PhD in Computer Science in 1996 and led an independent research group until 2001. At the time, he conducted early research into context-aware computing and initiated the Ubiquitous computing (UbiComp) conference series. In 2001, he was appointed Professor of Interactive Systems at Lancaster University, and became involved in interdisciplinary HCI research as part of the EQUATOR project, and expanded his research into user interface technology and the eye-tracking field.

Hans’ research is fundamentally motivated by the idea of ubiquitous computing. Interaction with computing used to have clear boundaries defined by the hardware of conventional computers but computing is now embodied in the world in a wide range of ways, blurring the lines between physical and digital. Hans has worked on topics from context-awareness and human activity recognition to spontaneous and cross-device interaction. Over the last ten years he has become particularly interested in eye movement and how it can be leveraged as a context and modality for interaction.
New Tenure-Track Assistant Professors

Peter Scholl first came to the department as a post doc in 2017, and then in August 2019 started his new position as tenure-track assistant professor. Before coming to Aarhus, he completed his PhD in Bristol in the UK, in 2015, where he continued working as a post doc.

His main research area is cryptography, which looks at the techniques behind keeping digital information secure. He is particularly interested in the design of protocols for advanced technologies involving secure computation, as well as applications of lattice-based cryptography.

Andreas Pavlogiannis has been an assistant professor at the department since September 2019. Before that, he was a postdoctoral researcher at the École polytechnique fédérale de Lausanne (EPFL) in Switzerland. He received a doctoral degree in computer science from the Institute of Science and Technology (IST) Austria. Prior to that, he received a master’s degree in computer science from the University of California, Davis, and a joint bachelor-master’s degree in computer engineering from the University of Patras in Greece.

Andreas’s research interests revolve around the algorithmic and mathematical analysis of systems. His primary line of work is on programming languages and formal verification of software systems, where he develops techniques for the automated reasoning about system correctness and performance. He also studies evolutionary systems, mainly ones that arise in a biological or social context. To this end, he contributes to the fields of evolutionary graph theory and evolutionary game theory.

Amin Timany will join the department as a tenure-track assistant professor in April 2020. He has a master’s degree from Technical University of Dresden (Germany) in “Computational Logic” (2013) and a PhD in “Engineering Sciences — Computer Science” (2018) from KU Leuven (Belgium). Since October 2018 he has been a postdoctoral fellow of the Flemish research fund (FWO) in KU Leuven.

His research interests are theory of programming languages and compilers, type theory, proof assistants and program verification.

(Hired in 2019, starts his employment in 2020)
Welcome back to Professor Ole Lehrmann Madsen

At the end of 2019, Ole Lehrmann Madsen retired as CEO of the Alexandra Institute. He started as CEO more than 20 years ago when Alexandra was founded as an extra job that eventually ended up as a full-time position and Ole has thus been on leave from the department for many years.

When Ole went on leave, he was running a successful research group in Programming Languages, which developed object-oriented programming languages, virtual machines, software development environments based on abstract syntax trees for editing and debugging of programs. Ole has worked with the late Professor Kristen Nygaard (University of Oslo) since the early seventies. Nygaard was a guest professor at the department for several years and later got the ACM Turing Award (together with Ole-Johan Dahl) for inventing object-oriented programming.

With Kristen Nygaard and others, Ole developed the BETA programming language, which has been quite influential on the design of more widespread languages like Java and C#. When Ole return to his professorship at the department, he will pursue research in object-oriented languages for bare-bone embedded systems and programming language concepts that can be used for teaching modeling and programming for kids. He is currently working on a new programming language derived from BETA.
At the department, collaboration with industry is a key focus area. In April 2019, the department, together with three other IT-departments at Aarhus University, kicked off a new collaboration concept called Aarhus University Digital Innovation Festival.

The core idea behind the festival is to create a week of collaboration activities, involving students, researchers and industry professionals, and centered around four key themes: Build, Learn, Inspire and Hire.

BUILD (Friday – Sunday)

The festival was kicked off with AU Hack, where 350 students from Aarhus University, and other universities gather over a weekend, form teams and compete to create the most innovative solution. Some of the groups worked on their own ideas and concepts and others addressed problems proposed by selected industry partner. The entire event was student organized and ended out in a grand finale where the winners of the different categories were celebrated. www.auhack.org

LEARN (Monday - Tuesday)

Next, the focus turned towards learning new skills in 9 different knowledge workshops. The workshops lasted between ½ - 1 day and covered topics such as Explainable AI, Deep Learning, Functional Web, Container Technology, Microservices, Augmented reality, Blockchain and similar topics.
In total 120 people participated in the workshop with equal participation from industry, students and researchers.

INSPIRE (Wednesday – Thursday)

On Wednesday and Thursday, inspiration was in focus. Here the goal was to bring researchers and industry together and discover different views on emerging trends and research within topics such as Machine Learning, Blockchain and cybersecurity, Cloud computing, IoT, drones and 3D printing, digital creativity and VR and augmented reality. More than 200 people participated in the conference with the presence of more than 80 companies and participants from both research and industry.

HIRE (Friday)

The festival ended with K-day (Career fair/day) where more than 50 companies participated with the aim of recruiting IT students for student jobs or full-time positions. In total more than 700 IT students visited the career fair. www.kdag.au.dk

The outcome

The festival was a joined initiative between Department of Computer Science, Department of Engineering, School of Engineering and Department for Digital Design and Information Studies. More than 1600 visited the festival and more than 100 companies participated.

The overall goal was to create a new platform for researchers, industry professionals and students to interact and collaborate. Based on the feedback, the festival successfully met this goal and 86 % of all participants wanted to participate in the same event next year.

As Mak Jaxion, a Senior Specialist at Vestas pointed out - “People that we are meeting and given a chance to network today are going to be the people we hire in and fight for in the near future. I think it is very important for us to have a presence here”.

Aarhus University - Digital Innovation Festival 2020 – 8-15th May

The Department of Computer Science will, based on the feedback from the 2019 festival, repeat the success in 2020 and the Aarhus University Digital Innovation Festival is scheduled for May 8 – May 15th 2020.

For more information and to watch recording of selected talks from 2019, please visit: https://www.digitalinnovationfestival.dk
Analysis: More than 468,000 buildings are at risk of flooding

Heavy rain and storm surge threaten homes across the country. The problem is increasing as the climate changes. An analysis from the Danish Regions and Scalco shows that more than 468,000 buildings along rivers, at hallows, and along the coasts are at risk of flooding.

