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AIML@LU Kick-off WS

29 MAY 2018

AIML@LU

- Already a lot of activity within AI an ML
  - Historically
  - at Lund University
  - within industry and society in the region.
  - As will be shown today
- What can a network help with?
  - Stronger network (for new **courses**, **research**, innovations)
  - Communication
  - …
- How should we **develop the network**?

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Agenda AM

10:15-12:00 **Introduction to AIML@LU, Round Table Presentations**

- **Introduction** – Sylvia Schwaag Serger, Kalle Åström
- **WASP** – Karl-Erik Årzén
- **LUCE** – Susanne Norrman
- **Centre for Mathematical Sciences** – Kalle Åström
- **Computer Science** – Jacek Malec
- **Automatic Control** – Bo Bernhardsson
- **Astronomy and Theoretical Physics**, – Mattias Ohlsson
- **Philosophy** – Christian Balkenius
- **Medicine** - Einar Heiberg
- **AI: On Fairness and Accountability** – Stefan Larsson
- **Social Sciences** – Maria Hedlund

»

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Agenda PM

12:00-13:15 **Lunch sandwich in the foyer**

13:15-14:00 **Group discussions with the following themes (so far):**

- **Undergraduate education** (Mattias Ohlsson)
- **Commissioned education** (LUCE Susanne Norrman/Anders Dackehed)
- **Social Sciences, humanities and AI** (Robert Willim)
- **Development of the AIML network** (Jonas Wisbrant)
- **Machine learning for real-time analysis and decision making** (Caterina Doglioni)

Other sugestions for themes?

14:15-15:00 **Wrap-up – presentations from group discussions**

15.00 and onwards **Coffee and continued discussions in the foyer**

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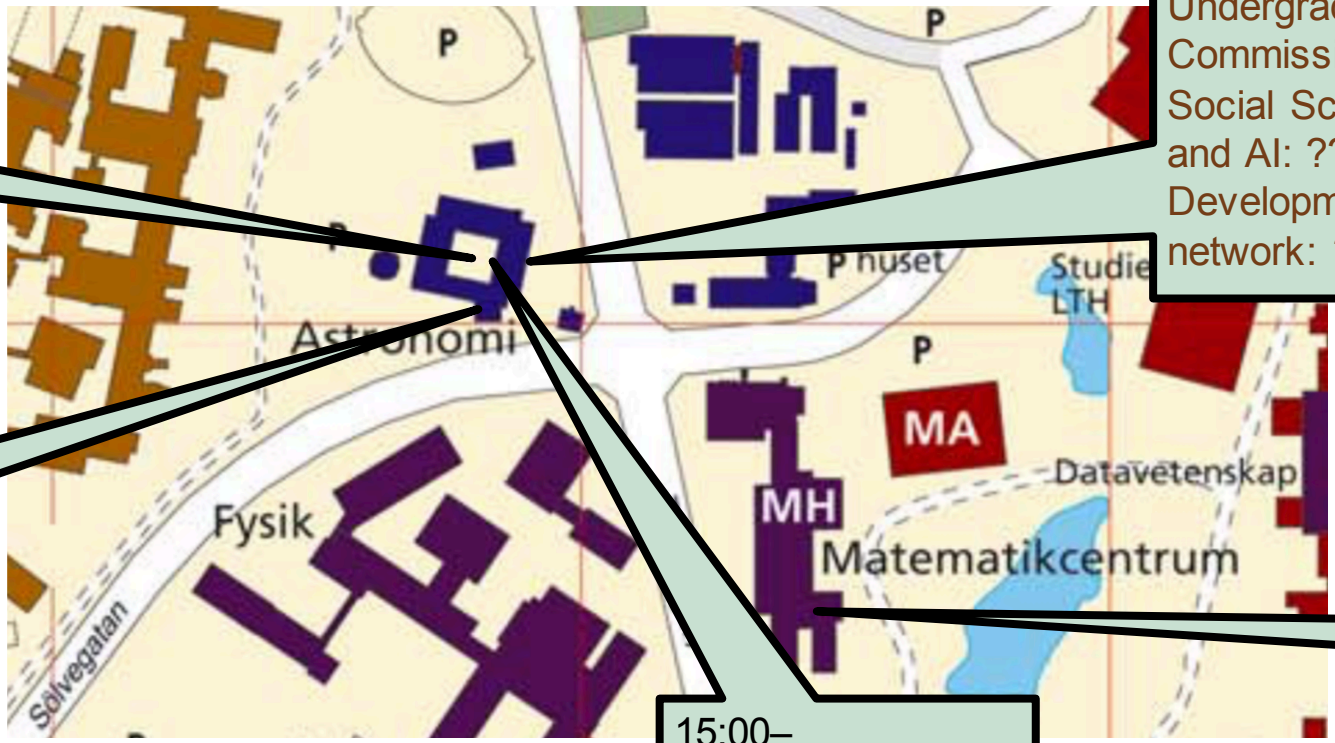
AIML@LU WS 29 May in space and time

13.15–14.00
Undergraduate education: ???
Commissioned education: ???
Social Sciences, humanities and AI: ???
Development of the AIML network: ???

12:00–13:00
Lunch



14:15–15:00
Wrap-up

Morning session

15:00–
Afternoon coffe and mingle

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Preliminary upcoming AIML Events

26 september
10 – 15

AIML WS:
Academia-society collaboration:
- **Research?**
- **Education?**
- **Innovation?**
- **Master Thesis?**

22 november
10 – 15

AIML WS:
Inventory of sustainable AI – ethical, social, legal

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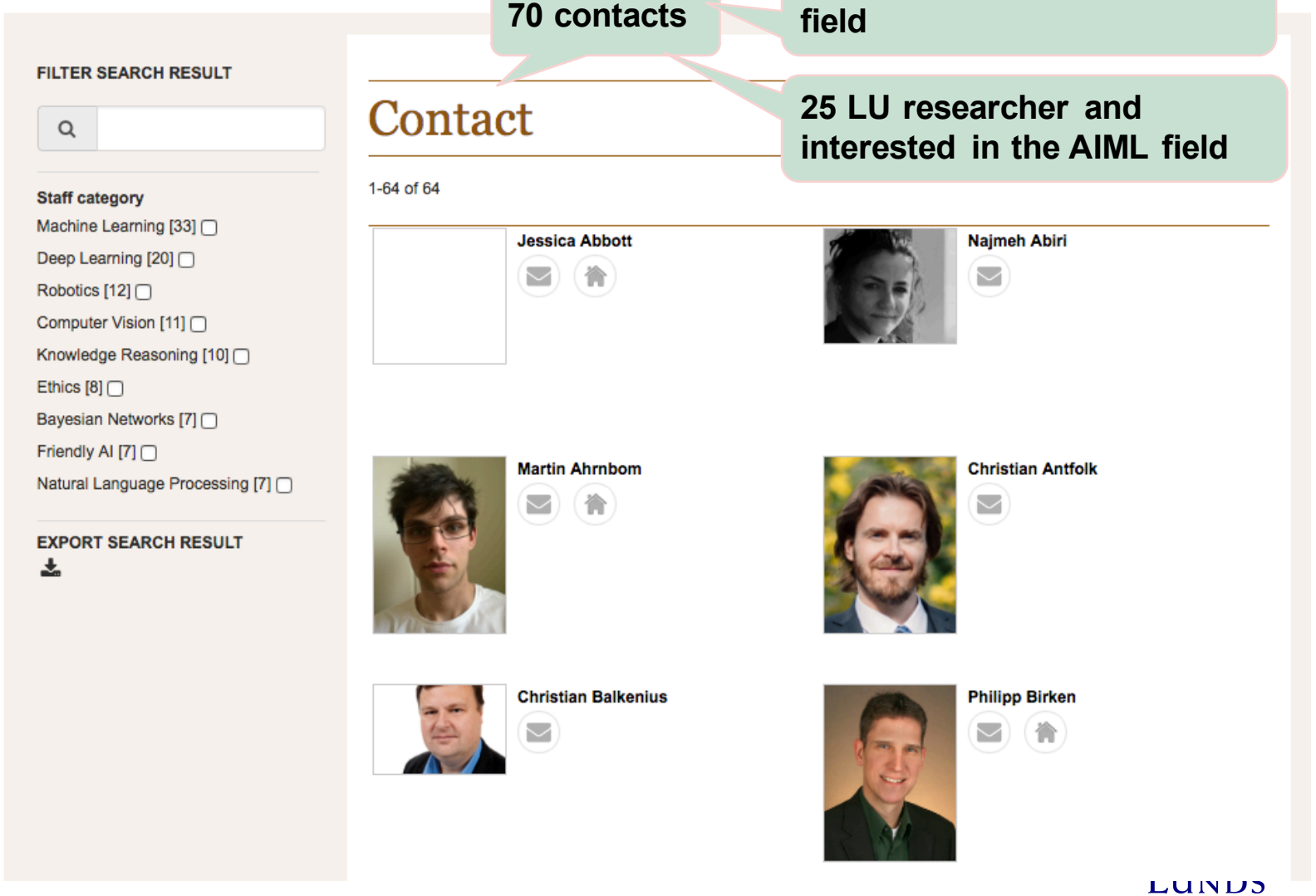
A webbsite

- People
- Courses and education

Send more courses!

- Overview and links to research groups

Contribute!



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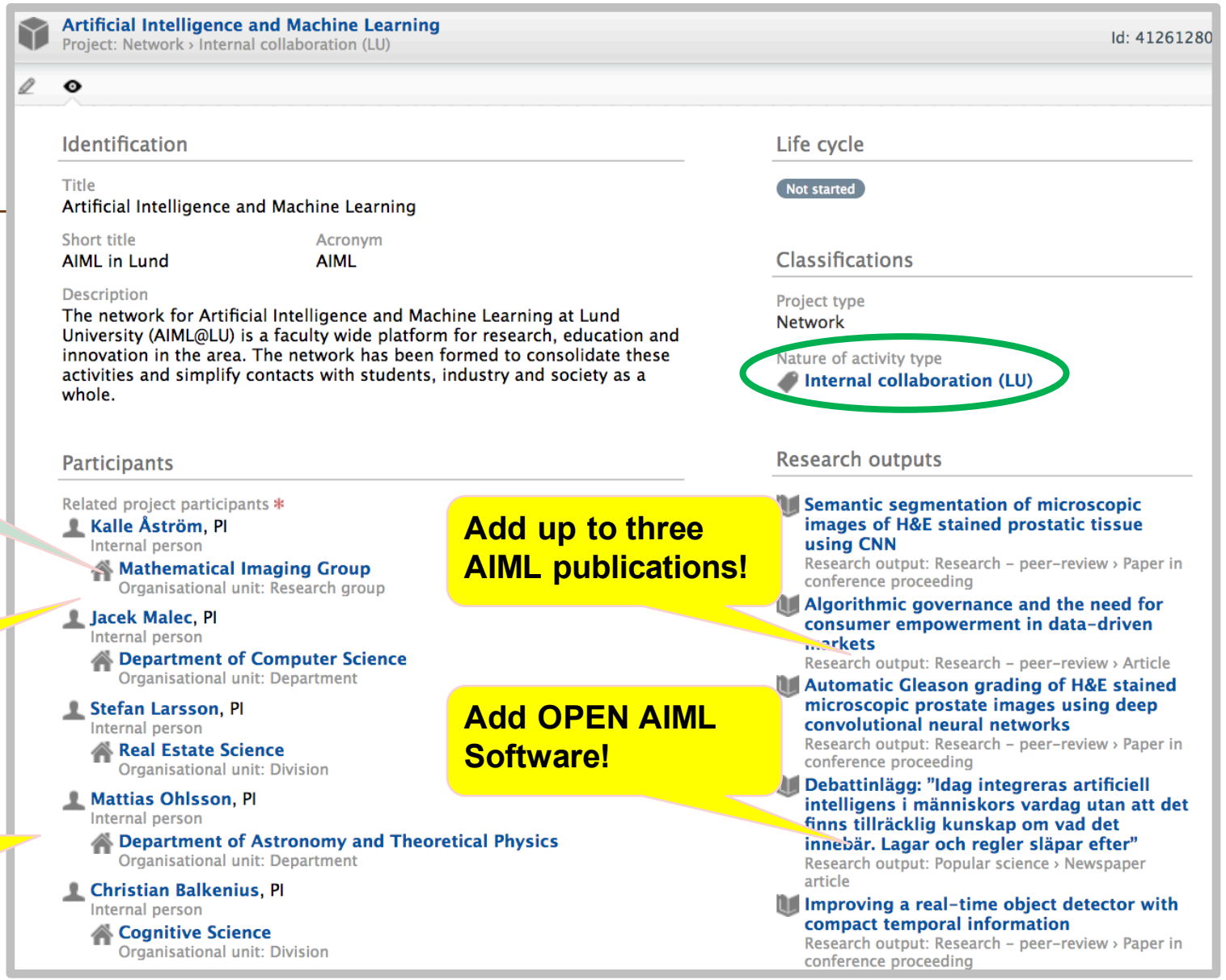
LUCRIS entity



