Programme
DTU Compute, Building 324, ground floor

13:00: Welcome: Philip Binning, Senior Vice President, Dean of Graduate Studies International Affairs, DTU Kim Knudsen, Associate professor, head of the DTU Compute PhD School

13:10: Good research communication: Johan Olsen, PhD in Biology, TV host in the science TV series Store danske videnskabsfolk and lead singer in Magtens Korridorer

14:00: The Bazaar is open

14:00 -14:30: Presentations: Posters, podcasts, video, showcases (ground floor)

14:30 - 15.30: Talks I (Room 40) / Pitch I (Room 60)

15:30 - 16:00: Coffee and cake

16:00-17:00: Talks II (Room 40) / Pitch II (Room 60)

17:00-17.45: Live music

17:45-18:00: Celebrating the winners (Kim Knudsen)

18:00- 20:00: Dinner

19:00- 19:30: Science Slam: 2 x 10 minutes (Room 60):
A science stand-up comedy show by Head of department Professor Per B. Brockhoff and Associate Professor Poul Hjorth from DTU Compute

Pitch: Panel of judges:
Søren Mayland, Business Developer from the investment and development company Capnova
Sune Lehmann Jørgensen, Associate Professor from DTU Compute
Iben Julie Schmidt, Communications specialist and owner of Scientifica

Talk session I: 14:30-15:30, room 40 (Panel of judges: Philip Bille and Jakob Eyvind Bardram)

Name	Title	Research area	Talk
Jacob S. Larsen	Automated NIR Management	Big Data/Data science	**14:30-14:40**
Kasper Lyngsie	Graph Colorings		**14:40-14:50**
Max Spooner	Methods and tools for the statistical data analysis for large datasets collected from bio-based manufacturing processes	Big Data/Data science	**14:50-15:00**
Frans Zdyb	Machine Learning As A Service	Big Data/Data science	**15:00-15:10**
Philip Vejre	White Box Cryptography	Secure Societies	**15:10-15:20**
Rune Junker	SDE modelling of cities	Smart Society	**15:20-15:30**

Talk session II: 16:00-17:00, room 40 (Panel of judges: Philip Bille and Jakob Eyvind Bardram)

Name	Title	Research area	Talk
Andreas Hess	CompoSec: Secure Composition of Distributed Systems	Secure Societies	**16:00-16:10**
Adrian Kirkeby	Hybrid Tomography	Life Sciences	**16:10-16:20**
Azucena Campillo Navarro	Risk assessment with matrix-analytic methods	Big Data/Data science	**16:20-16:30**
Magnus Dam	Dynamical Systems Approach to L-H Transition in Magnetically Confined Plasma	Other	**16:30-16:40**
Amanda Lenzi	Statistical modelling of space-time process with application to wind power	Big Data/Data science	**16:40-16:50**
Monica Emerson		Big Data/Data science	**16:50-17:00**

Poster presentations, ground floor (Panel of judges: Vedrana Andersen Dahl and ?)

Name	Title	Research area
Hari Om Aggrawal	Priors for Temporal Tomographic image Reconstruction	Smart Manufacturing
Sirin Gangstad	Ultra-long term subcutaneous EEG monitoring of brain function and disease	Big Data/Data science
Kenan Sehic	Numerical Uncertainty Quantification in Stochastic Wave Loads	
Federica Belmonte		Big Data/Data science
Hasan Baig	Analysis, Verification and synthesis of Genetic Logic Circuits	
Niels Ipsen	Big Data in the Food Supply Chain	Big Data/Data science
Lasse H. Christiansen	Optimal control of PDE systems	Cyber Physical Systems
Jonathan S.	Metal artifact reduction in CT using MRI	

Nielsen		
Maiya Medetbekova		
Anders R. Christiansen	Compressed Computation on Highly-Repetitive Data	Big Data/Data science
Giulia De Zotti	Market mechanisms for the integration of distributed energy resources	Smart Society
Damianos Tranos	Model Predictive Control strategies for real-time control of urban storm and wastewater systems	Cyber Physical Systems
Peter Jørgensen	Machine Learning for Quantum Physics	Big Data/Data science
Juan Camilo Gil Carvajal	Modeling audiovisual speech perception	Life Sciences
Georgios Arvanitidis	Geometrical aspects of manifold learning	Big Data/Data science
Janus Nørtoft Jensen	The Statistics of Estimated Surfaces	
Ekaterina Sherina	Numerical Inversion Methods for Impedance tomography with hybrid data	
Othoman Elaswad	Bridging Digital Divide	
Christine B. Linander	Optimizing product testing by sensometrics, psychometrics and statistics	
Jonathan D. Stets	Image-Based Tracking and 3D Content Generation	
Ann-Sofie Fisker	Digital Factory	
Sebastian Wolf	Smart Zero Emission Cities	Big Data/Data science
Tobias K. S. Ritschel	Dynamic optimization in Oil Reservoirs Management	Cyber Physical Systems
Ignacio Blanco	Decision-making for the Management and Planning of Integrated Energy Systems	Big Data/Data science