The analysis shows on three-dimensional maps what happens if different areas of Denmark are hit by a so-called 100-year event or by a flood, which pushes the water two meters higher than normal. The result is tremendous: 10,664 buildings along the rivers can be flooded, 393,574 properties in so-called lowlands and 64,000 buildings along the coasts are in danger of being flooded. Not at once, but they are located in areas where the risk exists.

This must be compared to the weather becoming more extreme. According to Professor Sebastian Mernild from the Nansen Center in Norway, in the future, the events that happen statistically once every 100 years can happen as often as once every 10 years.

Danish Regions believe that action is urgent to prevent basements, bicycle paths and roads from being flooded, also the association Danske Vandløb calls for faster action and recommends that a process for changing the river basin law should be initiated.

FACTS:

SCALGO was founded to bring cutting-edge massive terrain data-processing technology to the market. Our technology builds on more than two decades of basic and applied research within I/O-efficient and geometric algorithms at the Center for Massive Data Algorithms (MADALGO) at Aarhus University, Denmark, and at Duke University, U.S. The founders of SCALGO are world-leading researchers at these institutions. SCALGO maintains close ties to a number of research partners and domain experts in order to continue research into cutting-edge algorithm technology and new innovative digital tools.
Henrik Wann Jensen has been appointed Honorary Professor at the department.

Henrik Wann Jensen is an international leading researcher within Computer Graphics. He is, among other things, known for global illumination, photon mapping, and subsurface scattering methods, which are used for rendering photo-realistic scenes in movies and pictures. To honour this work, he received an Academy Award (Technical Achievement Award) from the Academy of Motion Picture Arts and Sciences for the methods to render the skin of Gollum from the Lord of the Rings movies.

Henrik Wann Jensen is originally from Aarhus and was a student at Marselisborg Gymnasium. He is now Chief Scientist of Luxion, which has offices in Aarhus and Orange County, California. Henrik Wann Jensen lives in Del Mar, but he often visits his family in Aarhus and the Danish department of Luxion, which is managed by his brother.

Henrik Wann Jensen has a PhD in Computer Science from DTU in 1996. He has been a Postdoc at MIT, a Research Associate at Stanford University, and has been Assistant, Associate and Full Professor (2002-2018) at the University of California, San Diego, where he is Professor Emeritus. He has also been a visiting Otto Mønsted Professor at DTU. He has been consultant for some of the most famous digital film producers Pixar (Steve Jobs), Weta (Peter Jackson, Lord of the Rings and James Cameron, Avatar). He now works as full-time Chief Scientist for Luxion, which develops the KeyShot tool, that is widely used for product visualization in areas such as design, advertisement, and architecture.

As Honorary Professor, Henrik Wann Jensen will contribute to strengthen the ties between the Department of Computer Science and Computer Graphics research both in industry and academia, and thus contribute to a possible recruitment to the area.

OTHER HONORARY PROFESSORS AND DOCTORS AT CS:

Honorary Professors:
- Michael E. Caspersen, Managing Director of IT Vest - networking universities.
- Bjarne Stroustrup, Managing Director for Morgan Stanley in New York
- Olivier Danvy, Professor at Yale-NUS College in Singapore

Honorary Doctor:
- Wendy E. Mackay, Research Director at INRIA Saclay - Île-de-France. Head of the In|Situ| research group in Human-Computer Interaction.
Kasper Green Larsen receives 2019 EATCS Presburger Award and wins great international recognition

Kasper Green Larsen, Ass. prof, is the first Dane ever to receive the international EATCS Presburger Award in appreciation of his “outstanding contributions in theoretical computer science”. The award is presented every year to one or more international researchers under the age of 35. Kasper will share the award with his German colleague, Karl Bringmann from the Max-Planck Institut für Informatik in Saarbrücken.

The committee consists of prestigious international researchers, who unanimously selected Karl Bringmann and Kasper Green Larsen as recipients of the award. And the fact that he has been picked by highly esteemed colleagues makes Kasper extremely proud: “Receiving this award is just overwhelming. Some of the former recipients were my big heroes when I was a PhD student. I’m very honoured that my international colleagues find my research worthy of such a prestigious award.”

The Presburger Award is presented at the ICALP (International Colloquium on Automata, Languages and Programming), the largest theoretical computer science conference in Europe, and recipients are recognised for their ground-breaking contributions to theoretical computer science research.

In selecting Kasper for the award, the Committee stated that Kasper had made a series of outstanding contributions to our understanding of how efficiently algorithms, and thereby computers, can solve computational problems. They said that through his research, Kasper had developed information-theoretical techniques enabling us to identify limits to how efficiently a computational problem can be solved. In many cases, these techniques have overcome barriers that researchers have been struggling with for decades. They stated that Kasper had explored the limits of computation in many areas of computer science, and had made ground-breaking contributions in a number of fields, including data structures, cryptography and machine learning.

“Apart from the recognition, the award will make a big difference in the future when I apply for research funding and have to attract new postdocs and PhD students,” explains Kasper Green Larsen.
The ST TAP Award 2019 goes to Special Consultant Søren Poulsen from the Department of Computer Science.

Over the past 12 years, Søren has made a unique contribution to the Department of Computer Science. The department’s great success in attracting more students is to a great extent due to the outreach activities initiated and led by Søren. Søren is extremely inventive. Among other things, he has helped develop, and currently manages, the department’s local hub for entrepreneurs - HatchIt Lab. He was also behind the initiative for the Katrinebjerg Career Day (K-day), which in just a few years has grown into Denmark’s biggest IT career fair. Furthermore, he has helped develop and implement the department’s strategy for business collaboration, including a new Business Club for IT companies and industry.
CS alumni was awarded with IT developer talent of the year title in 2019

Congratulations to alumni Martin Mortensen, who was named IT Developer Talent 2019. IT talent is a competition hosted by Version2, Ingeniøren and Jobfinder where the IT Talents 2019 - in the categories consultant, developer and project manager - are announced.