5 participants

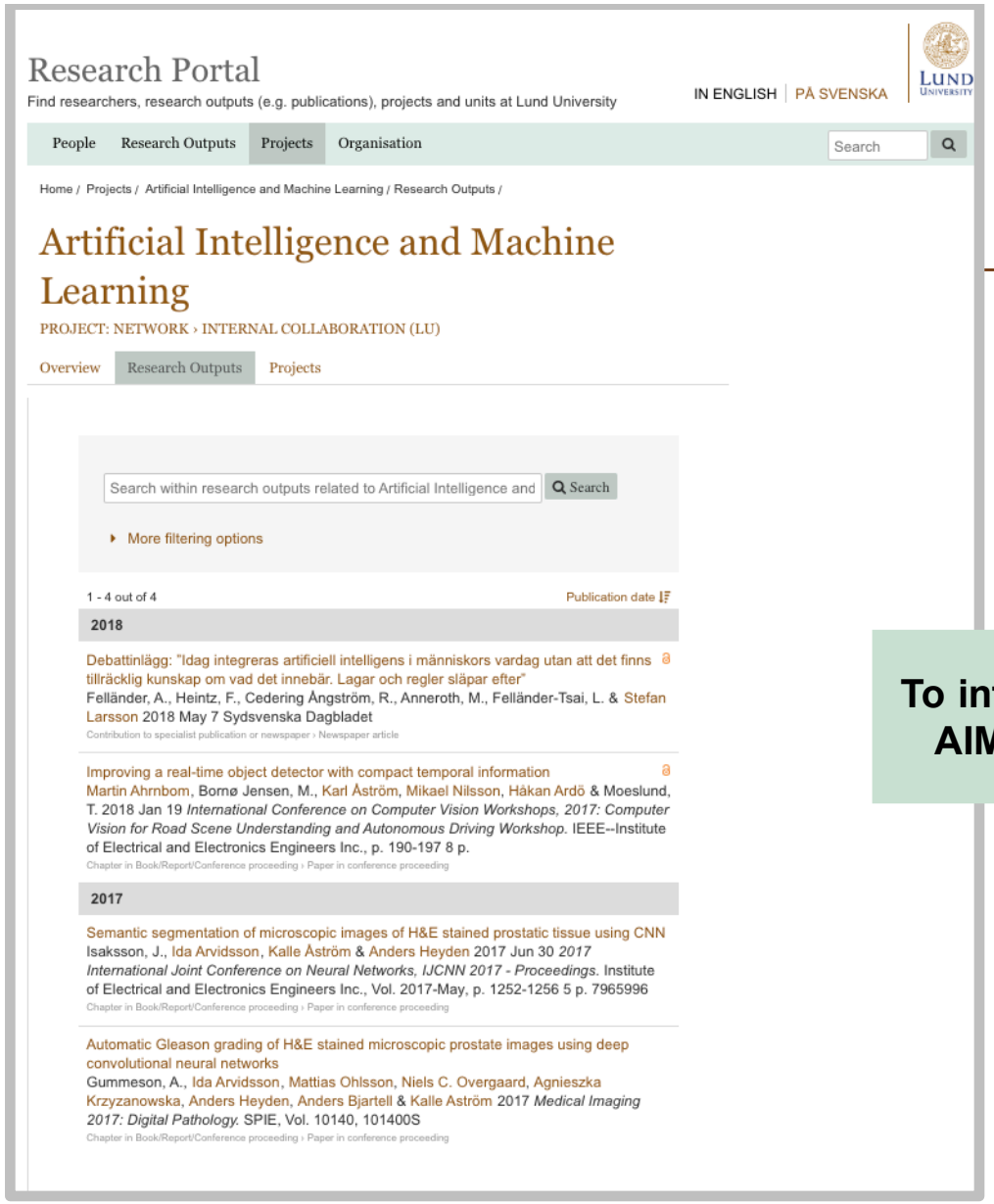
Affiliate yourself!

Affiliate ALL AIML research projects!

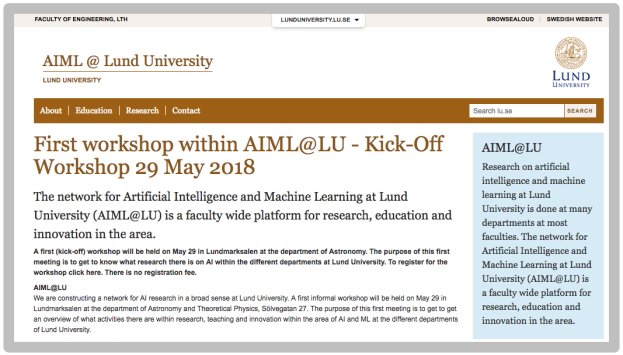
Add up to three AIML publications!

Add OPEN AIML Software!

Portal entity



To integrate to AIML webb



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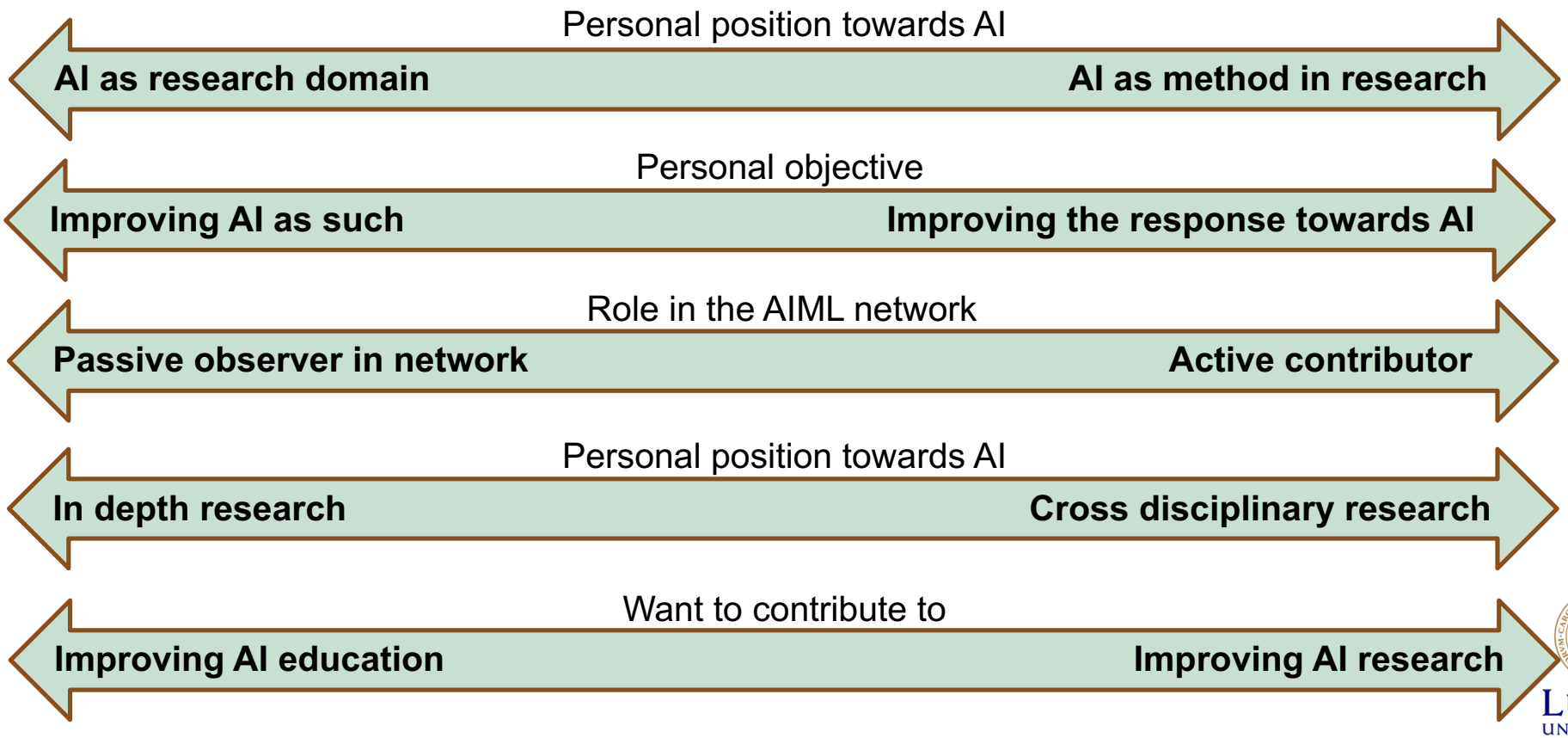
Expectation management
Who am I in the us-network?

Consider your position



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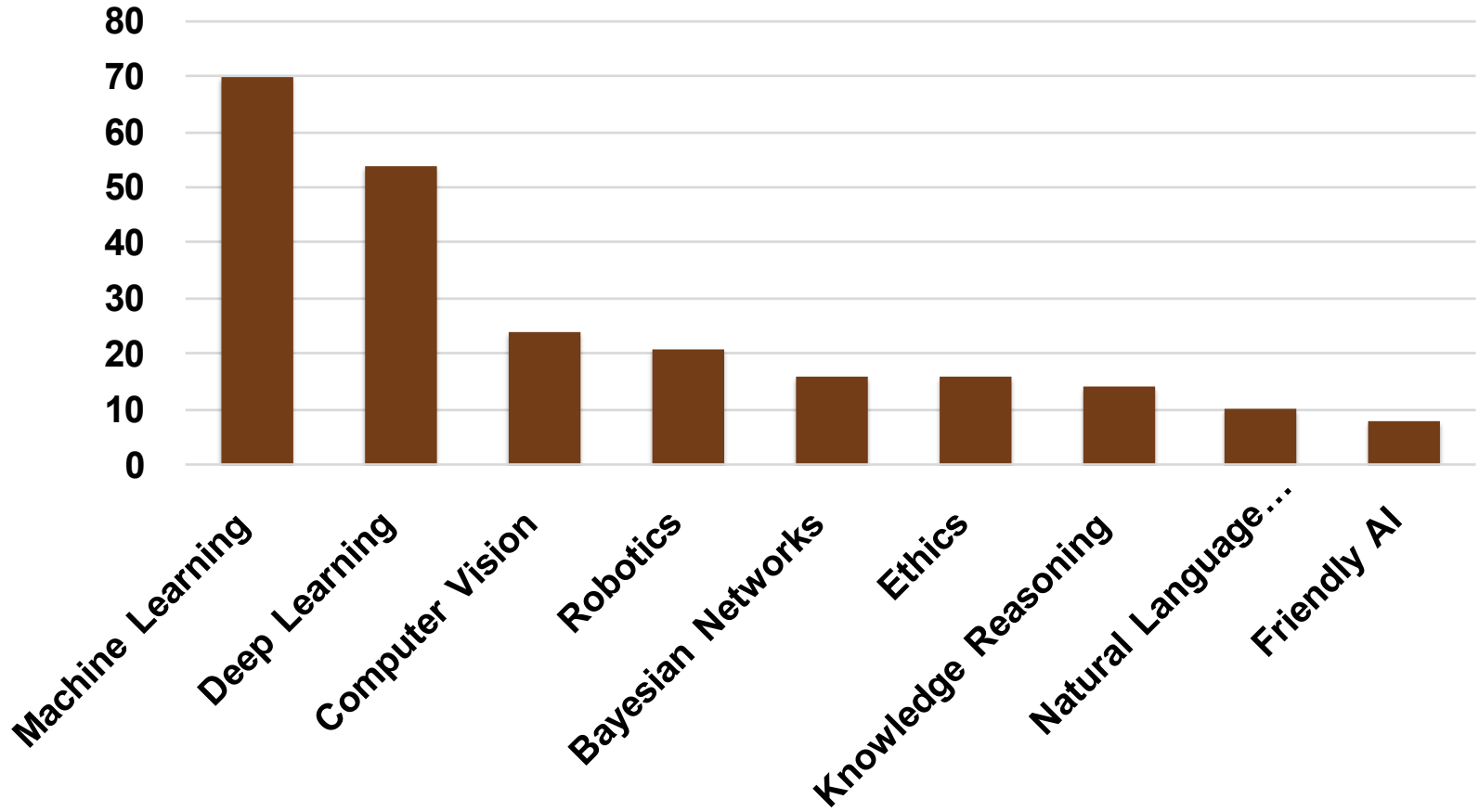
Our interest in AIML?



