

# FORSKNINGSKANONEN

## PROJEKT KATALOG

### SDU 2019

## FORORD

### Henrik Bindslev

Dekan med ansvar for SDU Campus Sønderborg

5

## MADS CLAUSEN INSTITUTE

Mads Clausens institute

7

### Wulf-Toke Franke

Paving the way for next generation of Electric Vehicles

8-9

### David Grube Hansen

Er din virksomhed klar til den fjerde  
industrielle revolution?

10-11

### Till Leißner

Nanophotonics – we manipulate light at the nanoscale

12-13

### Hossein Ramezani

Cooperation of robots over network:  
Master-slave and consensus algorithms

14-15

## DET SAMFUNDSVIDENSKABELIGE FAKULTET

Det samfundsvidenskabelige fakultet

17

### Andreas Küttel

Elite Sport and Mental Health – Protective and Risk Factors

18-19

### Jaume Castan PinosSimon

Humanitarian Intervention: The problems of moral wars

20-21

## DET HUMANISTISKE FAKULTET

Det shumanistiske fakultet

23

### Kerstin Fischer, Rosalyn Langedijk & Lars C. Jensen

Robots in Elderly Care - How can we get the elderly to drink more?

24-25

### Kerstin Fischer og Maria alm

Beskedne småord gør en vigtig forskel

26-27

# FORSKNINGSKANONEN 2019 - FORORD



NY TEKST

På SDU tjener vores forskning mange formål - heriblandt, at skabe og udbrede kendskab til ny viden, at understøtte undervisningen og ikke mindst at stille vores resultater og ekspertise til rådighed for virksomheder og uddannelsesinstitutioner.

På Campus Sønderborg trives praksisnære forsknings- og udviklingsprojekter i høj grad pga. det aktive og yderst engagerede samfund og erhvervsliv i området. Den stærke sammenhængskraft mellem universitet og lokalsamfund er helt unikt og skaber nyttig ny viden på tværs af fagligheder, videninstitutioner og grænser.

Forskningskanonen giver dig et indblik i flere af de mange spændende forskningsprojekter, som vi arbejder med på Campus Sønderborg. Når du bladrer igennem folderne bliver det hurtigt tydeligt, hvordan Campus Sønderborg arbejder med praksisnær forskning til gavn for det omkringliggende samfund - lokalt, nationalt og internationalt.

Gå på opdagelse og lad dig inspirere af vores brede vifte af tværfaglige forskningsprojekter som:

- En fortælling om regional udvikling på Sønderborgegnen 1957-2010
- Automating HMLV 'High-Mix Low-Volume' Manufacturing in SMEs
- Framing Through 'Culture': Counter-narrative in organization

God fornøjelse

Henrik Bindslev  
Dekan med ansvar for SDU Campus Sønderborg



# MADS CLAUSEN INSTITUTE

Mads Clausen Instituttet

# WULF-TOKE FRANKE

Lektor Wulf-Toke Franke

CIE – Center for Industrial Electronics

Mads Clausen Institutet, Det Tekniske Fakultet SDU

<http://www.sdu.dk/ansat/franke>

## Paving the way for next generation of Electric Vehicles

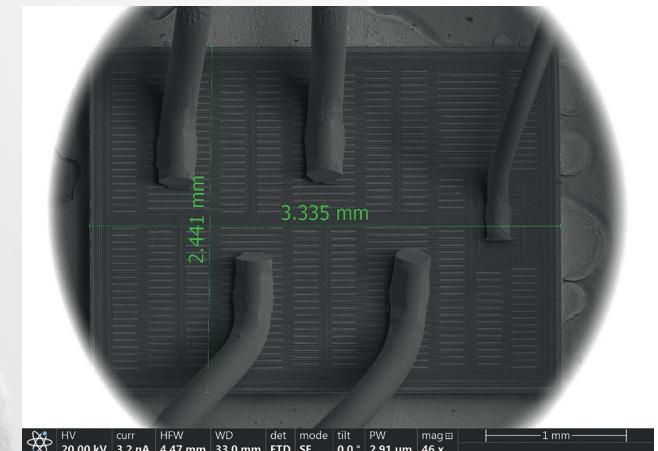
*The requirements for the next generation of electrical cars are longer range, higher reliability and reduced cost. This is about optimizing the drive train of the car.*

Have you ever asked yourself how an electrical car works? How you can change the speed without a manual transition and a battery that just provides a constant DC-voltage?