The jury’s motivates the nomination by saying: »Martin is naturally curious and has the energy to plunge into countless issues at once - and ensures a good result! During very tough deadlines, Martin has helped us design and develop solutions that are central to collecting ‘know-your-customer’ data. “

Honorable mention to PhD dissertation from the department

Congratulations to former PhD student Christoffer Quist Adamsen (now Software Engineer at Google) who has been selected by the Executive Committee of ACM SIGSOFT and its selection committee for this year’s honorable mention for the ACM Outstanding Doctoral Dissertation Award. The SIGSOFT Outstanding Doctoral Dissertation Award is presented annually to the author of an outstanding doctoral dissertation in the area of Software Engineering. In case of strong competition between several dissertations, the committee can choose to award the runner-up with a honorable mention.

Christoffer was awarded the honorable mention for his PhD dissertation from May 2018: Automated Testing Techniques for Event-Driven and Dynamically Typed Software Applications.
CS BUSINESS CLUB

GET CLOSER TO OUR STUDENTS AND RESEARCHERS

CS Business Club serves as the entry point for cooperation between your business and Department of Computer Science in areas such as recruitment, research and knowledge sharing. Visit cs.au.dk/businessclub to investigate your opportunities to collaborate with our researchers and students.

BENEFITS OF MEMBERSHIP

Investigate your opportunities to develop your business with project and thesis collaboration with students, recruiting, potential research and innovation collaboration with CS researchers, industrial PhDs, strategic partnerships and professional networks.

Participation in the annual career fair Katrinebjerg Karrieredag (Kdag) (value: DKK 8000).

Firsthand knowledge on news and events at Department of Computer Science
Invitations to special talks and events
03 Education
It’s just a short way from IT product development to the shelves at the world’s biggest supermarket chain

The urge to be creative is a crucial incentive for Tobias Fjelsted Alrøe, Jesper Lysgaard Rasmussen and Rune Haugaard. All three of them are graduates from IT Product Development at Aarhus University, and they are part of the team behind Frameo, an IT company that has developed a digital picture frame. The frame is now being sold in 25 countries, and it is on the shelves at Walmart, one of the world’s biggest supermarket chains.

A successful entrepreneurial career path needs a unique product idea, a good network and, not least, a desire to create something new based on a good understanding of user needs.

The adventure started with a phone call four years ago, when the three IT product developers were contacted by the founders behind Frameo. The company had come up with an idea for reducing loneliness among the elderly. Their solution was a digital picture frame enabling users to keep in touch with elderly family members by sending pictures to them.

When searching for partners to produce the picture frame, Frameo came into contact with Tobias Fjelsted Alrøe, Rune Haugaard and Jesper Lysgaard Rasmussen, the trio behind the IT company Appdictive. They were already running a successful business, developing Android apps for industry, health and entertainment, and they had specialised in all aspects and phases of app development - from idea and consultancy over programming and interaction design to integration of hardware.

This kick-started the partnership with Frameo. Today, the three IT product developers have acquired approx. 20 per cent of Frameo and serve as technical partners for the four Frameo founders.

**The degree programme helps understand users**

Tobias Fjelsted Alrøe often emphasises the mix of computer science with physical design and an understanding of how to use IT as an important feature of the IT Product Development programme. This combination has been crucial for the Frameo collaboration, because the picture frame is a popular gift for grandparents. And if it’s not simple and user-friendly, the elderly simply won’t be able to use it. Tobias Fjelsted Alrøe explains:

“We chose this degree programme because we like to create things. The IT Product Development programme has given us the knowledge and skills to write proper code. At the same time, we’ve gained an understanding of user-centred design, which allows us to view things from different angles. We develop products that are fun to use, instead of just system solutions that work technically.”

The first frames were produced in China, and since then, things have gone fast. The reason for developing a niche of selling the software under...
licence was that the Chinese manufacturers typically sell their products on to several other brands.

“Since then, it’s just grown and grown. There’s been interest in the market for our software solution, and this caused us to change our business model into a licence model where, instead of selling the actual frames, we sell software to Chinese manufacturers who then produce under licence. This speeds up the process of marketing the product and making a digital photo frame that Europeans like,” continues Tobias Fjelsted Alrøe.

Today, Frameo has sold more than 250,000 licences, and in 2019 the company had a profit of more than DKK 2 million (EUR 0.27 million). The core of the business is to focus on one thing and present the software in a way that makes it easy to use.

“It’s in the Chinese mentality that if the hardware is capable of something, then you should make the most of it. If you produce a photo frame, you might as well integrate it with a calendar, a weather station and a music player. But all these features make it terrible to work with for users,” says Tobias Alrøe.

Jesper Lysgaard Rasmussen adds:

“It’s all about keeping it simple, and being true to your own idea. It’s up to us to say that all these features should not be included, because in the end, users won’t like them. This is really the essence of Danish design.”

FACTS:
Frameo started out as a university project, when Emilie Christiansen, Kasper Borup Jensen and Nikolaj Schmidt, the three founders of Frameo, met at Aarhus University while studying digital design. They came up with the idea for a digital picture frame and joined forces with three IT product developers, Jesper Rasmussen, Rune Haugaard and Tobias Alrøe. Torben Ulrich, who has been running Denver Electronics for many years, is also part of Frameo.
Interview with three international students:
Why study computer science in Aarhus

Computer Science at Aarhus University from the eyes of three International Students

Denmark’s second largest city prides itself as being the world’s smallest big city - it’s large enough to have everything one looks for in a big city but small enough to retain a cosy small town vibe. The city is home to Aarhus University, the largest research university in the country which is a prestigious world top 100 institution surrounded by lush green parks and pristine blue lakes.

Meet three international students studying Computer Science at Aarhus University to get their perspective: Patrick Lewandowski from Germany (Masters), Maximilian Scheid from Germany (Masters) and Joao Belo from Portugal (Masters and PhD). The trio concur that the strong academic reputation of the Computer Science department is the main reason they chose to study at Aarhus University.

"I attended an Open Day at the university prior to applying for a Masters which gave me a feel of the city, the university, and the department" Joao reveals "I liked how the department is research oriented, has world-class professors, and gives students the freedom to choose what to specialise in". Now pursuing a PhD in Augmented Reality, Joao explains that he looks at how the field can improve human procedure in industry.

In addition to the freedom to choose from a range of different modules, Maximilian believes that there is a good mix of both practical and theoretical aspects. "There’s a big focus on actually doing stuff". He adds that the department is very much in tune with the students demands “As some of us wanted to do something related to Machine Learning, which the department didn’t have at that point, they created something for the summer intake”.