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Our interest in AIML – free text A-F

AI as a part of clinical work flow, diagnostic image evaluation

AI for Software Engineering

AI in society

AIML in signal processing

AIML in wireless communication

AIML medical applications

Application of Control to Computer-related problems

Applications in life sciences

Applications of AIML to software engineering

Apply machine learning to classify remotely sensed image data from satellite or aircraft

Applying learning techniques to crypto and security.

Bayesian decision theory

Biological neuronal networks

CNN

Cognitive architectures

Constraint Programming

Control theory,

Cultural analysis of machine vision

Differential equations

EEG and fMRI data analysis; Cognitive neuroscience of memory; Brain–computer interface

Efficient implementation

Feature extraction

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Our interest in AIML – free text H-Z

Hardware/material science related to AI

How to use a PowerAI box (AC922)

Human-Robot Interaction

Human-Robot Interaction

Image change detection

Image reconstruction

Image time series analysis,

Knowledge-Based Systems

LSTM

Machine learning to enable real-time decision making

Medical imaging

Methods for medical (genetic) variation interpretation

Modelling

Neuroimaging (e.g. MRI, PET)

Neuromorphic computing

Optimization algorithms for ML.

Perceptions an social shaping of AI

Quantum Information

Reinforcement learning

Requirements engineering and user aspects for AI applications

Researching social, cultural and philosophical aspects of AIML

Semantics

Social science input in AI research

Software Engineering for AI and vice versa

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Two moderated mailinglists

aiml-**intern**@listserver.lu.se — **114 subscribers**

aiml-**public**@listserver.lu.se — **9 subscribers**

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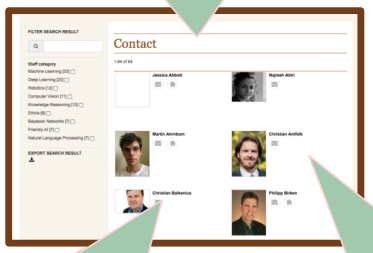
Contribute to the AIML network

Send more courses!

WEB

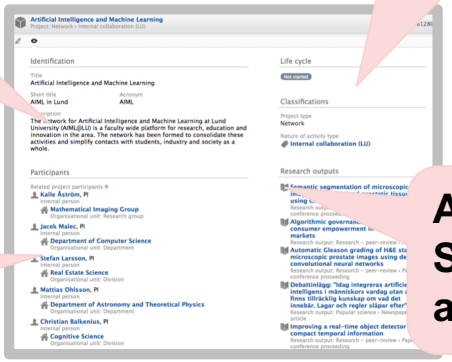


Research descriptions!

Calendar events and news!

Affiliate AIML research projects!

Affiliate yourself!



Add up to three AIML publications!

LUCRIS

Add open AIML Software and applications!

Tutorials for appliers

Need meets providers

Recommend people to participate:
- Events
- Send list
- Web page

Participate in events and workshops

Invite to events and workshops

Create events and workshops

Share knowledge

Invite to guest lectures

Co-design research projects proposals

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Karl-Erik Årzén

Wallenberg Autonomous Systems and Software Program

2017, November 14:

1000 MSEK more for AI from KAW (plus in-kind from universities and industry)

2018, March:

295 MSEK more from KAW until 2026 with 150 MSEK for AI (plus in-kind from universities and industry)

Total budget now 3.5 billion SEK (with 2.6 billion from KAW)

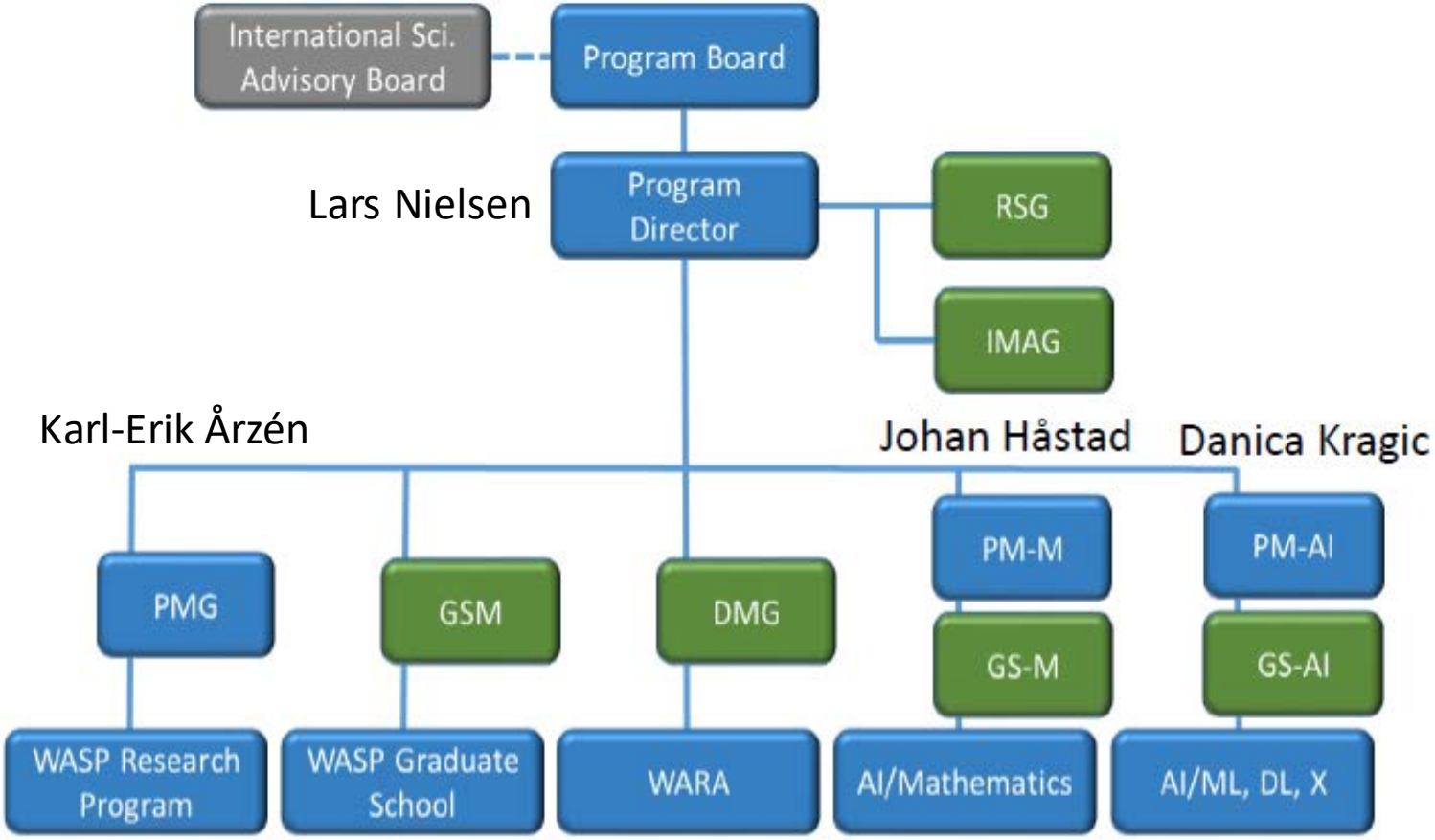
AI initiative

Two main focuses

- AI/ML,DL,X
  - ML: Machine Learning, DL: Deep Learning
  - X: X for other AI and for eXplainable AI (XAI)
  - Led by Danica Kragic

- AI/Mathematics
  - Theoretical basic questions of AI in the broadest sense
  - Led by Johan Håstad

WASP Organization



AI initiative - components

5 Wallenberg Professors in AI	Total 100 MSEK.
14 recruitment packages a 15 MSEK within AI/ML,DL,X.	Total 210 MSEK.
14 recruitment packages a 10 MSEK in AI/Mathematics.	Total 140 MSEK.
40 PhD students in AI/ML,DL,X.	Total 160 MSEK.
40 PhD students in AI/Mathematics.	Total 140 MSEK.
20 Industrial PhD students in WASP's current model.	Total 48 MSEK.
Reinforcement of calculation infrastructure.	Total 70 MSEK.
A career program 2021-2026.	Total 70 MSEK.
Overall collaboration.	Total 25 MSEK.
At the disposal of the Board 2023-2026.	Total 60 MSEK.
Operations, guests, management, and coordination.	Total 77 MSEK.
Post doc program	Total 50 MSEK.
WASP-AI (funding from KAW)	Total 1150 MSEK.

Current Calls

WASP-AI/MATH Recruitments

- Assistant Professor packages
- 6 out of 12 proposals granted in first round
- One to Lund – "*Numerical Optimization for Large-scale Machine Learning*"

WASP-AI/MATH University PhDs

- 18 proposals out of 84 selected to be advertised
- Two from Lund:
  - Carl Olsson, Mathematics
  - Tatyana Turova, Mathematics
- 15 out of the 18 will receive funding

Current Calls

WASP-AI Industry PhDs

- 59 proposals received
  - KTH – 26
  - Linköping – 12
  - Lund - 10 – (Sony*2, Saab, Mapillary, Arm, Acconear, Combitech, Dirax, nok9, ProgenicsPlasma)
  - Chalmers – 6
  - Umeå – 2
  - Uppsala and Örebro – 1 each
- 15 will be accepted in the first round

Current Calls

WASP-AI/MLX University PhD Projects

- Collaboration projects
- Machine Learning
- Two-three PIs and 2-6 PhDs
- Deadline first round: June 3

WASP-AS Expeditions

- Covers the entire WASP
- Two PIs and 2-4 Postdocs
- Deadline first round. August 10