The answer is: Advanced Power Electronics, but what does it mean? Power electronics is about to transfer a given DC voltage into an AC voltage with any magnitude and frequency. And this AC voltage is exactly what is needed to turn a motor to propel a car. However, the techniques to realize such a system are not sufficient for electrical vehicles. Therefore, we are working on new electric circuit topologies to make the system more efficient, more robust, cheaper and feasible for higher speeds.

This is realized by applying new power electronic devices made of new materials as Silicon Carbide with significant better electrical performance. However, these components cannot replace the very mature silicon devices one to one. Instead new power electronic circuits are required to completely utilize the features of these new components. Further, reliability is one of the most important requirements in automotive application. Since no field experience regarding failure mechanisms of these components exists so far, no secured prediction of the life time can be made.

At the Mads Clausen Institute, we are doing research to pave the way to commercialize these outstanding Silicon Carbide devices. Therefore, we are working on device level to fully understand their behavior and limitations but also on system level for a perfect integration in modern converters for automotive and other innovative applications to save energy and to reduce our carbon footprint. All that requires also further improvement in passive components as capacitors and magnetics leading a section wide co-operation.



# DAVID GRUBE HANSEN

Ph.d.-studerende  
SDU Technology, Entrepreneurship and Innovation  
Mads Clausen Institutet, Det Tekniske Fakultet SDU  
<http://www.sdu.dk/ansat/davidgrube>

## Er din virksomhed klar til den fjerde industrielle revolution?

Digitale tvillinger, augmented reality, virtual reality og collaborative robotter! Smart Learning Factory får SMV'er med på Industri 4.0.

Vi lever i en tid, hvor nye teknologier bliver introduceret i et hurtigere og hurtigere tempo. Der er bred enighed om, at alle disse teknologier samlet set har potentialet til at forme den fjerde industrielle revolution. At holde sig opdateret på nye teknologier og automationsløsninger er generelt set en udfordring for alle virksomheder, men små og mellemstore virksomheder (SMV'er) er i særdeleshed udfordret.

Mange SMV'er har måske styr på hvad digitale tvillinger, augmented reality, virtual reality, collaborative robotter, simulering osv. er, men det er noget sværere at svare på spørgsmålet, hvad kan teknologierne gøre for jer i jeres virksomhed? I løbet af min Ph.d. på Mads Clausen Institutet i Sønderborg, har jeg udviklet et koncept, der hedder "the Smart Learning Factory". Konceptet tager udgangspunkt i et samarbejde med SMV'er, så vi kan finde ud af om og hvordan, de nye teknologier kan bruges i netop deres produktion.

Rent lavpraktisk fungerer "Smart Learning Factory" som et laboratoriemiljø, hvor jeg har installeret forskellige teknologier, inspireret af Industri 4.0-bølgen. Her kan virksomheder få føeling med teknologierne, og derfra kan vi begynde at arbejde med teknologierne for at identificere, hvor nye teknologier kan skabe størst værdi i deres virksomhed. Et gennemløb starter oftest med at besøge virksomheden for at få overblik over, hvor langt de er nået i deres brug af teknologi. Derefter mødes vi i Innovationslaboratoriet på Alsion. Her bestemmer vi, hvor fokus skal ligge – om det er på produktet, produktionen, eller organiseringen af virksomheden. Typisk præsenterer vi de forskellige teknologier, og derefter går arbejdet i gang. Ved hjælp af brainstorms, kreative værktøjer, simulering og showcases på digitale tvillinger mm., prøver vi at inspirere virksomheden til at se, om de med fordel kan implementere dem.

I min Ph.d. bruger jeg den viden og de data, jeg opsamler, til at udvikle generiske automationsløsninger, som forhåbentligt i sidste ende vil komme mange SMV'er til gavn.



# TILL LEISSNER

Lektor Till Leissner  
SDU NanoSyd

Mads Clausen Institutte, Det Tekniske Fakultet  
<http://www.sdu.dk/ansat/till>

## Nanophotonics – we manipulate light at the nanoscale

Squeezing light to nanoscale dimensions opens the prospect of optical integrated circuits, which may overcome fundamental challenges related to speed and energy dissipation in today's electronic integrated circuit technology.

For decades electronics and optics have been two different worlds for researchers and engineers. On the one hand electronic circuits can be manufactured with structure sizes down to a few nanometers, so that millions of components fit into a small chip. On the other hand, optical devices take advantage of the speed of light, but in size they are limited by diffraction to a few hundred nanometers.