Not only is the department strong, but also the fact that Danish universities are tuition free (for EU/EEA students) and the possibility to apply for a state grant (SU) to help with living costs was another incentive for the students to at Aarhus University. Patrick says that the prospects for international students is furthermore made easier as they have a special international advisor at the university who can help with any issue they may have.

However, adapting to a different study and exam culture is bound to bring challenges. The consensus among the trio is that there have been more oral exams than they were used to. “I only had an oral presentation for my Bachelor thesis back at home, but here they are much more common,” Maximilian says. Joao agrees and advises that, “Maybe the first oral exam will be a big difference, but then you get used to it”.

Working in Denmark

The department has many connections to the industry, and is happy to help set up connections for those interested in a student job. Joao, Maximilian and Patrick quickly found relevant student jobs at interesting companies. Patrick, who is working as a Data Engineer at Danske Bank, adds that there is very little hierarchy in the office. “Everyone is really friendly and you can talk directly to your boss” he says, and continues, “They also expect
you to be direct because that means you’re honest”.

Regarding staying in Denmark post-graduation, all three feel that it would be beneficial to learn Danish even though Danes speak excellent English. Maximilian, currently learning the language, says “As a German, Danish is not hard to learn but the speaking definitely is a bit more challenging”. To stay in Denmark after graduation, Maximilian also adds that Computer Science graduates are in shortage so many opportunities come by.

Indeed the students believe that studying Computer Science at Aarhus University makes them well sought after by employers. Furthermore, there are numerous company events and workshops at the university. “You really see the interest of companies to get into the university to get in contact talents. This makes networking easier, and in Denmark, it is key,” Patrick says.

From adjusting to a new study culture to experiencing a new living environment, moving abroad can definitely be challenging, but the trio agree that their transition to Aarhus University has been seamless and the experience has been fulfilling. For all three, the prospects of staying on and working in Denmark is very much a possibility.

**Patrick Lewandowski** from Germany came to Aarhus University in 2018. He is in the first year of his master’s degree and works at Danske Bank.

**Joao Belo** from Portugal came to Aarhus University in 2017. After one year on the master’s programme Joao has been accepted as a PhD student in Augmented Reality.
Great career opportunities for Computer Science students in Aarhus

Two years ago a group of 10 international students commenced the Master’s programme in Computer Science at Aarhus University. It was the first time the programme admitted a larger group of international students. This summer they all graduated, and now two of them share their experiences.

Even though it has only been a few months since he graduated, Stefan Prisca is already busy at his first full time job as an IoT System Developer at the Danish company, Grundfos.

He started his career at Grundfos as a student assistant on the second semester of his Master’s programme, where Destination Aarhus helped him find a student job and after graduation, he was offered a full time position.

Before the Romanian native came to Denmark, he already knew he wanted to study a full degree here.

“A friend told me about Denmark, so I already knew it was a pretty awesome place,” says Stefan Prisca, who had also applied for Aalborg University, but chose to come to Aarhus.

“I found Aarhus more active and lively and the university introduction was really nice. But I also really liked the topics and course structure that made it possible to choose our own courses.”

Another one of the students who chose Aarhus University was Miguel Fialho from Portugal. He was accepted to both Aarhus University and University of Copenhagen.

“I looked at both Germany, the Netherlands and Denmark, before narrowing it down to Denmark, where the programmes were better suited for me,” he shares.

Great relationship between students and professors Miguel Fialho has really liked studying at Aarhus University – he especially enjoyed the relationship with the professors, where students are always welcome to stop by the professors’ office and then he liked the oral exams.

“I felt like the oral exams allowed the teacher to actually find out what I knew and allowed me to better express my knowledge,” he says and explains that he was a bit anxious the first time, but that it went away immediately when the exam began.

Stefan Prisca also enjoyed the relaxed relationship between students and professors and the high level in the courses.
“The professors were amazing. I liked the flat hierarchy, which meant I could just stop the professor in the hallway and ask a question. I also liked the very high level of teaching where all the professors were keeping up with the newest research all the time,” he says and adds that he also really valued that he was able to get a relevant student job while studying.

Miguel Fialho also worked during his studies. Since the second semester, he worked as a TA at the department and currently he is working with his professor to publish his Master thesis. Furthermore, he just landed his first full time job at In-Commodities in Aarhus, where he will work as a software developer.

Both graduates would like to stay in Denmark and really like the way of life here.

“The job environment in Portugal is tough. It is hard to become independent; which means that many 30-year-olds still live at home. The job would also not be what I like – I would not be intellectually challenged like here and I would have to work longer hours,” tells Miguel Fialho.

Stefan Prisca agrees: “The work-life balance and the 37-hour-week here is great. It means that when I get home in the afternoon I'm not tired and I still have time to do lots of other things.”

AUHack is part of “Major League Hacking”, and Aarhus University’s largest hackathon. Over a 36-hour period, students interested in IT development and IT design will meet and collaborate intensively to create prototypes and concepts.

The goal is to bring students from different fields of study and universities together, and to set a framework where they can carry out projects and ideas. Students from all study programs are welcome, and everybody is there to help each other and to have fun.

Read more and apply at auhack.org!
Internationals are excited about Aarhus

In May 2019, all EU/EØS applicants offered admission at the department were invited for a three-day visit to Aarhus. During the visit, the potential master students got to know more about the department, Aarhus University and city where they maybe will spend – at least – the next two year of their lives. 70% of the visitors have accepted the offer to study at Aarhus University.

How do you choose where you want to study abroad?
Most people make their choice based on previous knowledge or recommendations. Therefore, the department wanted to give its international applicants a first-hand experience of Aarhus before making their choice. For three days in May, the international applicants got to know more about the department’s study program and facilities, learned about practicalities when relocating to Denmark, and met with a range of local IT companies to talk about job opportunities during and after their studies in Aarhus.

“With the visit, we get the chance to show our international applicants Aarhus as the young, vibrant city it is, and how the Danish society and business environment works. These highly demanded students get several admittance offers, and may not know Aarhus as well as they know Copenhagen, London or Barcelona. So, the CS Visit is a perfect opportunity to put Aarhus on the map of attractive cities”, says Sofia Hedegaard Rasmussen, organizer of the CS Visit and Communications Specialist.