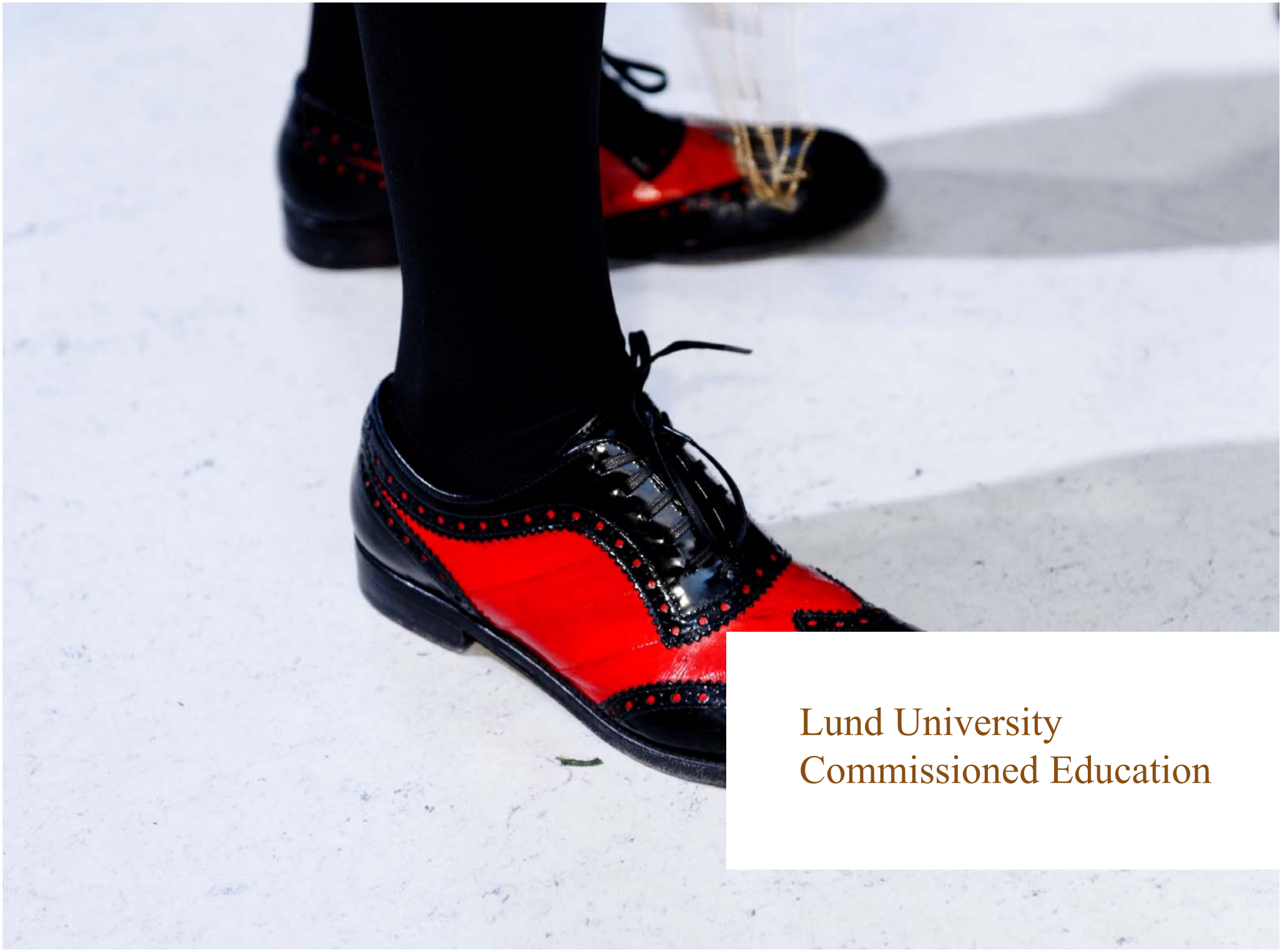
Current Calls

WASP-AI/MLX Recruitments

- Seven in the first round
- Expression of Interest
- So far 12 received out of which one wants to go to Lund
  - Very few are interesting or eligible for funding
- Absolutely necessary that you search actively

WASP Wallenberg Chairs in AI

- Five full professor
- Bertil Andersson (formerly with NTU) hired as recruiter
- Will be very difficult to find



Lund University
Commissioned Education

Uppdragsutbildning – ett strategiskt verktyg

- en viktig, men idag underutnyttjad, kanal för att föra ut både generell kunskap och de senaste forskningsresultaten och därmed bidra till samhällsutvecklingen
- ska **fånga upp** omvärldens behov samt erfarenheter och föra tillbaka både undervisning och forskning, vilket bidrar till universitetets kvalitetsutveckling.
- är en **mötesplats** för forskare och kursdeltagare för utbyte av erfarenheter
- öppnar för annan **samverkan** samt forskningssamarbeten
- ett sätt att bidra till internationalisering
- mer flexibelt och anpassningsbart till omvärldens behov

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Nyckeltal

130 kurser
och program

3100 deltagare

40 % internationella
deltagare

80/20
Nationella/Internationella
kunder

Ca 80 milj
omsättning

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Stöd från LUCE

- *Avtal och fakturering*

I samarbete med institutionerna:

- Marknadsföring och uppsökande försäljning
- Rådgivning och konceptutveckling
- Stöd kring e-lärande
- Projektledning
- Deltagarhantering och utbildningsadministration
- Kvalitetssäkring

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Våra områden

Ledarskap, Organisation
& Arbetsmiljö

Digitalisering

Teknik, Material
& Design

Hållbar utveckling
& Samhällsplanering

Social hållbarhet, Juridik
& Samhällsutveckling

Medicin & Hälsa

Lärande &
Pedagogisk utveckling

Innovation &
Entreprenörskap

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Utmaningar för universiteten

- **tydligare utbud** för livslångt lärande
- göra utbudet **tillgängligt** och **flexibelt**.
- vara med och skapa **möjligheter för dialog** för att få intressenternas input till vilka utbildningar som behövs

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Arbetsmarknaden – vilka behov finns?

Arbetsmarknadens behov och förändring

- Ökad andel högutbildade
- Snabb teknikutveckling
- Krav på ökad innovationsförmåga och stärkt konkurrenskraft
- Spritt behov
- Långt arbetsliv
- Matchning

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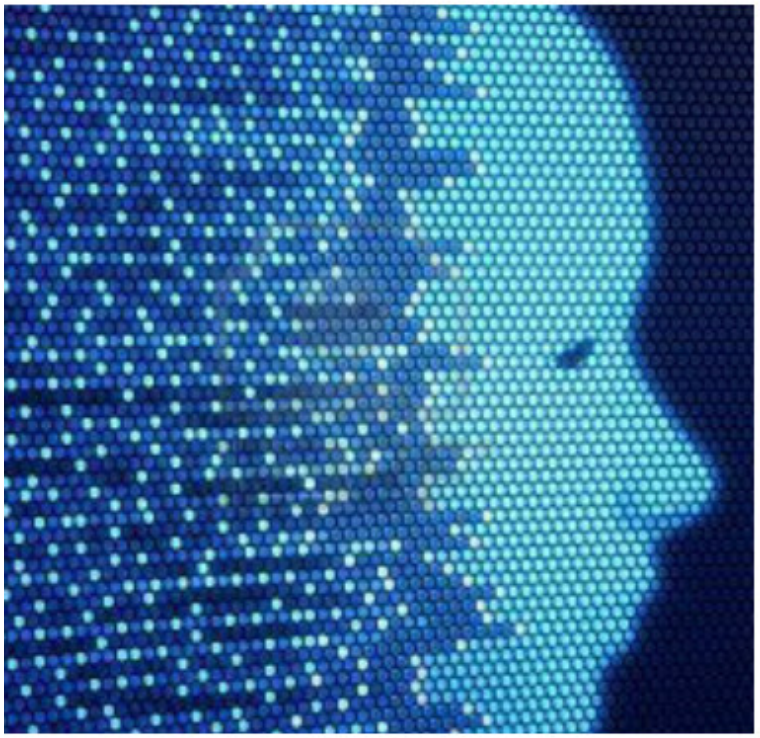

Artificiell Intelligens

Artificiell Intelligens

- Nationell satsning
- Vinnova-satsning
- Workshop i eftermiddag
    - Vilket kompetensbehov finns?
    - Vilken är målgruppen?
    - Vilken utbildning skulle LU kunna bidra med?

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Artificial Intelligence and Machine Learning

Kalle Åström, Centre for Mathematical Sciences, Lund University

Centre for Mathematical Sciences
Lund University

- Mathematics, Mathematical Statistics, Numerical Analysis
- Around 100 members of staff.
- World-class research in a number of areas, including **partial differential equations**, **computer vision**, **machine learning**, dynamical systems, numerical analysis
- Fields medal (Lars Hörmander, 1962)
- Gustafsson Prize (A Melin, A Meurman)
- Marr Prize (Fredrik Kahl, 2005)
- Clay Prize (Nils Dencker, 2006)
- Wallenberg Price (Erik Wahlén, 2016)
- PASCAL Challenges (C Sminchisescu, 2009-2012)

- Topics: Machine Learning, Deep Learning, Computer Vision, Medical Image Analysis, Statistical Signal Processing, Analysis of sound and radio, Applications, Probability theory, Optimization, Numerical Methods.

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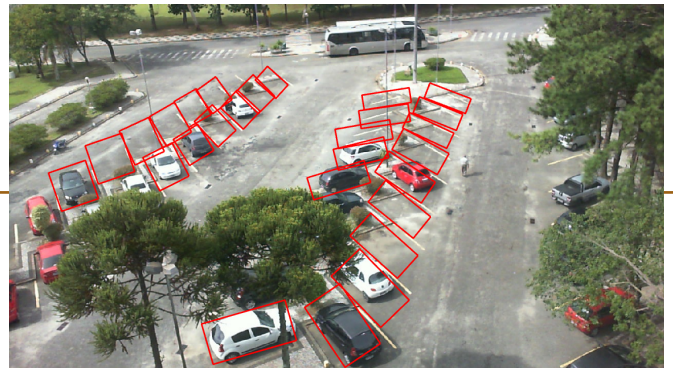
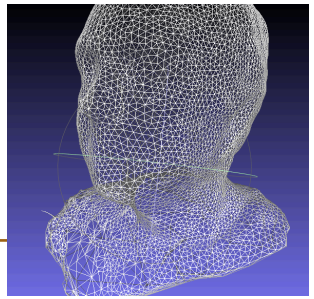
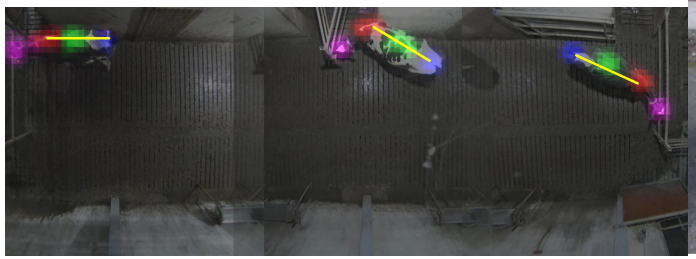
Research

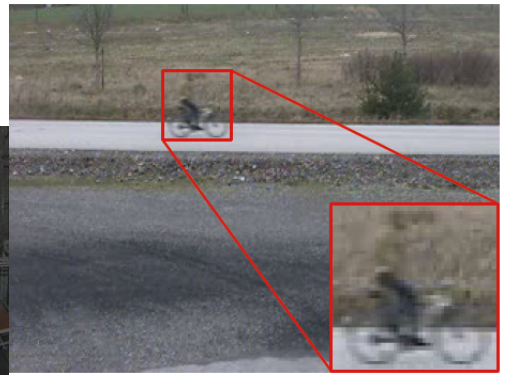
Research Topics

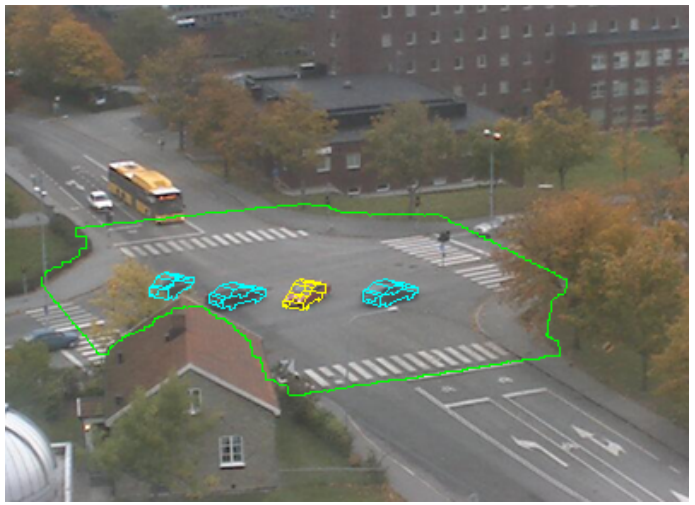
- Geometry and 3D
- Decision support – e-health
- Traffic safety
- Precision Dairy Farming
- Precision Agriculture
- Smart Cities
- Genomics
- Detection of explosives (NQR)