Showcases, ground floor (Panel of judges: Tobias Andersen and Christian Probst)

Name	Title	Research area
Sebastian Nesgaard Jensen	Real-Time Tracking of Deformable Objects	Smart Manufacturing
Jon Liisberg	Data-driven models for energy advicing leading to behavioural changes in SMEs and residences	Smart Society
Matteo Raffaelli	The Geometry of Generalized Flat Ribbons	
Alessandro Dal Corso	Virtual Reality painting for transfer of artistic skills	
Florian Gawrilowicz	A traceable 3D scanning and reconstruction pipeline	

Video, ground floor (Panel of judges: Tobias Andersen and Christian Probst)

Name	Title	Research area
Mina Kheirabadi	3D image analysis methods for security X-ray screening	Secure Societies
John Bruntse Larsen	Hospital Staff Planning with Multi-Agent Goals	Smart Society

Dolores Messer	3D Shape Analysis for Morphometric Evolutionary Modelling	Big Data/Data science

Podcast, ground floor (Panel of judges: Tobias Andersen and Christian Probst)

Name	Title	Research area
John Bruntse Larsen	Hospital Staff Planning with Multi-Agent Goals	
Andrés Occhipinti Liberman	Action Model Learning for Multi-Agent Systems	

PhD Bazaar May 10th: Pitch

Helle Rootzén will be leading the battle

The Panel of judges

	**Iben Julie Schmidt** is a science communicator. She has produced numerous videos about research and technology. She is a writer (e.g. for DYNAMO and DTU AVISEN) and the producer of the podcast "Supercomputing I Danmark". She also teaches storytelling and communication for researchers. She was head of communication at DTU Systems Biology until 2014 and is now the owner of a communication company called Scientifica (www.scientifica.dk) which specializes in communicating science and technology. With Scientifica she is helping DTU Departments as well as presearch based companies.
	**Sune Lehmann** is an associate professor at DTU Compute. He's also an adjunct associate professor at the Niels Bohr Institute at University of Copenhagen and the Associate Director of the Center for Social Data Science (SODAS) at the University of Copenhagen. Sune's research focuses on understanding large and complex datasets generated by human beings (social networks, data science, and that kind of thing).
	**Søren Mayland** – Business development consultant at CAPNOVA A/S Working with financing innovative early stage growth companies for 8 years, Søren has seen and assessed more business plans, pitches and presentations than most. His work include investing, project development, alternative financing (Crowdfunding + Soft Money) and business development. He has on several occasions served as board member and among other things Søren has secured +70 million DKK in grant funding. CAPNOVA is a seed investment and development company providing capital, solid business experience and a strong network in order to turn innovative ideas into successful businesses. CAPNOVA invests in new business ideas with large knowledge content and with a great potential. CAPNOVA can invest up to DKK 6 million in a

Pitch l: 14.30-15.30, room 60

Name	Title	Abstract	Research area	Pitch
Luca Pezzaross	Dynamic Partial Reconfiguration in FPGA based Multi-core Real-time Embedded Systems	Hard real-time embedded systems are a class of computer systems whose temporal behavior has to be completely predictable. In recent years, we have observed an increase in the usage of field programmable gate arrays (FPGAs) to implement multi-core systems-on-chip, especially for professional and high-end hard real-time applications. Dynamical partial reconfiguration is an emerging concept in the FPGAs industry that allows the reconfiguration of selected areas of an FPGA after its initial configuration, without affecting the functionality of the FPGA section not involved in the reconfiguration. The PhD project explores the usage of dynamical partial reconfiguration in the context of hard real-time embedded multi-core systems-on-chip. The project is particularly challenging due to the time predictability specification, but it also offers a variety of benefits, such as very high level of flexibility, smaller size, lower cost and reduced power consumption.	Cyber Physical systems	**14.40-14.43**
Bjørn Jensen	Quantity of interest tomography	It often happens that we are curious about things we cannot observe directly, and while there might be ways to directly observe these things, they might require destructive action that cannot be condoned. Examples could be looking inside a person, or perhaps determining the toy inside a kinder egg. Thus we device ways to try to spy at these unobservables by indirect measures. The link between these indirect measures and the unobservables is established by a mathematical model, which explains to us what our indirect measures would be if we knew the unobservable. Equipped with this we attempt to recover our unobservable from the indirect measures; we call problems like these Inverse Problems. Unluckily for us, the link, in general, might be highly unstable and our indirect measure inaccurate. This combination makes inverse problems very hard to solve; sometimes even impossible. Often though, while we might not for sure determine the unobservable, we can obtain a probability on the unobservable; i.e. we might be able to answer questions like: how likely is it that the unobservable is A compared to B?	Big Data/Data science	**14.46-14:49**