Why apply for Aarhus University?
Generally, the international students are attracted to the Danish way-of-living, no tuition fee and the academic level within computer science at Aarhus University. During the visit, many were positively surprised about the facilities at the department and the close cooperation with the local IT companies.

The CS Visit 2019 was organized in collaboration with the industrial network Destination AARhus whose member organizations – as many others - are experiencing difficulties recruiting enough qualified IT specialist for their open positions.

“The demand for IT talents is very high, and everyone is struggling to get the best into their organizations and teams. Considering that the IT industry is global it is of critical importance that the search for that talent is also global, as we will not be able to grow the adequate IT talent in Denmark alone”

- MARTIN STAMPE
CIO, DANSKE BANK
Aarhus is the best student city in Denmark

According to a new survey conducted by one of the biggest education search engines in the Nordics - Studentum.dk, the city of Aarhus is the best student city in Denmark for 2019. According to the survey, Aarhus scored high across several key parameters: Career Opportunities, Education Institution Quality and City Reputation. All of them are categories that prospective students value the most. The ranking is based on scores across seven parameters – the mentioned above, as well as Feeling Safe, Cost of Living, Cost of Housing and Access to Nature and Outdoor Opportunities.
Over three intense days, the participants have experienced an exciting but also challenging programme to get a better insight into the Computer Science and IT Product-Development programmes offered at the department. The girls have amongst other things participated in lectures, theoretical exercises, and workshops in subjects such as cryptography, sketching, and programming. Furthermore, they got an opportunity to meet female role models and to go on company visits.

A starving field
There is an acute shortage of IT specialists in Denmark, and the IT-field foresees that there will be a shortage of 19,000 IT specialists in 2030. According to a study made by DR, women only constitute a fifth of the overall working force with computer programming. Getting more women interested in IT is essential in mitigating the need for IT specialists. To achieve this, initiatives such as IT Camp for girls are an important tool, and many IT-companies have also actively participated in this year’s camp.

“Some of Microsoft’s primary values are ‘Diversity and inclusion’ and ‘Innovation’. By sponsoring IT Camp for girls, Microsoft wishes to acknowledge and support the importance of getting more women to start and complete a career within IT. Diversity is essential in getting the different points-of-view that are needed when assembling the creative development-teams, which are a part of creating the innovative solutions of the future”, says Mads Vil-Iassen, Principal Software Engineering Manager at Microsoft, which in 2019 was the primary sponsor for IT Camp For Girls.

More and more women choose IT as a career direction
In general, women are underrepresented on all of the country’s IT-educations, but more programmes have the last few years experienced an increase in female students. This also applies to Aarhus University, where they in 2019 admitted 13% women at Computer Science while IT Product Development has 19% female students. A lot of factors play a part in this, but the department sees IT camp for girls as a significant factor.

“I am very happy that so many young women want to join our IT-Camp, and become wiser about our exciting IT programmes. There is IT in everything, and with an education in IT Product
Development or Computer Science these young women can look forward to a lot of exciting jobs within many different lines of businesses. There is a great need for IT-specialists, but an even greater need for female IT-specialists. I hope that we get to meet many of the women again after the summer break, as students on one of Aarhus University’s IT programmes”, says professor and head of department Kaj Grønbaek.

It looks like Kaj Grønbaek’s wish for more female students can come true. The camp, which the girls described as inspiring, an eye-opener, and extremely educational, has had a particularly positive effect on their view on IT as a future study and career. Before the camp, only 31% considered IT as their future study, but after the camp, this number increased to 75%.

IT camp for girls takes place again in 2020. Anyone interested can keep an eye out for the event at https://www.itcamp.dk.

FACTS:
IT camp for girls takes place as the Department of Computer Science at Aarhus University in the autumn holiday. The camp is organised by passionate, volunteering students from Computer Science and IT Product Development, and is sponsored by multiple Danish IT-companies. Further information can be found on: https://www.itcamp.dk/
Award:

Teacher of the Year 2019

Five teachers were nominated for the Teacher of the Year award. The winner is selected via a vote among all the departments’ students in both computer science and IT-Product development. The winner was announced on Computer Science day. Turn to page 52 to find out who the winner is.

Gerth Stølting Brodal
Foundations of Algorithms and Data Structures

Gerth is nominated for the course Foundations of Algorithms and Data Structures. Gerth is always very committed to the content and goals of the course, and as a student, you want to meet up for the lectures because of the high academic level but also because the lectures are inspirational and fun. Gerth is very engaged in the communication between himself and the students during lectures, and he goes a long way to ensure that everybody actually understands the substance and the examples in every lecture. It is also very clear that Gerth puts a lot of effort into utilising instructors/TA’s in the best way possible.

Henrik Bærbak Christensen
Software Engineering and Architecture

Henrik Bærbak Christensen is nominated for the Software Development and Software Architecture course. During the course Henrik managed to exemplify core parts of the curriculum through small stories from the industry - always in a very committed and enthusiastic way. Henrik is very committed to maintaining the students’ attention throughout the lectures and manages to balance the weight of theory and practical aspects in an elegant manner. The course is perfectly complemented by a large project where all students had ample opportunity to apply and implement the theory. That way everyone was able to feel the joy of good code - as well as the frustrations of bad.
Marianne Graves Petersen is nominated for the Innovation Project course. Over the years Marianne has developed a strong project oriented course with a focus on industrial collaboration. The Innovation Project is clearly an important subject for IT Product Development students. One of the great strengths of this course is that Marianne facilitates a great deal of student ownership and involvement by integrating student involvement in the planning and execution of the entire project. This allows students to develop individual project- and process-skills but still maintain a focus on the academic subject.

Jaco van de Pol
Computability and Logic

Jaco is nominated for the Computability and Logic course. Jaco is always well prepared for lectures, responsive to feedback, especially when it comes to fixing initial problems i.e. study café scheduling. He also demonstrates an excellent ability to explain complicated subject matter in an easy and accessible way, which is important in a relatively difficult course such as Computability and Logic. Even though this is the first course Jaco teaches at Aarhus University it is very well organised and aligned to the rest of the CS curriculum.

Anders Møller
Programming Languages

Anders Møller is nominated for the Programming Language course. Anders achieves to convey complex subjects in a very simple and understandable manner. His lectures are very comprehensive, and the assignments corresponds extremely well to the curriculum. The concept of a project-driven course worked very well, and gave a great hands-on experience. The communication around the course (BB, video recorded lectures, Study Cafe setup) and the thorough feedback was outstanding and really made this course a great experience.