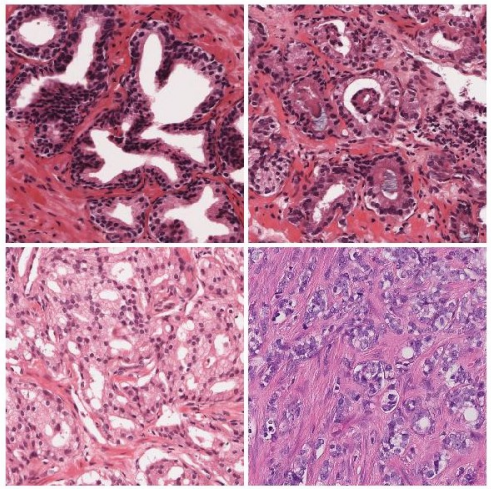




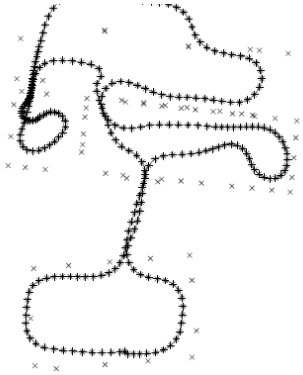








Computer Vision 3D understanding Mapping. Localization



- Internship 1990
- Master's thesis 1991
- Autonomous Systems
- Geometry
- Optimization
- Indoor and Outdoor positioning
- Kiruna-mine

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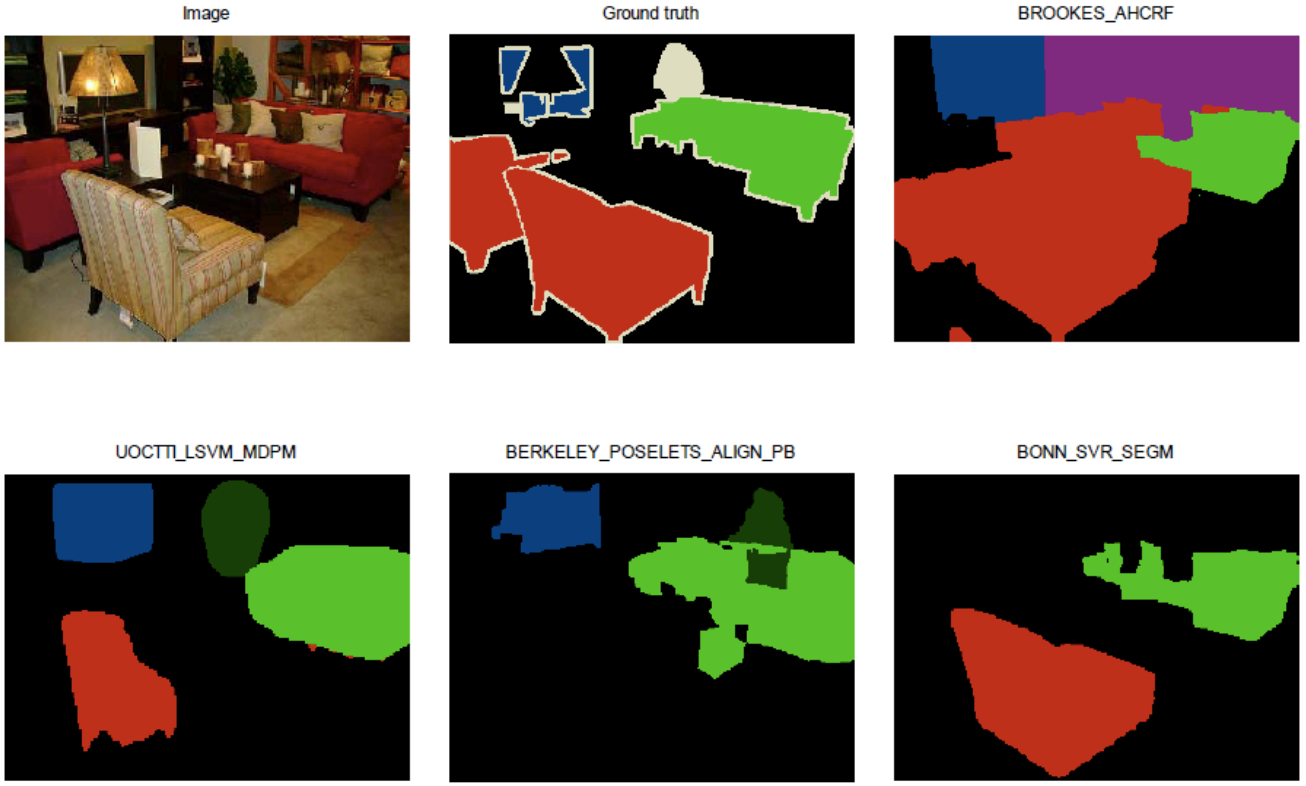
Example Segmentations



Sminchisescu.
Winner of PASCAL segmentation challenges 2009, 2010, 2011, 2012

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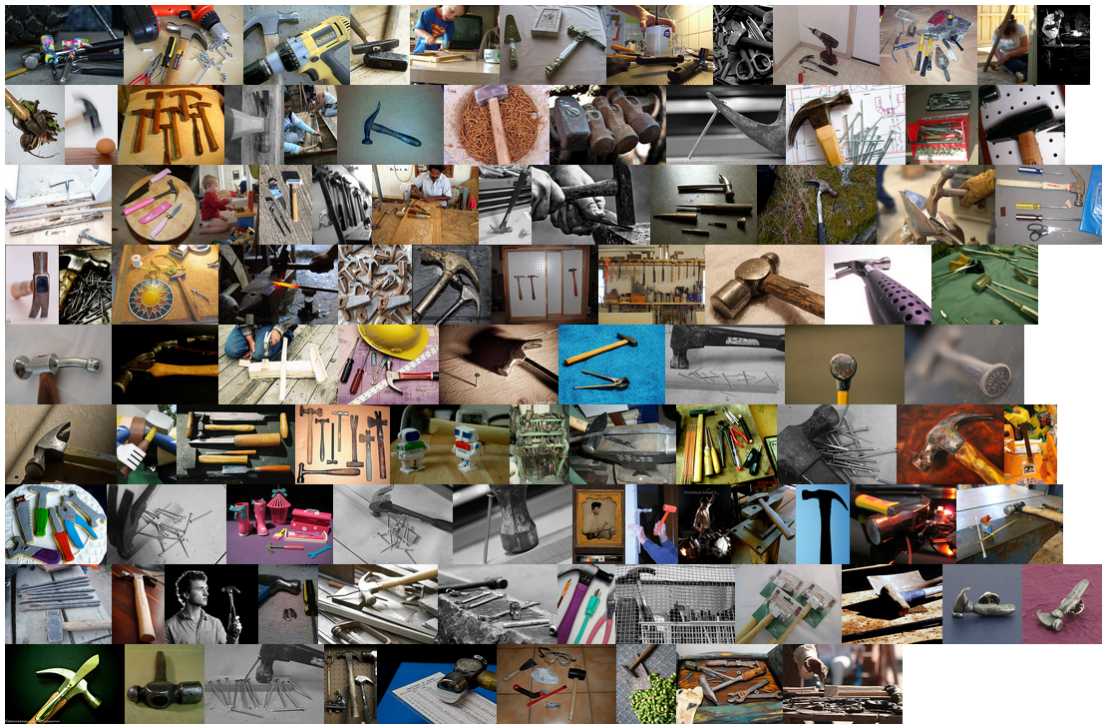
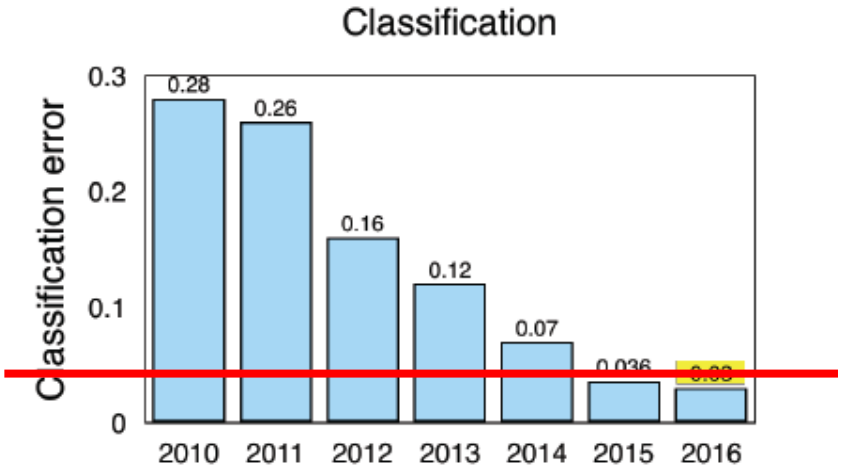
CVPR, ICCV, Challenges
Deep learning

Test images for “Hammer”





Human performance

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Teaching

- Machine Learning
- Image Analysis
- Computer Vision
- Spatial statistics
- Linear and logistic regression

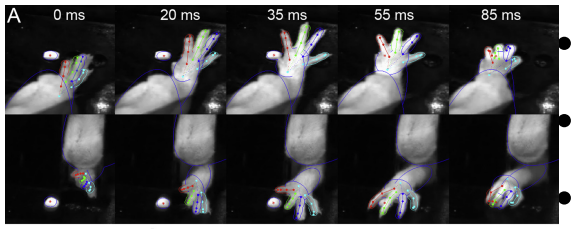
- Project course math/applied math
- Master's thesis

- Optimization
- Combinatorial Optimization
- Iterative Solution of Large Scale Systems in Scientific Computing
- Probability Theory
- Nonparametric inference
- Mathematical foundations of probability

Applications, Collaborations, Startups

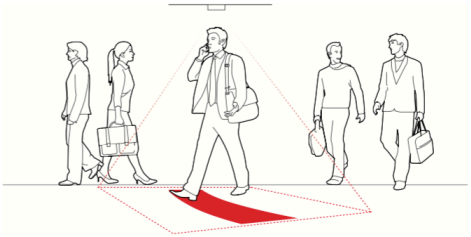
Collaborations

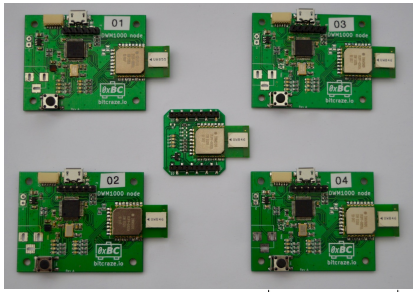
- Danaher Motion
- Hövding
- Sony
- Axis
- SLU
- Anoto
- Cellavision
- Combain
- Ericsson
- Flatfrog
- Precise Biometrics
- Katam
- Qlik
- Region Skåne



Startups from math@LU

- Mapillary
- Polar Rose
- Decuma
- Cognimatics
- Spiideo
- Ange Optimization
- Mometric
- Nocturnal Vision
- Ximantis
- Qlucore





AI & ML @ Computer Science

JACEK MALEC

http://cs.lth.se

- Robotics and Semantic Systems, http://rss.cs.lth.se
- Software Engineering, http://serg.cs.lth.se
- Embedded Systems Design, http://esd.cs.lth.se
- Software Development, http://sde.cs.lth.se
- …
- http://nlp.cs.lth.se,
- http://ai.cs.lth.se,
- http://jacop.cs.lth.se