		As it happens, we are often not actually interested in the uncertain unobservable A coming from the model but rather some derived quantity, say, how many pieces does the toy in the kinder egg consist of? Information like this might be much more stably determined than the unobservable itself. In this project we would like to uncover more about what information we might derive stably and what might not be determinable at all.		
Rasmus Dalgas Kongskov	Segmentation-Driven Tomographic Reconstruction	The use of x-rays to investigate the interior of objects has been known for over a 100 years. About 50 years ago the first CT-scanners were released. CT-scanners are massively used today for both medical and industrial purposes, but almost everywhere, the scanner-data is still processed in the same way that it was 50 years ago. Requirements for CT-scanners keeps increasing: high resolution, dose-reduction, acquisition-time reduction, etc. All of these requirements cannot be handled by means of the standard data-processing methods, therefore I work with developing and adapting the models and methods to meet the requirement of modern day CT-applications.		**14.52-14.55**
Jesper Løve Hinrich	A Probabilistic Framework for Tensor Methods with Applications in the Life Sciences	We live in a digital society in which information is gathered in more and more detail from our interactions on social media, smartphones to medical records and biomedical sensors. This information can be used quantify our physical and mental state. For example using brain imaging and genome sequencing to understand neurological disease or the influence of genetic variations. Information collection and analysis is widespread in all areas of science, and the increased use of multiple high speed and/or high resolution sensors lets information be gathered in much finer detail than ever before. However, the resulting multi-modal datasets are difficult to analyze as most method are currently based on two-mode (matrix) modeling, which is problematic when faced with higher order tensor data, i.e. greater than two modes. Tensor methods account for this multi-modal structure and have been successful in a wide range of fields. Current practices are based on point estimates (i.e. maximum likelihood), which can be unstable to small changes and does not provide parameter uncertainties for the estimated model. Therefore, we investigate	Big Data/Data science	**14.58-15.01**

		fully Bayesian modeling, which is a type of probabilistic modeling that allows for handling parameter uncertainty in a natural way and facilitates joint inference of model order and parameters. Probabilistic modeling of tensor decomposition methods is in its infancy and currently restricted to the basic Tucker and Canonical Polydiac decomposition along with a few simple constraints. The aim of this PhD project is to develop a high-performance open source toolbox. Providing a collection of basic and advanced probabilistic tensor decomposition methods, as well as tools for model selection and validation. The developed methods will be use to address current challenges in the Life Sciences, specifically within neuroimaging, genetics and chemometrics		
Darius Adam Rohani	Adaptive, context-aware cognitive behavioral therapy for affective disorders	Almost every single person carries a phone. Besides calling and browsing the internet, it is a computational "power-horse" embedded with numerous sensors. These sensors can be turned on and passively monitor your surroundings and behavior. Mental disorders affecting mood, such as depression, is a disorder where behavior change is a key symptom and treatment method. This pitch will take you into my project of designing a smartphone app that constantly monitors and guides the patient towards a healthier living; essentially providing the patients with a 24/7 artificial psychologist.	Life Sciences	**15.04-15.07**
Kamilla Nielsen	The frame set for Gabor systems generated by b-spines	In harmonic analysis, frames offer a way of representing complex signals using much simpler building blocks. Compared to orthonormal bases (ONB), frames introduce redundancy which is useful in applications. Gabor systems are constructed by taking translations and modulations of a given window function. In Gabor analysis, it is simply not possible to find an ONB with special desirable properties, while it is possible to find a frame with these properties. However, Gabor systems only form frames for special translation and modulation parameters. Part of my project is to develop methods to determine the parameters that make a Gabor system generated by B-splines a frame. The B-splines are of particular interest in applications because they are piecewise polynomials and compactly supported. In applications, it is essential have so-called dual frames. These are needed in order to have stable expansions of signals. I will work on finding these dual frames for functions of		**15.05-15.08**

		interest, including the B-splines. As well as being needed for expansions, the dual frames also provide estimates for the so-called frame bounds. These bounds determine how useful a given frame will be in applications. A good ratio between the upper and lower frame bound will be close to one. Across all of my work I will use numerical methods to complement and support rigorous mathematics. There already exists a time-frequency analysis toolbox for Matlab called LTFAT. I will utilize the existing elements of this toolbox in my code and make extensions for the toolbox		