Researchers around the world tackle the challenge to merge optics and electronics. Using specific nanostructures, we can now master the flow of light at length scales far below the classical limits. Light can be scattered, refracted, confined, filtered, and processed in fascinating new ways that are impossible to achieve with natural materials and in conventional geometries. This control over light at the nanoscale has not only unveiled a plethora of new phenomena but has also led to a variety of relevant applications, including new venues for integrated circuitry, optical computing, solar, and medical technologies, setting high expectations for many novel discoveries in the years to come.

At SDU NanoSYD we are part of this development. In particular we put emphasize on new fabrication methods that allow to design tiny structures that can focus and guide the light. We are using a so-called Helium ion microscope that is unique in Scandinavia. This microscope allows us to nanostructure the surface of metals and semiconductors by a defined bombardement with Helium, Neon and Gallium ions. Furthermore, we combine these nanostructures with organic thin films and nanofibers in order to enhance effects potentially relevant for sensing applications and for advancing organic energy devices, such as solar cells. In addition to this we have several techniques to characterize the propagation of light at the nanometer scale.

In my talk I will introduce this fascinating field and our local contribution to this research area.

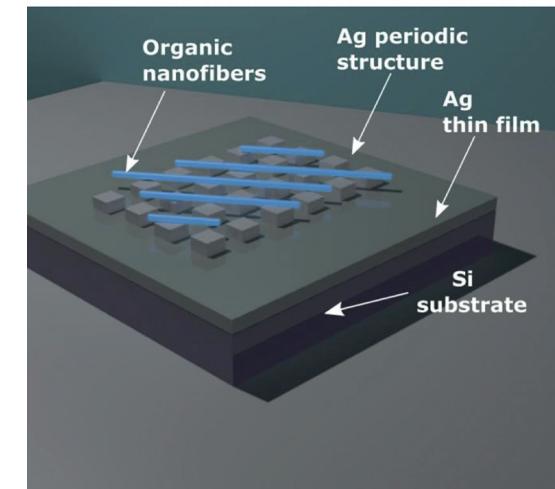
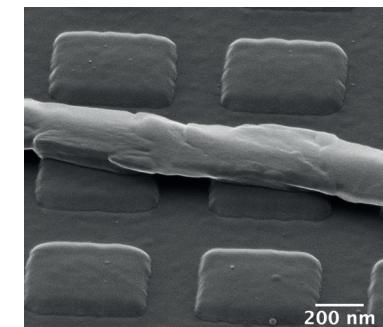


Figure 1. 3D model of organic nanofibers transferred to an array of nanostructures (left). Single fiber imaged with Helium ion microscopy (right)



# HOSSEIN RAMEZANI

Adjunkt Hossein Ramezani

SDU Mekatronik

Mads Clausen Instituttet,

Det Tekniske Fakultet SDU

<http://www.sdu.dk/ansat/ramezani>

## Cooperation of robots over network: Master-slave and consensus algorithms

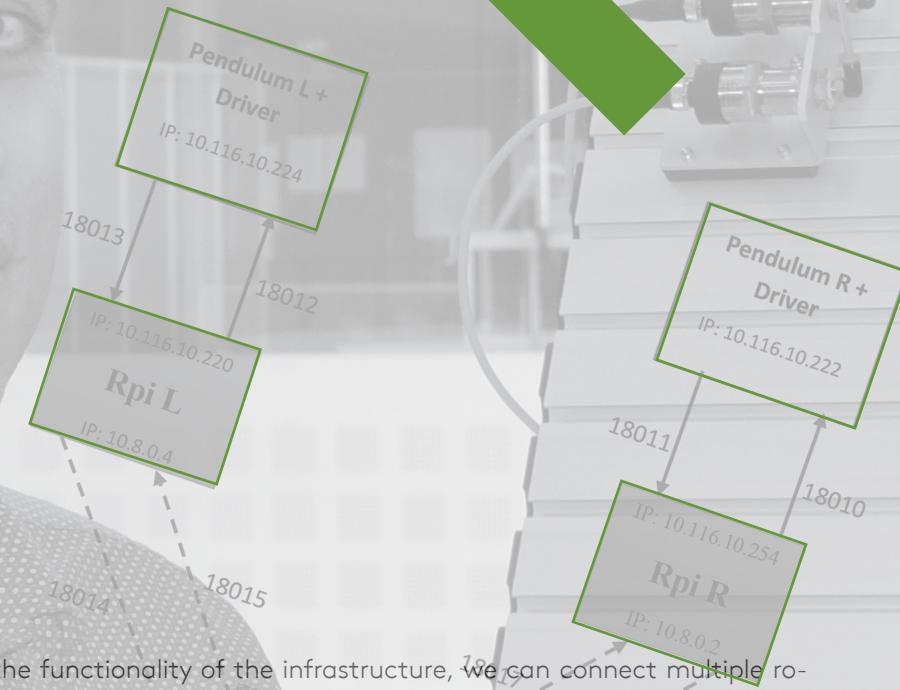
Controlling robots over the internet is an interesting and challenging problem, as it can be affected by many factors such as delay and reliability of the network.