PREVIOUS WINNERS

2018: Kasper Green Larsen
2017: Gerth Stølting Brodal
2016: Henrik Bærbak Christensen
2015: Niels Olof Bouvin

2014: Olivier Danvy
2013: Henrik Bærbak Christensen
2012: Gerth Stølting Brodal
Very Successful First Run of New Data Visualization Course

Would you want to know how to predict certain diseases best? Or maybe rather which shoes to invest in when strategically building your sneaker portfolio? Or are you interested in finding out about the shipping routes of the transatlantic slave trade? None of these are computer science questions at first glance. Yet, computer science and in particular Data Visualization can greatly help in answering them.

This semester, the Computer Science Department at Aarhus University offered the Master-level course on Data Visualization for the first time. Data Visualization is the science and craft of showing large volumes of data graphically, creating highly specialized charts and diagrams for interactive visual data analysis and presentation. You could think of data visualization as picking up where the charting wizard of your spreadsheet software leaves off. It is the method of choice for any data that are too complex for the commonly offered bar charts, line charts, and pie charts.

“Data Visualization is unique in the sense that it is a perfect blend of soft and hard sciences” says Harshit Mahapatra, one of the more than 30 students who participated in the course this year. And indeed, building a data visualization requires many computationally and aesthetically complex steps to come together: from cleaning and preprocessing the data to designing and rendering the interactive graphics. In order to learn about all these different steps, the course is designed as a combination of lectures and project work that go hand in hand. This allows students to try out the concepts from the lectures in an actual visualization scenario and to learn from the feedback they receive along the way.

Assoc. Prof. Hans-Jörg Schulz, who runs the course, says “I was amazed by the broad range of datasets the students chose for their projects. And by the students’ creativity and programming skills in realizing their visualization ideas in code”. Indeed, the project results that come in the form of videos, interactive websites, code and data repositories show how much the students are invested in their vis-

Visualization of Skyler Roth’s project to identify certain disease predictors to be used in early diagnoses.
ualizations. A selection of this year’s projects can be found at https://vis-
au.github.io/#course-projects-2019

For example, there is Skyler Roth, an exchange student from West Vir-
ginia University, whose visualization solution helps to investigate ma-
chine learning results from patient data to identify certain disease pre-
dictors to be used in early diagnoses.

And there is Casper Hogenboom, ERASMUS student from Maastricht
University, who built visualizations to aid chart analysis for trading and
investing in rare sport shoes. Another example is the one by Harshit Mahap-
patra, Tomas Mota, and Maximilian Scheid, who visualized a large da-
aset on the transatlantic slave trade to communicate its egregiousness
down to the individual ship.

The new course is popular

The Data Visualization course is par-
ticularly popular among exchange
students, as for many it is a unique
opportunity to gain insight into a
scientific field that is not covered at
their home universities. But it is not
only the course contents that draw
foreign CS students.

For many, the unique course struc-
ture with its diverse learning activi-
ties from weekly visualization tool
tutorials to a hackathon on the last leg
of the visualization project is a wel-
come change in their educational
routine. “The course is demanding in
every part and the expected level of
professionalism in the visualization
project is well above your average
course hand-in” tells us Nils Simon,
ERASMUS student from Goethe Uni-
versity in Frankfurt am Main. He adds
“but the lecturer and the teaching
assistants are always available to
help with plenty of feedback and
suggestions, pushing you to get
the most out of the course and the
project. Clearly the highest level of
commitment I’ve seen in teaching in
five years of university.”

So, what did Nils get out of the visu-
alization project? With Niklas Müller,
Nils used the project to build a vis-
ualization tool for investigating the
voting behavior of members of the
German parliament. The tool makes
it astonishingly easy to see periods
of coalitions and oppositions among
Germany political parties and to drill
down further to see for which topics
of legislature these overall patterns
are broken. As Nils wants to use data
visualization in his future job after
completing his MSc in Germany, the
project will be a cornerstone of his
project portfolio when applying for
positions.

Data visualization is sought after by
many companies

These days, experts in Data Visu-
alization are much sought after by
companies in Denmark and abroad.
Whether as data scientists, data vis-
ualization designers, data visuali-
zation engineers, or data journalists– data and the need for its graphical
display have arrived in all areas of
business. But also in the more main-
stream computer science job profiles,
knowledge of state-of-the-art visual-
ization frameworks like d3.js, Plotly,
or ggplot2 is often considered a strong
advantage for an applicant.

Are you interested in getting that
advantage to count in your favor as
well?

The Data Visualization course runs
every fall semester and is open to
students with a CS background. Stu-
dents from other fields need to be
fluent in computer programming –
preferably JavaScript and/or Python– to take the 10 ECTS course. Inquiries
about course contents can be direct-
ed at Assoc. Prof. Hans-Jörg Schulz
(hjschulz@cs.au.dk).

Nils Simon and Niklas Müller has built a visualization tool for investigating the
voting behavior of members of the German parliament.
And the CS Awards go to...

Teacher of the Year

GERTH STØLTING BRODAL

Foundations of Algorithms and Data Structures

Teaching assistant(s) of the year

The teaching assistant of the year is given to one or two teaching assistants with consistent outstanding evaluation scores and remarks in course evaluations.

WINNERS

Benjamin Barslev Nielsen
Compilation

Simon Meldahl Schmidt
Introduction to Programming

Student Award 2019

The student of the year award is given to one or more students who, during the year, have contributed to the study-environment, taken initiative to extraordinary activities, or have been good representatives of the Department of Computer Science in other ways.

WINNER

Thomas Øther Rasmussen
Social Coding Event
KDAG 2020
KATRINEBJERG CAREER FAIR

15 MAJ 2020
11:15 - 15:00

NYGAARD BUILDING (5335), FINLANDSGADE 21, 8200 AARHUS N
KDAG.AU.DK

KDAG 2020 PRESENT A GREAT POSSIBILITY FOR OUR STUDENTS TO ENGAGE FACE TO FACE WITH IT COMPANIES LOOKING FOR TALENTED GRADUATES AND STUDENTS FROM OUR DEGREE PROGRAMMES.