Pitch II: 16:00 - 17:00, room 60

Name	Title	Abstract	Research area	Pitch
Elena Bossolini	From non-smooth to smooth - on regularization using slow-fast theory	Friction is a mechanical force that plays an essential role in our everyday life. Think for example to car brakes or to the pleasant sound produced by a violin. Without friction, an object moving on a plane at constant velocity would keep its motion up to infinity (in case that there are no other obstacles on the way!) Friction plays also a key role in earthquake dynamics. One may describe an earthquake rupture as two faults that are sliding one over the other one: during the sliding friction appears. There are not enough earthquakes in Denmark to justify a PhD on this topic, however the same equations can be used to model the behaviour of car brakes. In this pitch, I will present a model for earthquake ruptures that has been given us by the danish brake manufacturer Roulunds Braking, and I will show some results about periodic solutions of this model		**16:10-16:13**
Frederik Banis	Efficient Operation of Energy Grids	Electrical grids are one of the core infrastructures in our world nowadays. In order to ensure a stable operation of these grids, we need to meet certain requirements. New challenges for the stable operation are arising as we increase the amount of fluctuating renewable energy sources. In order to cope with this situation, one can improve control strategies leading to an increased degree of flexibility in the system, enabling for compensating the increased variability introduced to the system. Another option is the improvement of the physical infrastructure within the grid. However, as this is expensive, improving control strategies has the potential to save money. The control of a complex system as the electrical grid comes with challenges and is not a trivial task. Model Predictive Control approaches will be used in order to provide flexibility and taking part in various system services related to a stable system operation1. A scenario clarifying this, even though overly simplified, is imagining a garden-watering system using rainfall as the source of water. One can predict rainfall, storing water compensating for dryer periods. If a physical storage is very expensive, one can still use control strategies to introduce time-shifts. This is done by moving away from the current-time optimal water amount provided to the plants to an optimal water amount over a chosen time horizon. One would then provide more water than necessary prior to a predicted time of low rainfall to the plants, optimizing the overall health of the plants. Footnotes: Cp. ERA-Net Smart Grids Plus uGrip project description.	Cyber Physical Systems	**16:16-16:19**

Philip Jørgensen	Big Data in Food Supply Chain		Big Data/Data science	**16:22-16:25**
Christoffer Rasmussen	Tools for Reliable Energy Performance Characterisation of Buildings	A significant amount of the global energy consumption and CO_2 emission are related to the building sector. It is often stated that 40 % of the global energy is consumed within the building sector, and the same sector accounts for 30 % of the total global greenhouse gas emission. According to Eurostat, households alone accounts for more than 25 % of the energy consumption in the EU. But equally important, these buildings offer great possibilities for large energy savings and reduction of greenhouse gases. Building codes decrease the permitted energy consumption year by year, and highly efficient building are designed. Numerous international studies show, however, that the energy consumption often is 50, 100 % or even several times higher than predicted in the design phase. An energy performance gap is apparent. A gap that is often ignored and explained by the unpredictable behaviour of the occupants. But why not learn from this gap and make one saved unit of energy in the design phase become one saved unit of energy in the physical world? Today, there is no operational method or tool that can be used to identify, quantify and analyse the reasons for the discrepancies between expected and resulting energy performance of renovated buildings. Consequently, there is an unfulfilled possibility to target building improvements and optimise building operation. With the present PhD project, tools for reliable on-site dynamic testing of energy performance characteristic of building renovations will be developed. These tools aim to reveal and evaluate hidden information about the actual building fabric and the occupant's influence on the building performance. Information that can explain the building performance gap. Information that can be utilised to educate the occupants in more intelligent building use. Information that can reveal design and construction flaws, which we can learn from and increase the quality of the future built environment. Information that makes calculated energy savings, energy savings in the physical world. As part of the project, methods for good test and modelling conditions will be studied. Through the project, special emphasis will be on how to use time series data from sensors (energy, temperatures, CO_2 concentration, humidity, etc.) for a reliable and		**16:28-16:31**