Typically, controlling a robot means that the robot should follow a desired trajectory. Generating the desired trajectory and designing a controller to make the robot follow that trajectory are the main phases of controlling a robot. Traditionally, the control unit is a local unit in which the controller is implemented on an embedded board attached to the robot or on a computer connected to the robot by cables. However, in a networked control system, some parts of the control unit are not local. It could be either the controller or the trajectory, which are generated in another location, and the command is sent to the robot over network.

An intuitive example for that is the haptic robot with two parts, master and slave, where the slave part is in contact with the patient and the master part is being moved by a surgeon. The surgeon has visual and haptic feedbacks from the patient through the camera and sensors connected to the slave robot and can move the master robot manually. The slave robot should follow the master one precisely and with a minimum delay to have a successful operation. Another example for the networked control system could be when a customer reports a fault in a product to the company, the company can take the control of its faulty product over internet and test the product to find the location of fault.

In the Cyber Physical Lab of the section SDU Mechatronics in Sønderborg, we have developed a distributed networked control system where all nodes are raspberry pi boards, which communicate to each other and to the server over the internet. All code generation is done in Matlab/Simulink and then deployed to the boards over internet.

Emnegrafik Hossein Ramezani



To prove the functionality of the infrastructure, we can connect multiple robots to the network and make them cooperate. To do that each robot can be connected to a Raspberry pi (Rpi) board where the Rpi can control the robot locally or it can receive the control signal from other nodes in the network. There is also a computer in the network for the purpose of code generation and monitoring. Using this setup one can test master/slave structure, consensus algorithm, the effect of delay and other situations that can happen in a real industrial distributed control system. For instance, at the moment we are using this infra-structure to implement a lab-version of a distributed power system in which the issues that can happen in the network part of a smart grid can be imulated and truly studied.

# DET SAMFUNDS- VIDENSKABELIGE FAKULTET

Institut for Entreprenørskab og Relationsledelse

# ANDREAS KÜTTEL

Studieadjunkt Andreas Küttel

Learning & Talent in Sport

Institut for Idræt og Biomekanik,

Det Samfundsvidenskabelige Fakultet/

Det Sundhedsvidenskabelige Fakultet SDU

<http://www.sdu.dk/ansat/akuttel>

## Elite Sport and Mental Health – Protective and Risk Factors-

Mental health as a core component of any culture of excellence – what is the role of the sporting environment?

Elite athletes need to deal with heavy training loads and various performance demands that present potential threats to their mental health. Just as physical training must be balanced with adequate recovery to see progress, so too, psychological demands must be balanced with strategies to support mental health. Our systematic review of studies related to athletes' mental health revealed that researches have mainly investigated on risk factor related to mental ill-health such as anxiety and depression (see Figure 1; Kuettel & Larsen, 2019). In understanding mental health on a continuum from languishing to flourishing (Keyes, 2002), it was our focus not only to look at risk factors but also at protective factors potentially fostering athletes' mental health.

We are currently conducting a survey with Danish elite athletes from 17 different sports. Preliminary results indicate that the general stress level from sport, education and the private sphere negatively influences athletes' well-being and adds to depressive and anxiety symptoms. On the other hand, social support from both the private and sports environment fosters mental health and can reduce depressive symptoms. Furthermore, a positive sporting environment where athletes can contribute as role models, have an influence on their training schedules, where they can learn through making mistakes, and where they feel accepted by teammates and coaches contributes to their mental well-being. Comparison between type of sports also shows that depressive symptoms occur more often in certain disciplines (e.g., swimming, basketball, rowing) than in others (e.g., tennis, triathlon, soccer) where athletes also report higher mental well-being.

