DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE



#IMADAsdu



Martin Svensson, Head of Department

Welcome to the frontier

The Department of Mathematics and Computer Science houses some of the most groundbreaking programmes, researchers and opportunities within IT, computer science, artificial intelligence, data science and mathematics. Every day we help push the boundaries of possibility. We develop programmes and solutions for tomorrow's challenges, and we are an essential part of the advancement of society in Denmark and the world at large.



"At IMADA, I have learned to question why we do as we do. Computer science is a very theoretical and analytical education, and I have learned to analyse problems before proposing solutions."





A Modern and Pioneering Department

Founded in 1972, the Department of Mathematics and Computer Science is today a state-of-the-art department, consisting of more than 100 employees and 750 students. Every year, we educate about 90 students in mathematics, computer science, data science and didactics.

Our students enter workplaces and research positions from where they help drive development forward through mathematics and computer science at the highest level.

The Global Goals and Mathematics

The University of Southern Denmark (SDU) works purposefully with and for the UN Sustainable Development Goals. The research and solutions we create at the Department of Mathematics and Computer Science are crucial in order to be able to solve the problems we face. We educate the people and conduct the research that forms the basis of the technological solutions that are

critical for our collective future.





Business Collaboration

The Department of Mathematics and Computer Science educates IT specialists at the highest level. Our expertise is far-reaching and essential, and we help companies, institutions and the public sector solve complex issues on a daily basis.

Solving Real-World Issues

It is important to us that the students work with real issues from the very beginning. That is why we value business collaboration very highly, because we believe that it fuels high-quality solutions – both during and after the studies.

Every day we solve complex problems for companies throughout Denmark, and the specialists that we train at the Department of Mathematics and Computer Science are in great demand in the business world.

"In the Applied Mathematics programme I gained a thorough knowledge of statistics and the programming languages R and Python, all of which I use a lot today. I also learned to handle large projects and to collaborate with others. In addition, I got a mathematical mindset to approach problems with."

Nina Louise Pedersen, Data Scientist at the IT and Development Agency of the Danish Ministry of Taxation



How we collaborate:

- → Development projects
- $\rightarrow\,$ Thesis projects with companies
- → Consulting services

- \rightarrow Shared employment
- \rightarrow Guest lectures
- \rightarrow Data science, data sets from companies

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Artificial Intelligence, Cybersecurity and Programming Languages

We are pushing the limits of modern digital systems. We work at the crossroads of artificial intelligence, cybersecurity and programming technology, and we develop both theory and tools that equip developers to handle tasks within programming, coordination, modeling and systems analysis. Software, data and systems are only getting bigger and more complex, presenting challenges in terms of developing and analysing them manually. We build the solutions that will solve both today's and tomorrow's challenges with security systems – and we help pushing development forward.

Center for Distributed Systems

Digital life and modern infrastructure are largely based on distributed systems such as cloud computing, edge computing and the Internet of Things. At the Centre for Distributed Systems, our goal is to make these distributed systems more secure, accessible and sustainable. We research, develop and support external partners and industry, and build bridges between knowledge-based development and those who ultimately use the solutions.

Computational Science

The modern lab is digital. We use computers to simulate models of reality, as in some fields it is the only option and in others the most efficient. In everything from aerodynamics to elementary particle physics and atomic physics, our models help to expand our understanding and develop new theories and solutions. We use mathematics broadly, as it forms the basis of the groundbreaking algorithms, techniques and analyses we develop.

SDU eScience Centre

Established in 2013 as a "one-stop shop" for eScience at SDU, the centre's mission is to promote and support digital research across the faculties at SDU, both as a provider of national HPC (High Performance Computing) services in collaboration with other Danish universities and the Danish e-Infrastructure Cooperation (DeiC) and by developing state-of-theart HPC and data management services. The centre also functions as a support and training centre for digital research and provides in-depth knowledge of the relevant modern digital platforms.

Algorithms

Algorithms are central to computer science, and a basic professional understanding within algorithms is consequently an important part of professional and career change readiness.

Computer science as a field is developing at lightning speed, and the students at Algorithms at SDU are at the forefront of this development. Our students from Algorithms step directly from their studies into exciting jobs and career opportunities, most finding work in the industry – either as self-employed or as important additions to companies of all sizes – where they work with large data sets, resource optimisation, areaspecific algorithms and much more.

Center for Algorithmic Cheminformatics

In this strategic initiative we are developing groundbreaking new computational methods for analysing chemical reaction networks, with the long-term aim of putting SDU at the centre of a revolution in this area. A current focus includes the modelling of the healthpromoting effects of gut bacteria via algorithmic methods.