People:
Elin Anna Topp
Pierre Nugues
Volker Krüger
Klas Nilsson
Jacek Malec
Krzysztof Kuchcinski
Flavius Gruian
Per Runeson
Christoph Reichenbach

- Teaching AI, ML and Intelligent Robotics since 1990s
- Hundreds of examination projects related to AI and ML

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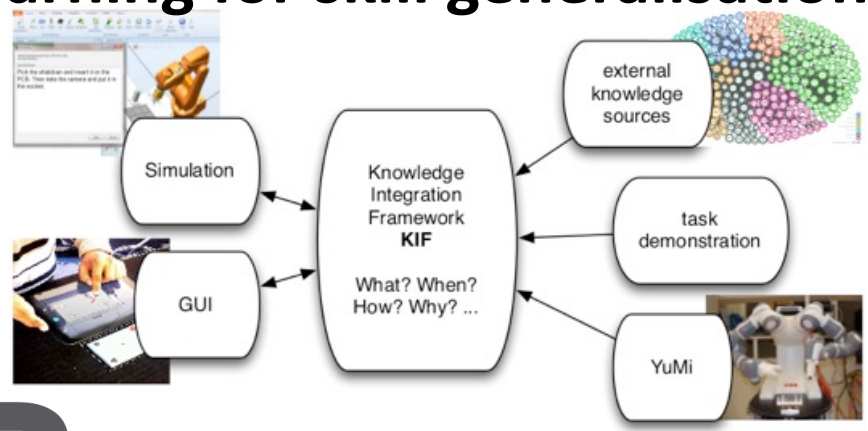
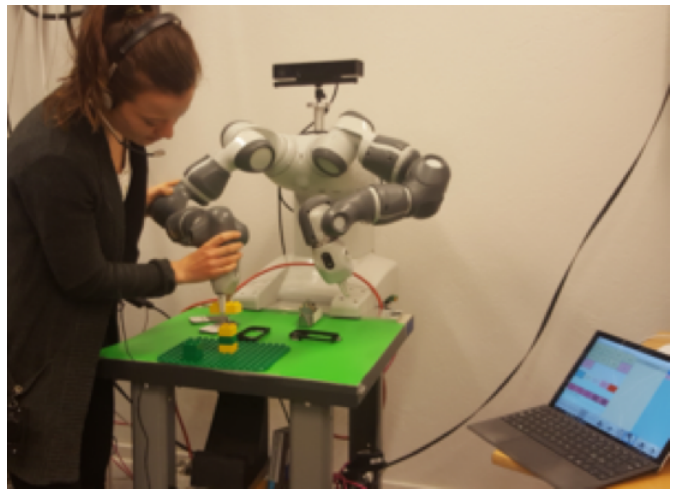
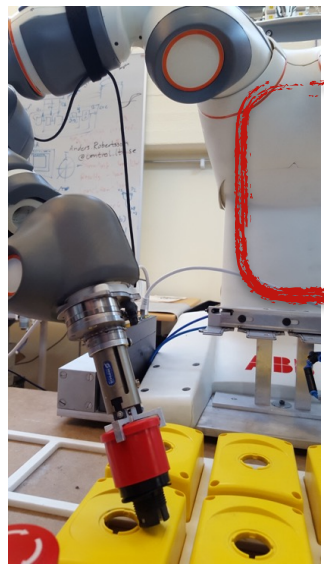
RSS research interests: knowledge representation, robotics, human-robot interaction, robot cognition, natural language processing

- **Useable programming methods and tools**
- **Interpreting human behaviour**
- **Knowledge-based robotic cognition**
- **Machine learning for skill generalisation**







Errors!
Errors!
Errors!

COGNIBOTICS

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Finding Interaction Patterns

Question was: Can we find re-occurring patterns in user behaviour that tell us about their communicative intentions, in case the utterance is ambiguous?

Yes, we can! We can find them using, e.g., Bayesian Classifiers

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Natural Language Processing

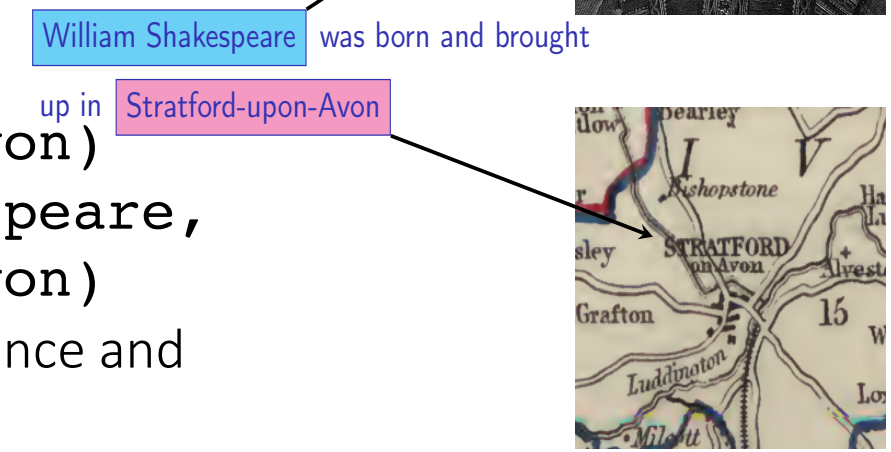
creating prediction models

for **heart transplantation**

Semantic processing for large multilingual corpora

The goal is to structure knowledge in text as a graph:

1. **Input text**: *Shakespeare was born and brought up in Stratford-upon-Avon, Warwickshire,*
2. **Extracted predicates:**
   `born``(Shakespeare, Stratford-upon-Avon)`
   `brought_up``(Shakespeare, Stratford-upon-Avon)`
3. **Resulting graph** (coreference and entity linking):



CoNLL 2008, semantic parsing, English, 1st

CoNLL 2009, semantic parsing, 7 langs, 2nd

CoNLL 2011, Coreference, English, 4th (2nd with the corrected evaluation script)

CoNLL 2012, Coreference, English, Chinese, Arabic, 4th

recently: entity linking, English, Chinese, Spanish

All our models use machine-learning techniques trained on annotated corpora and/or Wikipedia

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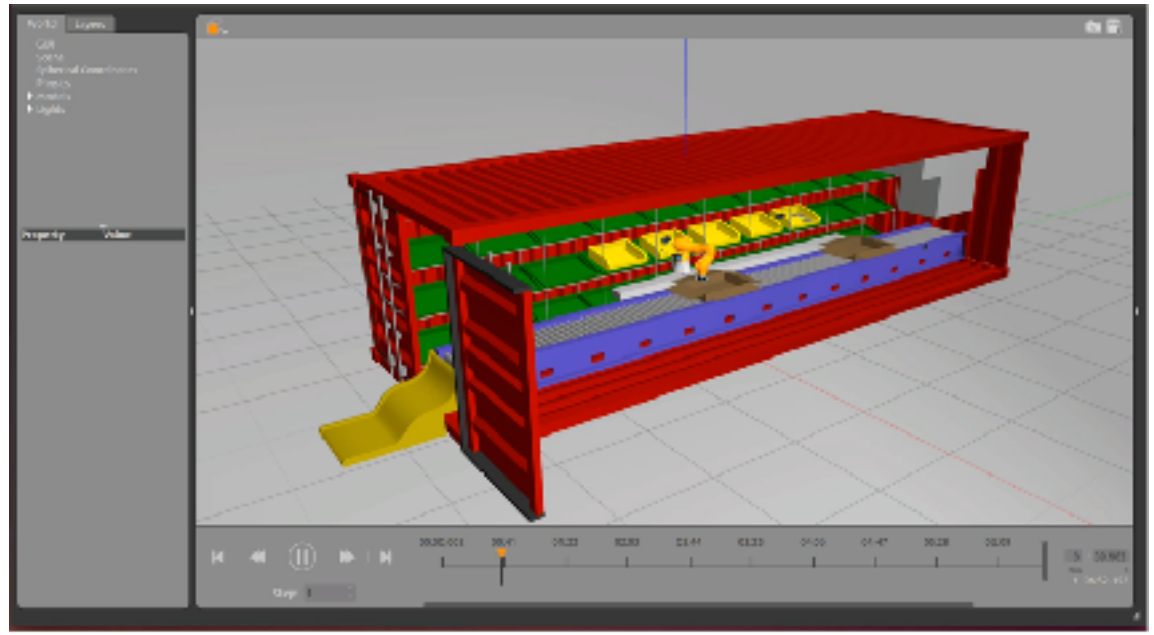
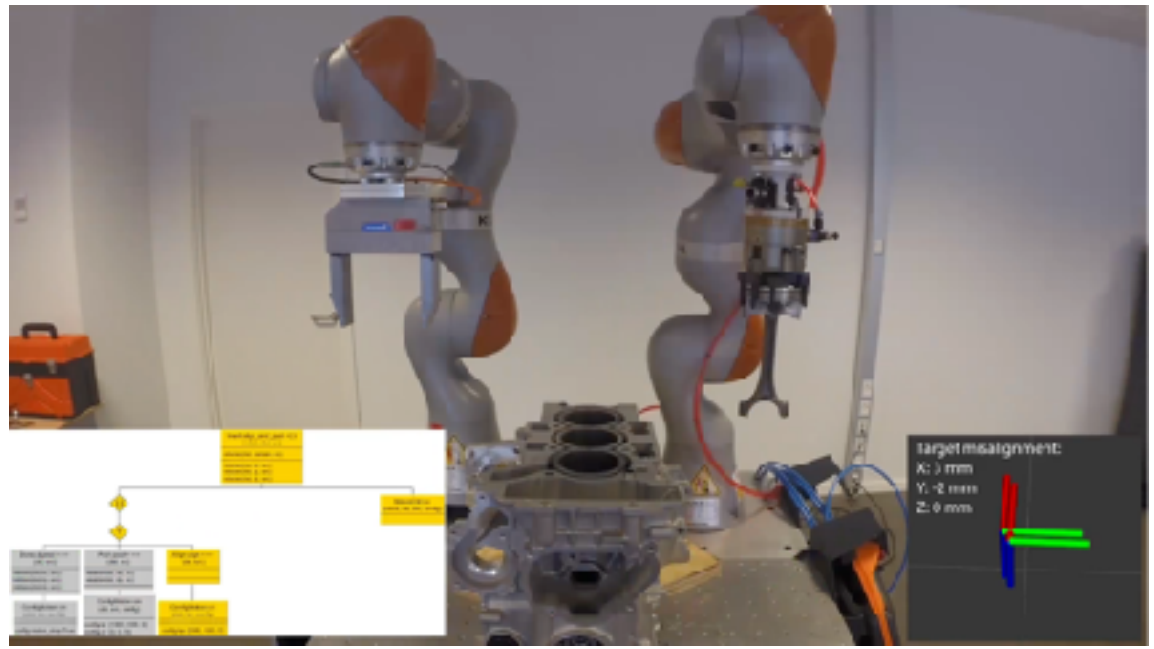
- How can a robot learn to do a specific job?
- Can the robot find strategies its own?
- How can the human help?
- Can the robot learn from other robots?



- Following ideas of AlphaGo Zero:
  - Use Deep Learning from Simulation (top)
- Use Bayesian learning for physical exploration (bottom)

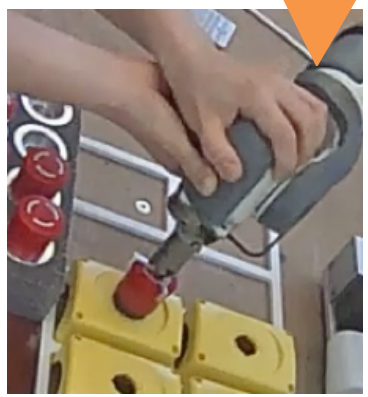


Make robots understand, that they do not understand!