Sporting organizations, practitioners, and researchers should pay due attention to athletes' mental health in their efforts to promote athletic performance. In the future, researchers should investigate the features of sporting environments that nourish or malnourish athletes' mental health with the aim to inform federations, clubs, and talent academies.

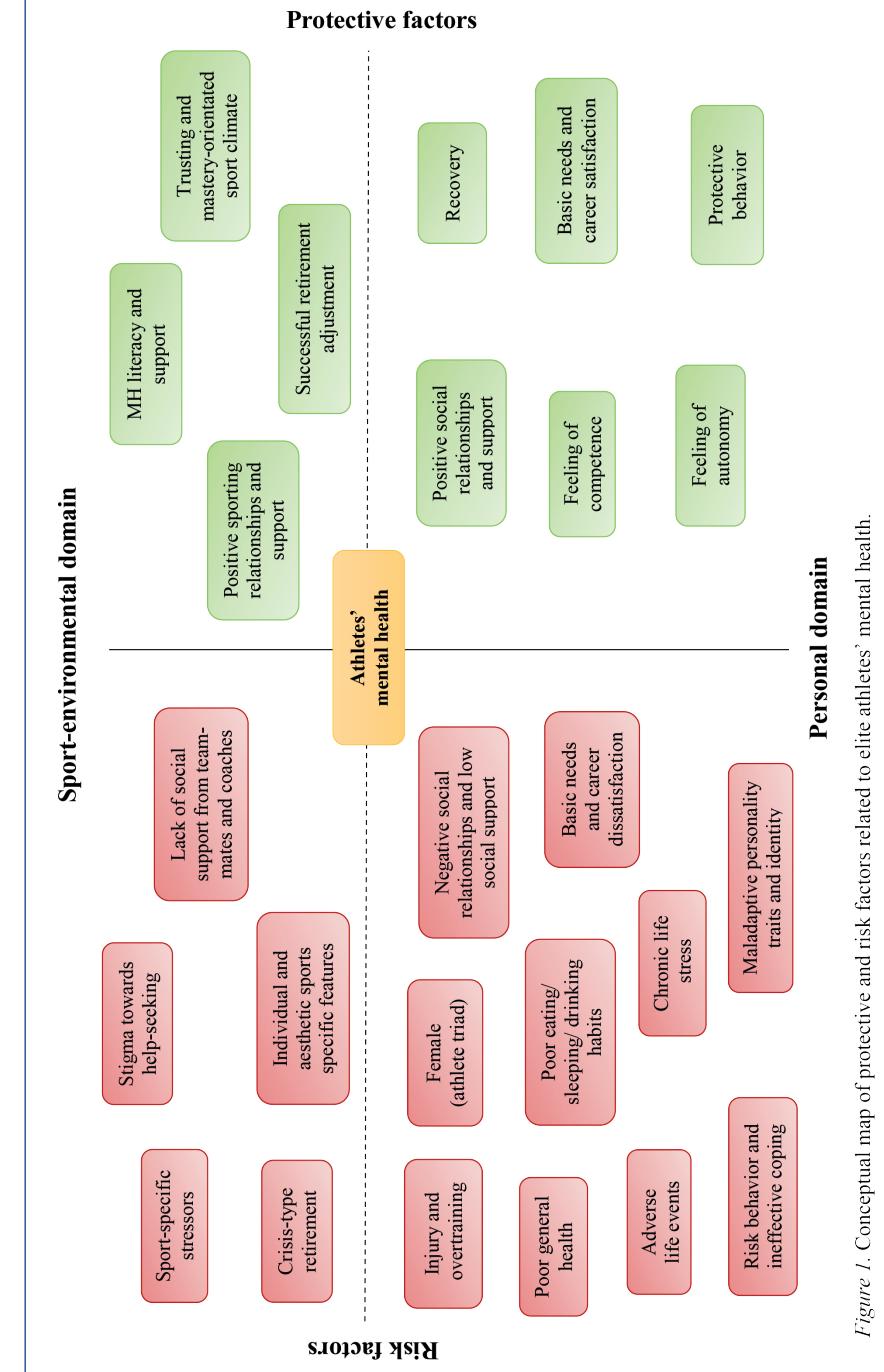


Figure 1. Conceptual map of protective and risk factors related to elite athletes' mental health.