Develop solutions that matter

Become a technology consultant at KPMG and join an international network of colleagues committed to helping companies and organisations thrive.

We work together and combine our expertise within technology, business and finance to find opportunities for our clients. We help them grow, innovate and shape the future. Together, we come up with new ways of solving today's challenges, and we use our experience to anticipate future ones.

Join us. We will provide you with the tools that you need to build the career that you want.

kpmgcareer.dk



Data Science and Statistics

Data science is a rapidly developing field, and we are helping to expand the field in both theory and practice. We combine expert knowledge from computer science, machine learning, data mining, statistics and bioinformatics when we develop new methods for data analysis. We collaborate across other academic branches and work with real-world issues from businesses and the public sector.

Centre for AI Science and Applications (CASA)

At CASA, we build a bridge between the highly sought-after capabilities in artificial intelligence at the department and our partners, helping researchers and students share knowledge and create solutions for industry, the public sector and across the university.

Laboratory for STEM Education and Learning

The Laboratory for STEM Education and Learning (LSUL) is a strategic research, development and educational collaboration between the Faculty of Science at the University of Southern Denmark and the University College South Denmark, as well as the UCL University College. We bring together experts, students and practitioners in mathematics, science and technology to focus on research, development and education in the field of science and technology in the education system.

Centre for Research in Science Education and Communication

The centre innovates and changes education and communication through network-based, interdisciplinary collaboration and innovation. The centre focuses on knowledge media, learning systems and information technology – and how these can support competences in problem solving, creativity, communication and collaboration.



Topology, Algebra, Analysis and Geometry

We research the innermost essence of mathematics with a special focus on understanding the mathematics that describes quantum phenomena. This mathematical development is essential for a better understanding of the universe we live in, and is a central driving force in the technological progress of the future. In terms of research, we embrace a wide range of topics, but we are particularly strong in areas such as quantum topology, operator algebra and geometry.

Centre for Quantum Mathematics

At the Centre for Quantum Mathematics (QM), we focus on creating a new and completely mathematical foundation for all quantum phenomena, both purely theoretically, but also in relation to the development of quantum computers and advanced quantum algorithms.

HAR DU AMBITIONER?

Skal du skrive speciale, søger du praktikforløb, eller har du en helt tredje case? Vi leder efter *dig*, der vil være den bedste inden for machine learning og big data. Med et forløb hos ordbogen.com bliver neurale netværk, transformers og masser af computerkraft en del af din hverdag, alt sammen placeret på hovedsædet i Odense, tæt på SDU.

Jakob Frydendal Jensen

Jeg læser datalogi på SDU og arbejder som machine learning-udvikler for Ordbogen, hvor jeg skal skrive mit speciale. Et projekt her er et forløb med 'edge tech' inden for sprogforskning, mange ressourcer til rådighed og sparring med kompetente medarbejdere.



Prof. Peter Schneider-Kamp

Vi løser mange opgaver i samarbejde med studerende og går op i, at vores arbejde er meningsfuldt og har værdi for samfundet. Det kan blot starte som en god idé. Kan det laves? Det prøver vi! Grundlæggende betyder det, at det er okay at fejle, så længe det er med et større formål for øje.

Læs mere på ordbogen.com/odin

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Programmes

At the Department of Mathematics and Computer Science, we have some of the most groundbreaking programmes in IT, computer science, artificial intelligence, data science and mathematics. We work closely with the business community, and our students experience how the programmes provide access to amazing and ambitious career opportunities immediately following graduation.



Here you can see an overview of our programmes:

BACHELOR'S DEGREE

- \rightarrow Applied Mathematics
- → Computer Science
- \rightarrow Mathematics
- Mathematics-Economics

MASTER'S DEGREE

- \rightarrow Applied Mathematics
- → Computational Biomedicine
- \rightarrow Computer Science
- → Data Science
- \rightarrow Mathematics
- → Mathematics-Economics

CONTINUING EDUCATION

We create targeted courses for companies in order to train employees and ensure that the company remains up-to-date and has access to the latest knowledge.

We also offer these continuing education programmes:

- Master in Mathematics
 - Master in Science Education





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Quasi OS - an IMADA startup

Quasi OS was created by three graduate computer scientists from the Department of Mathematics and Computer Science. In collaboration with the department and Universal Robots, they are developing a new and secure control system for robots, and the Danish Hub for Cyber Security has provided financial support for the project. Already during their studies, the three computer scientists began to develop the system, which is based on improved security. The ambitions, however, go far beyond operating systems for robots – the goal for Quasi OS is to one day be able to challenge Windows and Linux. You can read more about the system here: www.quasios.com/quasios/

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"I remember the really cool community at IMADA. We were in study groups from the beginning, which at first glance might seem a bit tiring, but it turned out that it was really good for us to work in groups. Mathematics is quite a heavy study if you don't have someone to work with. Because of this community, we knew each other regardless of year, so there was always someone who had tried it before and could help."