- **true cooperation** of humans and robots in industrial settings
- representation of and reasoning about **cooperative skills**
- **awareness** of time flow and its consequences
- mutual understanding and **trust**
- **awareness** of misunderstandings and lack of knowledge
- **learning** cooperative skills
- **talking** to (or with) robots in English, Swedish, German, Polish, …
- **learning** semantics of new robot skills, transforming it into **knowledge**
- robotic learning in the context of various industrial **applications**
- teaching a robot **responsibility**

This is the approach position. Open the right gripper.

Now we pick the button. Close the gripper.



Use force to guide the button into the hole like this.

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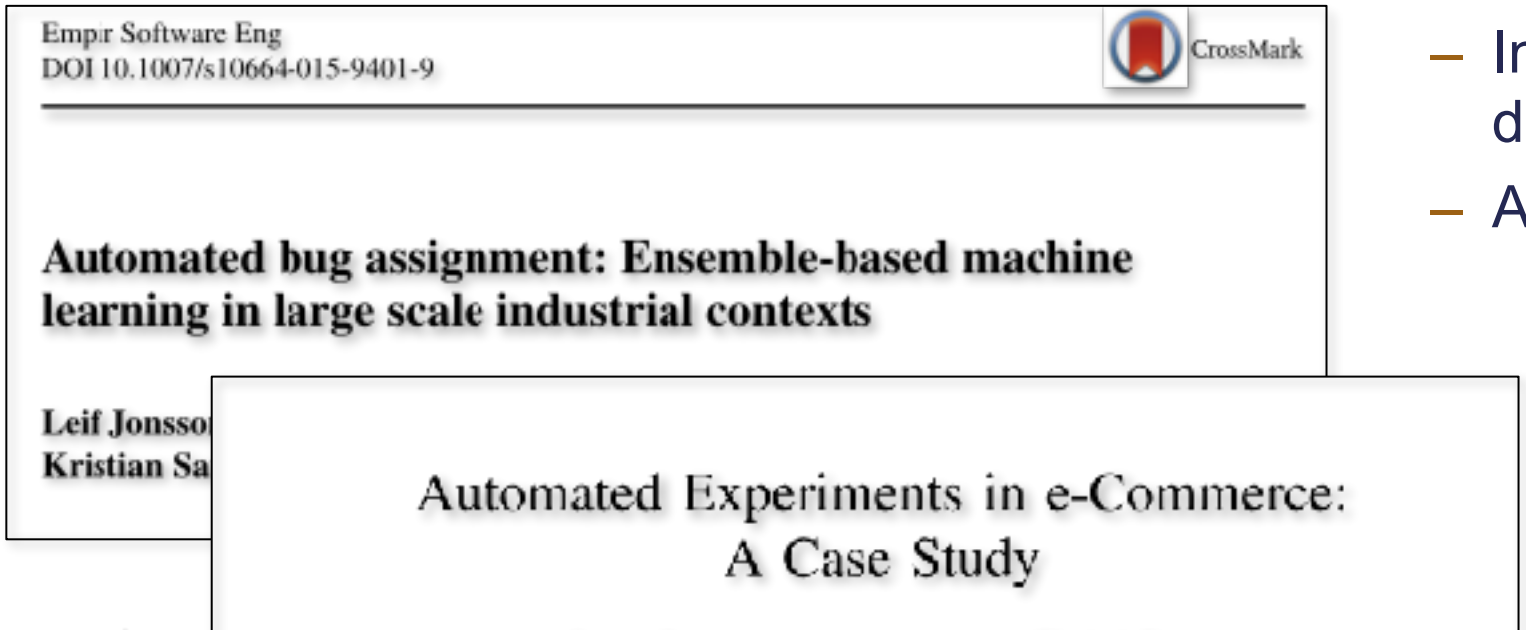
Constraint Reasoning: AI since XX century

- JaCoP: a constraint solver with Java API (http://www.jacop.org)
- JaCoP-related ideas:
  - constraints or models for Bayesian networks
  - simple NN analysis using constraint programming
  - using CP for optimisation useful in NN construction
  - using constraint reasoning for generating explanations
- FSM inference using RNNs
- NNs for predictive maintenance and fault detection

AI/ML for SE

- Assist software engineering tasks with AI/ML
  - Automated bug assignment to teams
  - Automated selection/adaptation of features



- Future work:
  - Automated repair
  - Automated refactoring
  - Automated optimisation/configuration
  - Decision support for SE
  - Internet bots to support software developers
  - Automated testing

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SE for AI/ML

- Build reliable AI/ML system
- Same challenges as in 1968, but…

…more complex:

- Verification and validation – behaviour not specified in advance and continuously changing
- Platforms – Trusted in new context with new data
- Data – Ownership, privacy, quality
- Integration – Programming languages for AI/ML
- Trustable AI – Ensure behaviour compliance
- Accessible AI – Guidance on algorithms, data etc.

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AIML @ Automatic Control

BO BERNHARDSSON

Background

- Cybernetics, Richard Bellman
- Partially Observable Markov Decision Processes[Åström 65]
- Adaptive Control Lund 70s, PhD theses
  - Björn Wittenmark (Prof Lund), Lennart Ljung (Prof LiU), Bo Egardt (Prof Chalmers), Ulf Borisson, Claes Källström, Jan Holst (Prof Lund), Jan Sternby (Prof Luleå), Tore Hägglund (Prof Lund), Rolf Johansson (Prof Lund)
- Artificial Intelligence 80s
- Expert Systems
- …

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Some Industrial Outcome

- Autopilots for Tankers
  - Adaptation
  - SteerMaster
  - Northrop Grumman

- ABB ++
  - AutoTuner - ECA (>200kSystems)
  - Induce experiment to tune PID
  - NovaTune, Gunnar Bengtsson

- First Control,
  - Gunnar Bengtsson

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Research – Expert System Boom - end 1980s

- Expert system, capture knowledge of experienced control engineers doing
  - PID auto-tuning (PhD by KE Årzén)
  - System identification (Lic by Larsson and Persson)
- Model-based AI techniques for system diagnosis
  - Multi-Level Flow Models (MFM)
  - PhD by Jan Eric Larsson → Goalart spinoff
- Symbolics Lisp Machine
  - KEE (Knowledge Engineering Environment)
- Multi-View Object-oriented Control System
  - Architectures based on G2 Real-Time Expert System (Gensym)

Research in recent years
- Theory and Applications

- Iterative Learning Control and Reinforcement Learning
- Control theoretic analysis of learning algorithms
- Statistical machine learning theory for adaptive control
  - ACC18 session co-organized with UC Berkeley group

- Next Generation Autotuners, PhD, Josefine Berner
- Virtual Sensors for Heavy Duty Engines, PhD Maria Henningsson
- Adaptive Control for Aerial Vehicles, Lic, Anders Pettersson, SAAB
- Machine Learning for EEG-based classification, MSc projects
- ...

\+ Robotics

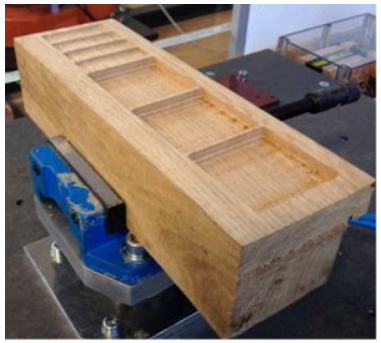
Research on Learning at Robotics Lab, LTH

- Research on learning and adaptation in several robot applications at Robotics Lab, LTH.
- EU/FP7 projects COMET and SMErobotics, targeting robotic machining. Also joint research with Univ. Jaen, Spain, on learning in machining.
- EU/H2020 SARAFun, learning in robotic assembly.
- Methods: Iterative learning control (ILC), online path / trajectory learning, artificial neural networks, and reinforcement learning.

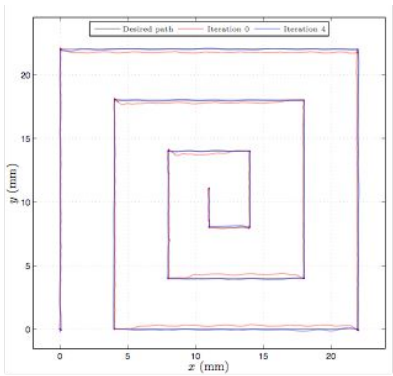
- O. Sörnmo: Adaptation and Learning for Manipulators and Machining, Ph.D. Thesis, 2015
- B. Olofsson: Topics in Machining with Industrial Robot Manipulators and Optimal Motion Control, Ph.D. Thesis, 2015
- M. Karlsson: On Motion Control and Machine Learning for Robotic Assembly, Lic. Thesis, 2017

Research on Learning at Robotics Lab, LTH (cont'd)

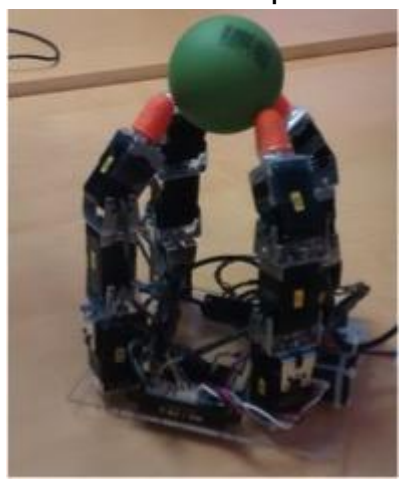
- Example application with robots milling in oak, where the optimal path is learned online based on wood properties with force sensing.
- Iterative learning control for robot machining in aluminium (including modeling and identification approach).

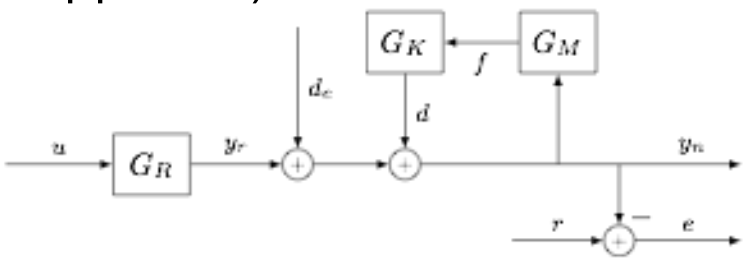


ILC for PKM



Reinforcement learning for in-hand-manipulation





- I. Dressler: Modeling and Control of Stiff Robots for Flexible Manufacturing, Ph.D. Thesis, 2012
- O. Sörnmo: Adaptation and Learning for Manipulators and Machining, Ph.D. Thesis, 2015
- B. Olofsson: Topics in Machining with Industrial Robot Manipulators and Optimal Motion Control, Ph.D. Thesis, 2015
- M. Ghazaei: On Trajectory Generation for Robots, Ph.D. Thesis, 2016

Teaching

- PhD course in Deep Learning (2016)
  - Study circle with students from several departments
- WASP Autonomous Systems Course (with KTH)
  - Includes some AI&ML components
- Master's Program (restart) proposed to LTH
  - Systems, Control and Learning

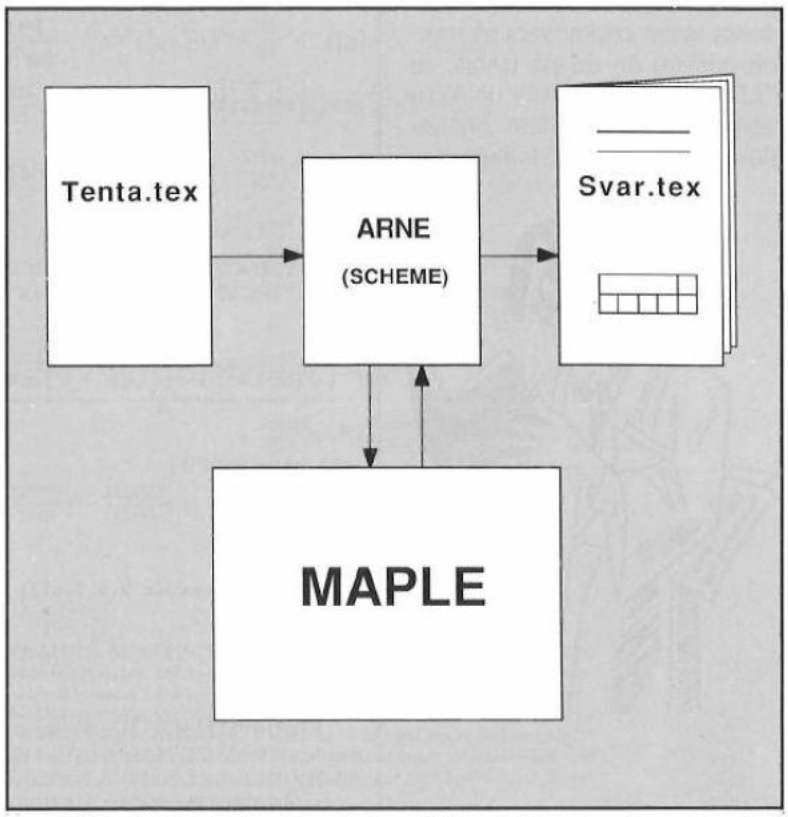
Bonus material

ARNE — AnalysRäkning Numera Elektroniskt

Av Bo Bernardsson, Inst för reglerteknik

ORDO 2/88

Teknologens dröm är nu uppfylld. Mata in skrivningen i Analys 2 till programmet ARNE och vänta tio minuter. Ut på laserskrivaren kommer lösningar färdiga att lämna in på tentamen. Programmets prestanda är jämförbar med medelteknologens.