More than 50 companies and +700 students will be waiting in line to present themselves at the intense One-minute-madness session, followed by conversation with students and visitors at the company stands in the Nygaard building.
FIRST.Global - Danish Robot Olympiad for High School students

The Danish qualification tournament for the annual International youth robotics event FIRST Global Challenge was held September 28 at the department.

On September 28 2019, six teams from High Schools across Denmark competed in the Danish Robot Olympiad finale at Aarhus University. The teams competed for the opportunity to represent Denmark at the International FIRST Global Challenge 2019 in Dubai, UAE.

The challenges in the Robot Olympiad are based on the robot platform REV Robotics, and are specifically designed to match the level of the major technical subjects taught at High School level in Denmark. The theme of the international First Global challenge in 2019 was “Ocean opportunities” and presented the students with a challenge of building a robot solution to track, sort and dispose of pollutants at the ocean surface, simulated by a 6 x 6 meter playing field.

In the Danish finale students were asked to solve a set of more differentiated tasks related to the international challenge, but with an aim to integrate the challenge into specific learning activities in the high school curriculum.

The Danish challenge set was designed by associate professor Ole Caprani, and in the 2019 edition focus was on building and programming fast solutions to sensing and sorting colours and block objects.

“The First Global Challenge is a way for us to engage more actively with high school teachers and students, focusing on a specific topic with a real academic content that can be used in the classrooms. During the competition High School students and teachers develop their ideas and solutions in close collaboration with staff and students from Computer Science. In this way the Robot Olympiad also serves as an excellent introduction to life as a university student,” says Ole Caprani, Associate Professor.

The Danish team did very well at the First Global Finals in Dubai ending 9th out the 191 participating nations.

The Department will organize the Danish qualification tournament for the First Global 2020 competition during the summer and fall 2020. Learn more about the Robot Olympiad at cs.au.dk/RobotOL, and the International FIRST Global Challenge at first.global.
Kdag 2019: 50 meters and 5 job offers

Once again, the Peter Bøgh Auditorium was completely filled, as the department organized Katrinebjerg Career Day (also called Kdag) for the fifth time. 52 companies from Denmark and abroad participated to tell what they can offer some of Denmark’s most sought after students.

Getting responsibility from day one, working in small, agile teams and being part of a social workplace were some of the things the companies highlight that can offer the students. At the same time, the companies were ready with surprises, sweets and smart gadgets to lure the students to their stand. “We might attract the students with a little popcorn, and then we can talk to them,” said Anne Nørgaard from Zitcom. Many other companies had the same idea and for instance brought along Formula 1 simulator, ice cream truck, coffee bar, Super Nintendo tournament, drones and much more to lure the students to their particular booth for a talk about their future.

Stine Ramsing, who is studying IT product development, Kdag is a great opportunity to start the job search. She finishes her studies this summer, and has started to look for a job: “I went to Kdag to get an overview of which companies are relevant to me. At the same time, it is a good way to get in contact with the companies.”

The retail company Bestseller participated for the third time in Kdag, and they would like to make the students aware that Bestseller is also a large IT company: “We are a global company and have about 300 employees who work with IT, of which 100 of them sit in Aarhus,” said Dann Bleeke, Head of Bestseller IT, and continued “we are looking for students with a technical profile who want to try new things and who want to inspire.”

For the companies, Kdag is a unique opportunity to get in touch with the students: “We are present today to meet the students where they are,” explained Daniel Maass, Specialist in Innovation Lab, Discovery & Incubation at Terma, which had several open job listings for the career fair. The contact with the young IT talents, who soon will be entering the labor market, is particularly important, as over 40% of Danish IT companies last year had problems getting their open positions occupied.

The attractive IT students

Common for all the participating companies is that they all urgently need employees with a background in IT. According to a study prepared by the Danish government, Denmark will lack 19,000 IT specialists in 2030. This means that the IT students from Aarhus University are in very high demand, which also showed by the companies’ enthusiasm for Kdag.

“There has been a huge demand from the companies to participate in Kdag 2019”, says Sofía Hedegaard Rasmussen, who is one of the organizers of Kdag, and continues “you can really see that our students are in high demand, because the 52 booths were sold out in just 24 hours and 47 minutes, and another 15 companies were on the waiting list.”

The meeting between the companies and the future IT staff is also something that makes an impression on the students. Computer students Oliver Pedersen said, among other things: “It is nice to know that there are so many opportunities to get a job.” This is supplemented by Maximilian Scheid from Germany, who reads his master’s degree in computer science at Aarhus University, “The interest of the companies is absolutely overwhelming, I have only managed to walk 50 meters through the stand area, and I already have five different job offers.”
Around 100 quota 2 applicants visited computer science on Saturday May 4

For the second time, the Department of Computer Science conducted quota 2 admission tests. The test will help ensure that the department’s new students have some good academic prerequisites and a strong motivation. This year, 68 computer science applicants and 25 IT product development applicants were tested in their study ability, and gained an insight into the degree programs they have applied for.
On October 23-24, 62 high school students jointed our department for the annual study trial, where they got an insight into the life as a student at Aarhus University.

Study trials is a three-day event at Aarhus University, where students from all over the country can tryout their perhaps future study. This year, 62 students had chosen to visit department of computer science to learn more about our two programs computer science and IT-product development. At Computer Science, 49 high school students got a feel for how it is to study Computer Science. Furthermore, 12 students will grapple with the world of IT-Product development.

The event allows high school students to get an insight into almost every aspect of life as a university student. How is it to be a student of computer science, and what exactly is computer science and IT-Product development? The program is tailored to answer these questions, and any other questions the participants may have. This is accomplished by having a program that mixes presentations with exciting exercises. Additionally, the participants will get a chance to meet and talk to students and teachers from the department.

Participants at Computer Science got an insight into some of the courses students of Computer Science have throughout their program. Algorithms, cyber-security, and programming are just some of the subjects the participants got an introduction to. The participants did not only hear exciting presentations about the subjects but also got hands-on experience with fun and challenging exercises such as Capture the flag.

Those participating at study trials at IT-Product development also experienced an exciting mixture of presentations and hands-on experience, as they attended different workshops throughout the event, such as a workshop about prototyping.