		stochastic characterisation of the thermal dynamical properties of buildings. More specifically stochastic grey-box models, which are formulated using stochastic differential equations, will be studied in order to estimate the central parameters related to the refurbished buildings.		
Morten Hannemose	Making robots see: Fusing computer vision and robot control	The goal of this project is to enable a tighter integration of computer vision and robot control. In the manufacturing industry, there exist many tasks that are tedious to carry out, which could benefit from automation. These tasks vary in how difficult they are to automate, where the easiest ones can be solved by a robot doing exactly the same action repeatedly. However, in more complicated tasks there is a need to adapt to slight variations in how the object is placed, which means that the robot needs to be able to see the object, to know how to interact with it. This is done by adding a camera to the robot, but the computer needs to be able to understand what it sees and communicate this information to the robot. Then the robot needs to inform the computer vision system whether this information is sufficient to solve the task, or how it can obtain the sufficient information. Currently, it is very labor intensive to program the robot/camera setup to work together, and in order to make the given task solvable, the solution often exploits as much knowledge about the object as possible. This means that it can only handle a specific type of object, which only companies producing large volumes of the same item can afford. In order to make automation a possibility for smaller companies with a varied production, it is necessary to have a robot that can adapt to new tasks without requiring a complete reprogramming. I will work towards bridging the gap between computer vision and robot planning, which will enable the fields to work closer together. This integration will make fewer tweaks necessary when implementing vision for a specific robot task, which in turn will mean that more companies can afford it. This will in turn increase productivity, as workers will be free to do more mentally demanding tasks that produce more value for the company.	Smart Manufacturing	**16:34-16:37**
Astrid Engberg	New Multi-Modal Registration Methods: Application in Fetal Image Reconstruction	The aim of the project is to develop new methods for aligning medical images with a focus on fetal images. Fetal imaging is a crucial tool when studying defects in the developing fetus inside the uterus. Ultrasound is by far the most commonly used fetal imaging technique, but Magnetic Resonance Imaging (MRI) can produce more detailed images with a higher resolution. However, the uncontrollable movements of the fetus make it difficult to obtain sharp images. In order to compensate for the motion, advanced image processing techniques are applied, where a high-	Life Sciences	**16:20-16:43**

		resolution motion-free MRI scan is constructed from stacks of ultra-fast low-resolution images. This process requires fast, accurate and robust alignment of the low-resolution images because it is necessary to iteratively change between estimating the motion and recovering the motion-free image. Current alignment/registration methods are insufficient due to their long processing time and certain challenges in obtaining the parameters for the perfect alignment. In this project, I will reformulate mutual information based registration as a spatial interpolation problem. This will enable me to greatly improve the speed and the robustness of the registration, resulting in faster alignment and hence more accurate fetal image reconstructions where both linear and non-linear anatomical deformations can be accounted for. This will hopefully allow for early diagnosis of fetal abnormalities, such that potential prenatal interventions, parental counseling and urgent postnatal surgery can be planned.		
Jeppe Nørregaard	Learning to Read and Think		BigData/Data science	**16:46-16:49**
Tinna Björk Aradottir	CGM-augmented insulin pens for type 2 diabetes	In USA, 60% of patients receiving long-acting insulin treatment only, do not reach recommended treatment goals. The main reasons reported include lack of empowerment and confidence, sub-optimal dosage regimen, fear of hypoglycaemia and complexity of treatment. In the long run, the poor treatment outcomes lead to complications and socio-economic burden. Continuous Glucose Monitors (CGM) measure interstitial glucose every 5-15 minutes, compared to the traditional treatment of using self-monitored blood glucose (SMBG) measurements that provides a single glucose reading. Through frequently available measurements of glucose concentration, CGMs are able to track glycaemic variations more effectively than isolated SMBG measurements. Over the last years, many research groups around the globe have done extensive research within control algorithms for closed loop systems for type 1 diabetes (T1D). Based on the current status and activities within the field, we expect that a fully automated closed-loop system will become available for T1D patients within the next few years. The aim of the project is to utilize the emerging technologies becoming available to T2D patients to enable safe and effective dose calculations, from the perspective of both patients and health care providers (HCPs). We integrate connected insulin pens and a CGM with a mobile phone, and call the system CGM-augmented insulin pens. We develop algorithms that use CGM and insulin data to predict blood glucose	Life Sciences	**16:52-16:55**

		concentration and continuously estimate intra-individually varying physiological parameters such as insulin sensitivity, and optimise the dosage regimen based on predicted outcomes. We expect that the use of the system empowers patients to self-titrate basal insulin and, in the more severe cases of T2D, enables safe bolus calculations. Furthermore, we expect that the system provides HCPs with sufficient insight to prescribe an optimal treatment regimen.		