# JAUME CASTAN PINOSSIMON

sdu.dk/ansat/sug  
sdu.dk/ansat/simontf

Social Entrepreneurship and Participation: First insights from the  
Interreg-project Benefit4Regions (B4R)

## Humanitarian Intervention: The problems of moral wars

Is it legitimate to wage a war on moral grounds? Do moral wars even exist? Even if they do exist, can moral wars generate secondary (collateral) effects, which may make the remedy worse than the disease?

Those questions motivated – and troubled me – so much that I decided to write a book about it. I decided to focus on a case, which had been used as the epitome of the moral war: NATO's intervention in Kosovo (March–June 1999). A case, which by the way, has been largely forgotten as a result of more recent conflicts in the Middle East and elsewhere. I realised that most articles and books written about Humanitarian Intervention –or Responsibility to Protect (R2P) –discussed the legitimacy and desirability of such intervention, but little was said about what happens next. So, I decided to investigate the consequences of so-called moral wars myself conducting several trips to Kosovo and interviewing a wide range of individuals including high rank officials from the international community (UN, EU, OSCE and others), diplomats, spies, local politicians, members of the civil society and victims of the war.

In my book, which does not shy away from controversy, I argue that the 1999 intervention has had significant consequences for Kosovo in terms of political transformations, territorial alterations and arguably war crimes, none of which was officially intended or foreseen when NATO intervened. Two decades after NATO's intervention and a decade after unilaterally declaring independence, Kosovo continues to be confronted with daunting existential challenges that inevitably affect the stability of the region, border relations, and the credibility of the organisations operating within Kosovo, namely the UN, the EU and NATO. The book claims that not only is the political and territorial conflict far from being settled, but that the implications have gone beyond Kosovo, creating shock waves, which have galvanised conflicts elsewhere. In effect, Kosovo has been used as a pretext, as a legitimisation and as an inspiration for those who aspire to challenge the border status quo and by those who want to wage wars based on moral grounds.





# DET HUMANISTISKE- FAKULTET

Institut for Design og Kommunikation

# KERSTIN FISCHER, ROSALYN LANGEDIJK & LARS C. JENSEN

Ph.d.-studerende Rosalyn Langedijk  
<http://www.sdu.dk/ansat/rla>

Professor MSO Kerstin Fischer  
<http://www.sdu.dk/ansat/kerstin>

Videnskabelig assistent Lars C. Jensen  
<http://www.sdu.dk/ansat/larscj>

## Robots in Elderly Care - How can we get the elderly to drink more?

When we get older, we lose our sense of thirst so that we may literally forget to drink enough. Dehydration, however, has considerable negative effects on a person's physical and even mental health; for instance, even slight dehydration can lead to headaches and depression. So how can we get people, and especially the elderly, to drink more?

In the Smooth project, we are working towards a robot that offers drinks to the residents in elderly care facilities. After observing how things are handled in elderly care facilities today, we started working with the Living Lab in Sønderborg and to experiment with different ways in which a robot can encourage people to drink water.

In our experiments, we made a simple robot prototype 'Caspar' (based on an iRobot) guide participants through the lab (either our HRI Lab or the Living Lab) and collect all they need to set up the table for a nice snack (see picture). In the first experiment, when it instructed participants to pick up a glass, it informed them about the health benefits of drinking enough water in one sentence. The second sentence was then in the focus of our tests: In one set of experiments, we had the robot say: "Most participants drank half a liter after the experiment," in the other, the robot said: "Most female/male participants drank half a liter after the experiment," depending on whether the participant was male or female. Psychologists call this strategy social proof. It turned out that people drank significantly more water after the experiment if they heard the sentence, which was tailored based on their gender, compared to the baseline condition.

In another experiment, we studied the effects of bringing in scientific expertise. For one group of participants, the robot said: "You as expert know how important it is to drink enough," whereas for the other group, the robot said: "Research has shown how important it is to drink enough." The results show that both groups drank more water than the baseline group, but that the group who was talked to as experts (they all worked in elderly care in some function) drank the most.

In future experiments, we will continue to gather effective strategies that the robot developed in Smooth can use to make residents in elderly care facilities drink enough water.



# KERSTIN FISCHER MARIA ALM

PhD Maria Alm

<http://www.sdu.dk/ansat/kerstin>

Professor MSO Kerstin Fischer

<http://www.sdu.dk/ansat/kerstin>

Institut for Design og Kommunikation  
Det Humanistiske Fakultet SDU

## Beskedne småord gør en vigtig forskel

Sprogforskere i Sønderborg gør det nemmere at undervise i sproglige fænomener, der er vanskelige at forklare.