After each day of study trials, the participants joined multiple after-study activities, which allowed them to experience campus-life in Aarhus, as well as meeting future study-buddies and in general got a taste for life as a student at Aarhus University. After-study activities included events such as a view over the city of Aarhus from the book-tower, a quiz-night, and much more.
EXPO of first-year IT-product development projects

This week, first-year IT product development student displays their prototypes from the course Foundations in IT product design. Their assignment was to create shared interfaces for light control in a study setting. For the project, the groups all have created lamps and controllers but each with a specific scenario which they have experienced themselves or observed in the study cafe.

Nikoline and Johanne (above) have created a lamp that makes it possible to signal to others if an interruption is welcome or not. “In the lab, we often experience that groups take breaks at different times. If you are in the middle of a great workflow, it can be very disturbing if others to come over to talk. With this lamp it is easy to signal to those around you if you are busy, or ready for a chat,” Johanne explains. Nikoline shows their controller, made with a ball, which can be used to adjust the light. “We think the study café is such a great place, and if it was possible to change the light, it might also be used for other purposes than just studying,” she explains.

A lamp that really caught the eye is one that looks like the solar system. The group who created the lamp explains that it will help students take breaks, and thereby optimize the time they spend studying. When you move the little planet around the sun (lamp) it functions as a timer for the study period. Once the planet returns to original position the light changes to indicate that it is time for a break. It is also possible to change the color of the sun to ensure the most optimal light for both work and break.

Great work by all the new students. Incredible to see how much you have learned in just half a year.

The prototypes will also be on display tomorrow, so swing by the study cafe and have a look.
This year Girls’ Day in Science set a new record with a turnup of more than 3200 girls attending the event. The girls attending the event were able to meet women working in the field, scientists, and students, whom they could take example from and get an insight into their field. Furthermore, they were able to have their eyes opened for all the exciting opportunities that lie within technology and science. Therefore, it makes a huge difference when companies and educational institutions open their doors for the future students.

In Denmark there is a large need for people studying subjects such as IT, technology and the natural sciences. Companies are in need of qualified workers and women are under-represented in the field. In 2019 only 32% of the new students studying STEM are female, which is a progress of 1 percentage point compared to 2018, although some fields of study have a much lower percentage of women. In a world which gets more technological by the day, we need men and women who will take part in the development of new technology. To get more women to work within these fields, 63 companies, organizations and educational institutions opened their doors for 3200 girls from elementary school. At the event the girls were able to get an insight into the field by working with practical tasks and other related work.

Girls’ Day in Science focuses on the fact that a lot of girls do not choose an education within IT, technological or the natural sciences. The event had a focus on women with successful experiences to boost the girls’ confidence in their abilities. Three female students from our department made an exciting workshop in collaboration with Google.
Capture the Flag Event

For the first time ever, the department hosted a Capture the Flag competition, where contestants participated in 24 hours of trying to break Cyber Security.

Over 150 participants challenged each other’s hacking skills regarding Cyber Security at the competition Aarhus Cyber Security CTF. By completing different Cyber Security challenges, teams are able to gain points in the form of flags, where the number of points gained depends on the difficulty of the challenge, the number of teams who had already solved the challenge and its specific topic. The competition lasted 24 hours, where participants of all abilities sought to not only improve their skills, but also to capture flags. The competition was Jeopardy-style with 5 categories and 30+ challenges, with topics such as:

- Web exploitation (XSS, Authentication, Information, SQL-injections, etc.)
- Cryptography
- PPC (algorithms to break stuff, automated playing games, etc.)
- Badly configured servers
- Reverse engineering

Learn and Hack Your Way Through Challenges

The participants were mainly students from Aarhus University, however, everybody with an interest in cyber security were welcome. Having a prior knowledge of coding or mathematics would be a solid start, however, the event focused on being beginner-friendly, while also providing a challenge for the experienced hacker. If a team was struggling with a specific topic, they could improve their skills by attending one of the several talks and introductions or buy hints with their points, thus getting them back on track.

Casual competition

Although both pride and prices were at stake, the event had a casual and laidback vibe, where it was more about having fun than winning. Free pizza and coffee kept the energy levels high throughout the 24-hour competition. LEGO sponsored the prices, which went to the three best teams, and the winners of a lottery ticket-pool. The team “./dirtyc0w” - who were just 13-15 years old - convincingly won first place with 11,132 points, which was almost twice as many as the runners-up from team “TotalFailure”.

The event, which was the first of its kind, was a huge success with over 150 attendees. If you want to participate in future events follow us on Facebook: https://www.facebook.com/datalogi/
Digipipi girls uses micro:bit to build “living” creatures

On March 2019, IT Product Development students Marie-Louise Stisen Sørensen and Ninna Hoffmann helped the girls from Digipipi Aarhus to build cardboard creatures with blinking eyes and beating hearts programmed with BBC’s micro:bit.

Digipipi, whose mission is to balance the gender gap within IT, technology and digitization, had in collaboration with Department of Computer Science arranged six workshops on Wednesdays where girls from 7-13 years worked with different aspects of IT.

About Digipipi Aarhus:
The association’s purpose is to offer girls aged 7 to 13 a digital platform and activities whose primary purpose is to generate interest and disseminate knowledge about technology, IT and the digital media (hereafter TID) using voluntary female role models.

The overall vision is:
• To make girls independent and conscious users as well as consumers.
• Providing them with tools and learning opportunities based on their learning profiles
• Working to give girls and women positive self-image in relation to TID
• To create debate on the role of girls in TID
• To back up and create relevant material for girls in relation to TID
Friday June 28, family, friends and teachers gathered at Department of Computer Science to celebrate the graduation of 56 new masters in Computer Science and IT-Product development.

Associate Dean of Education, Finn Borchenius, congratulated and handed the Master’s diploma to each of the 56 graduates who attended the graduation ceremony in a packed Peter Bøgh Andersen auditorium.

Chief Technology Officer at SCALGO, Thomas Melhove, who graduated from the department in 2004, held this year’s graduation speech: “It is quality rather than quantity that matters. Do a good job tomorrow”.

In 2019, 56 students have completed a master’s degree in either Computer Science or IT Product Development at Aarhus University. The department wishes the best of luck to all of them, and hope you will stay in touch as an alumnii!
AND WELCOME TO
191 NEW BACHELOR STUDENTS

In August, the Department of Computer Science welcomed 191 new bachelor students.

For the next three years, they will be studying either IT-Product development or Computer Science. Two degrees that are in high demand on a job market that is in desperate need of IT specialists.