Janne Arnhoff Eriksen, Data Developer, the National Board of Social Services



House of Code - sparring partner



At House of Code, we contribute to the students getting a feel for reality when they are in dialogue with or collaborate with us. We support their learning with tasks from our daily work, which simultaneously contribute to our business and support the students in their learning journey.

For us, it is all about the passion to create something that some people can enjoy in their everyday life – and which creates value. This applies to our customers as well as employees, and, hopefully, to even more students. We have been collaborating with IMADA for several years and are looking forward to many more years to come. A collaboration can be a case/task, an in-company period, a thesis, a job or something completely different. Together with the students, we will continue to expand the collaboration, focusing on learning from the real world. So if you have an appbased idea, let's start a dialogue about your options. We look forward to hearing from you.

Henrik Stær Grove, COO & Partner +45 2261 0509 // henrik@houseofcode.io



Shape the Future of Aviation with ForeFlight

At ForeFlight Odense we tackle some of the hardest problems in aviation with modern, innovative software solutions. These include sophisticated algorithms to optimize an aircraft's planned route, precisely calculate fuel burn and flight time, analyze weather systems, and seamlessly communicate with aviation authorities around the globe. We also build the front-end iOS and web applications that pilots use to plan their flights every day.

Our team includes programmers, researchers, pilots, dispatchers, graduate and undergraduate students, and more from all over the world, bringing creative ideas from diverse backgrounds together to solve new and more complex problems. Throughout the global aviation industry our team is becoming known for these innovative solutions and for our relentless pace of development. If you have what it takes, we invite you to come join the fun and build some awesome, industry-leading, brain-twisting software.





Solving Real-World Issues with Cutting-Edge Software

I joined ForeFlight after finishing my Masters in Computer Science from SDU. The thing I enjoy most about working at ForeFlight is that the problems we work on come from real-world issues that pilots and flight planners face every day. It's fulfilling to learn about these and develop elegant solutions that automate complex and time-consuming tasks in their day-to-day operations.

You do not need to be an aviation nerd to work with us, although it helps. There are so many cool ideas and stories within aviation, and you're always learning new things and solving new and interesting problems.

Each winter we have a company-wide hack week where we showcase cool projects we built together. It's a great way to try out new techniques and see what cool experiments others have come up with, many of which end up being shipped as fully-fledged features. As the team has grown it's been exciting to see the new faces that join us every year - I look forward to seeing yours one day!

DANIEL DAHL Director of Engineering - Flight Planning Apps

Hone Your Skills with a Tight-Knit Team

When I started at ForeFlight as an industrial Ph.D. student, I was really excited that I could use the techniques I had learned during my studies, since many of them only have applications in a small number of situations.

I continued working at ForeFlight after concluding my Ph.D. and found that I didn't need to work on a thesis to still be challenged on my mathematical and algorithmic skills. For example, we've trained a neural network to identify obstacles in front of runways, used local search to optimize the elevation profile of planned routes, built quad-trees to optimize lookups for airspaces, and more. Aside from challenging problems like that, the domain of flight planning is about as interesting as it gets, and learning about the aviation industry and how aircraft work has been really fun.

The atmosphere at ForeFlight Odense is better than any I could imagine. We're a young team with an average age of about 30 and many of us joined directly after our studies, including more than 10 computer scientists from IMADA. We recently moved into a newly-renovated office at Odense Harbour with plenty of room and some really nice facilities. The company supports almost any type of social activity, so we have regular board game nights, Friday bars, and plenty of other company events.

There is a short distance between having an idea and being allowed to run with it. Bringing up your own personal ideas is strongly encouraged, and due to our fairly flat management structure it's easy to get your ideas approved and make them happen quickly.

ANDERS KLARSKOV KNUDSEN Engineering Lead - Runway Analysis







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FOLLOW ALONG

The University of Southern Denmark works purposefully with and for the Global Goals.

We work for a sustainable and inclusive place for people.

We work for diversity, inclusion, freedom, development and democracy.

At the Department of Mathematics and Computer Science, we contribute with research and groundbreaking development, which is crucial in solving the complex problems that the world faces.



SDU 🎓

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

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