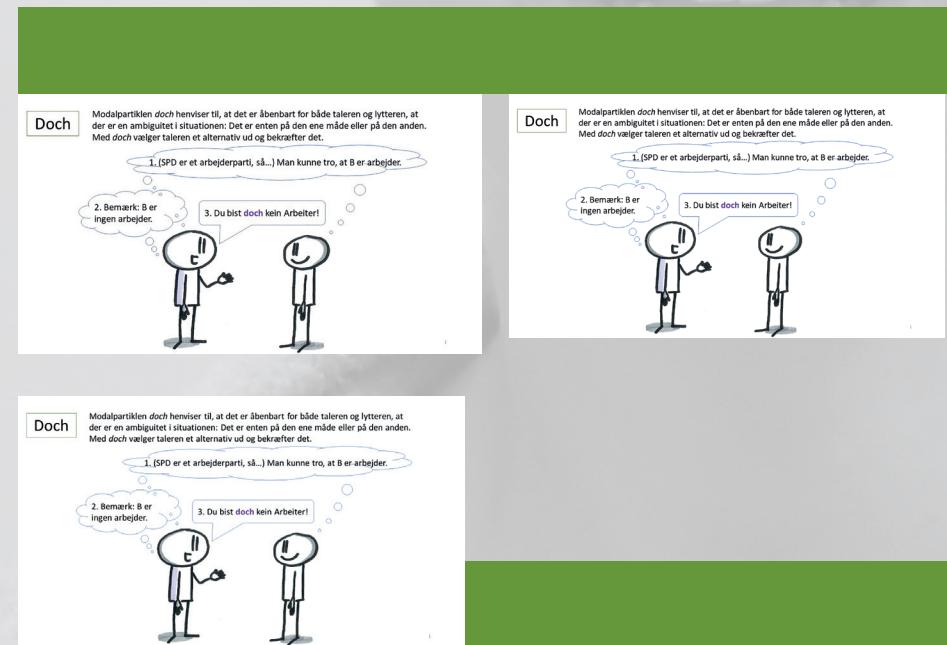
I mange germanske sprog findes der en gruppe småord, der har stor effekt på fortolkningen af en ytring. Modersmålstalende bruger dem automatisk og reagerer instinktivt på deres budskab. Men de ved egentlig ikke, hvad de betyder, eller hvordan man bruger dem i det store hele.

I tysk sprogskrivelse bliver disse småord kaldt for modalpartikler. I den autentiske ytring nedenfor er de markeret med lilla, fed skrift:

Aber du bist **doch** kein Arbeiter, du bist **doch** Akademiker. Warum bist du **denn** für die SPD?  
Men du er **X** ingen arbejder,      du er **X** akademiker.      Hvorfor er du **X** tilhængere af SPD?

## Sproglige fænomener, der er vanskelige at forklare

Lige sådanne sproglige fænomener, der er svære at forklare, og som ikke rigtigt har fundet deres plads i traditionelle undervisningsmaterialer, undersøger vi i et projekt om forbedring af andetsprogsundervisning på Syddansk Universitet i Sønderborg. Modalpartiklerne er ekstra forvirrende, fordi man tilsyneladende kan udelade dem, uden at der går konkret information tabt. Derfor tror nogle, at modalpartiklerne faktisk ikke betyder noget, men at man kun smider dem ind i sin tale for at vinde betenkningstid. Men det stemmer ikke: Disse småord nuancerer ytringen og giver lytteren signaler om fortolkningen. Modalpartikler er meget frekvente i talesprog, på alle stilniveauer, så det er vigtigt at forstå og bruge dem korrekt. Men der er sjældent tid til dem i undervisningen, og indtil nu har der desuden manglet en god og tydelig forklaringsmodel, så lærerne har heller ikke vidst, hvordan de skulle forklare dem. Lingvistisk forskning viser vejen



På grundlag af tidligere forskning, den konkrete forklaringstilgang inden for kognitiv lingvistik og samtalsanalytiske og korpuslingvistiske metoder har vi i vores projekt udarbejdet et undervisningsmateriale for modalpartikler, der forklarer, hvordan modalpartiklerne fungerer, både som gruppe og som individuelle partikler inden for denne gruppe. Her er en beskrivelse af den tyske modalpartikel doch:







**SDU** 