Artikelförfattaren vid kombinerad in och utmatningsenhet

sekunder)

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Department of
Astronomy and Theoretical Physics

ML applications within:

- Astrophysics
- Bioinformatics
- Biological Physics
- Medical informatics
- Systems Biology

Research and development of ML methods.

Focused on (deep) neural networks

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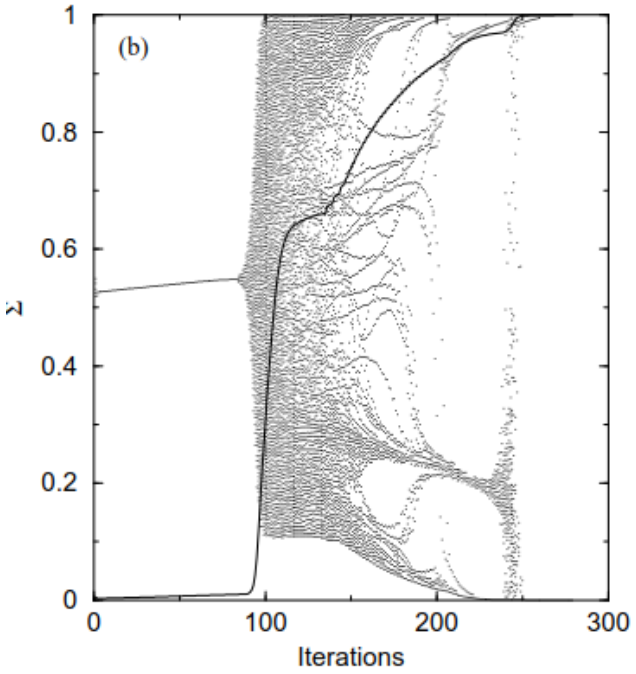
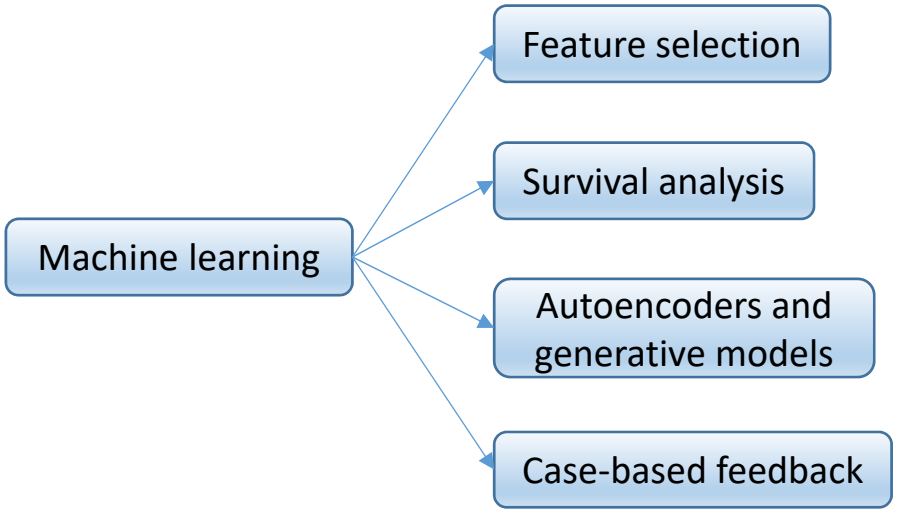
History: Carsten Peterson & Bo Söderberg

- Neural networks for optimization
- Mean field annealing
- Mean field Bolzmann machines



Current research



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Astrophysics: spectroscopy

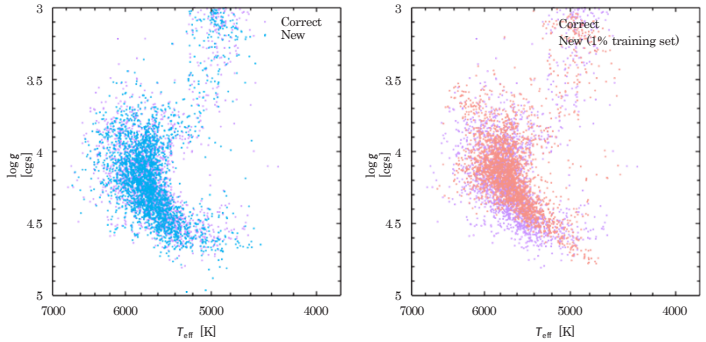
Ross Church

Philipp Birken

Dominic Ford

Sofia Feltzing

Rapid analysis of stellar spectra



Automatic classification of stellar spectra

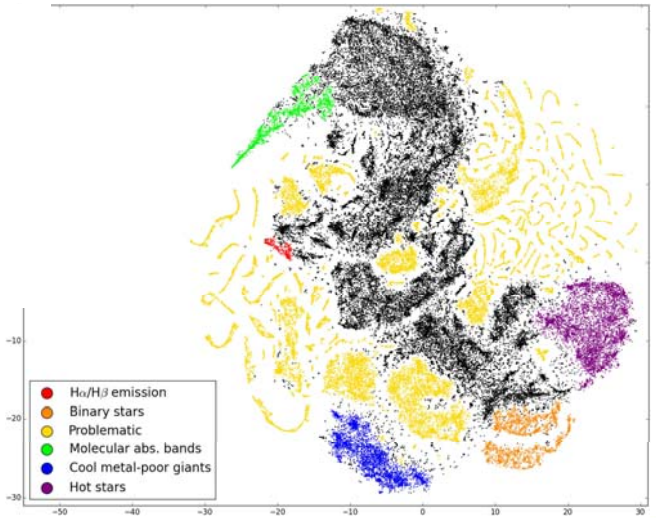


Figure from Traven et al. (2017)

+ Gregor Traven (postdoc, starts HT)

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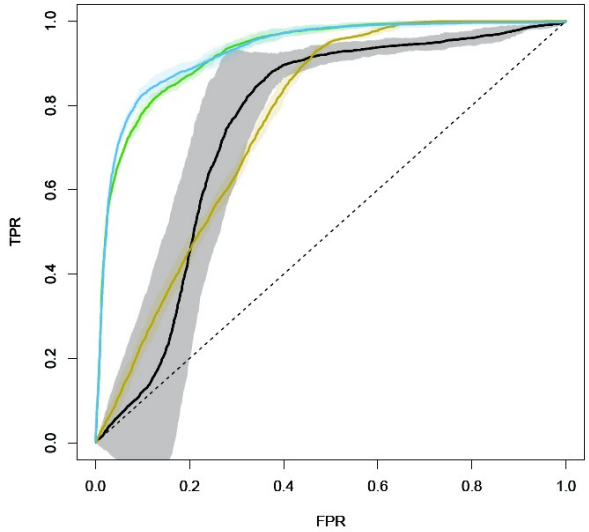
Astrophysics: discovery



Feature-based supervised classification to find massive black holes in stellar clusters

Abbas Askar (starts June)

Plus interest in:

- Analysis of planetary dynamics (Davies, Mustill, Lorek)
- Finding structures in Gaia data (McMillan, Hobbs)
- Analysing galaxy formation simulations (Agertz, Renault)

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Biological Physics

Anders Irbäck
Yuan Li
Daniel Nilsson

Tobias Ambjörnsson
Albertas Dvirnas

Bo Söderberg

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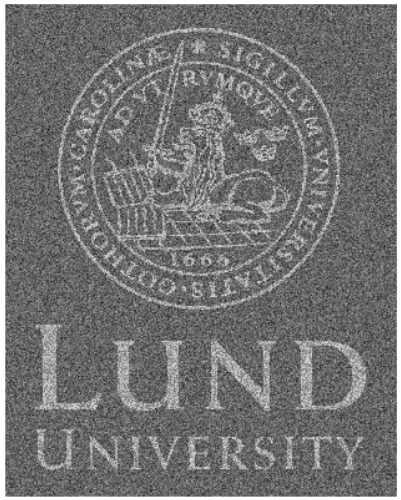
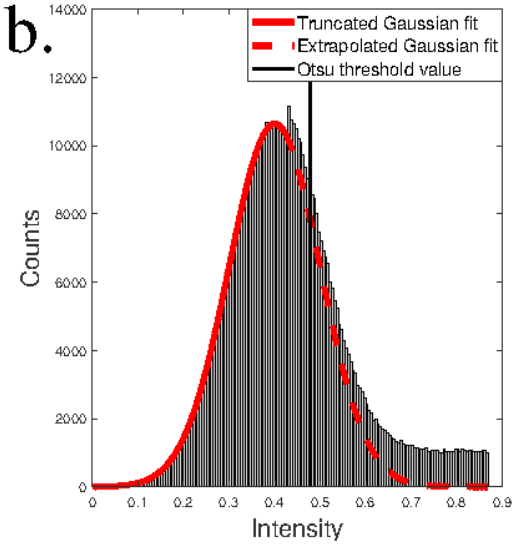
Unsupervised and probabilistic segmentation of fluorescence images.

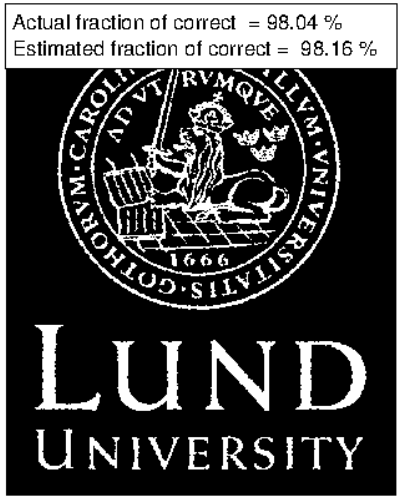
a.



b.

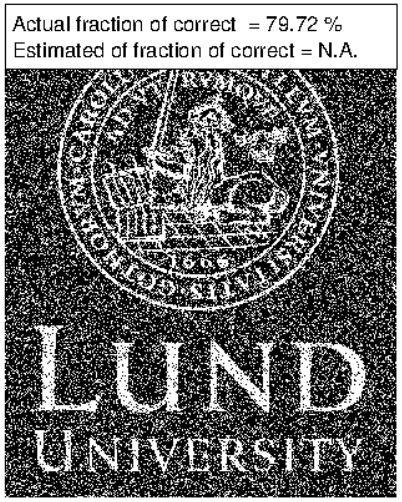


c.



Our new method

d.



Otsu

"Beyond CNNs: using Truncated Function Fits + Bayesian Decision Theory, we "train" using only the original image as input (no training data required). [M. Brander and T. Ambjörnsson, in preparation]."

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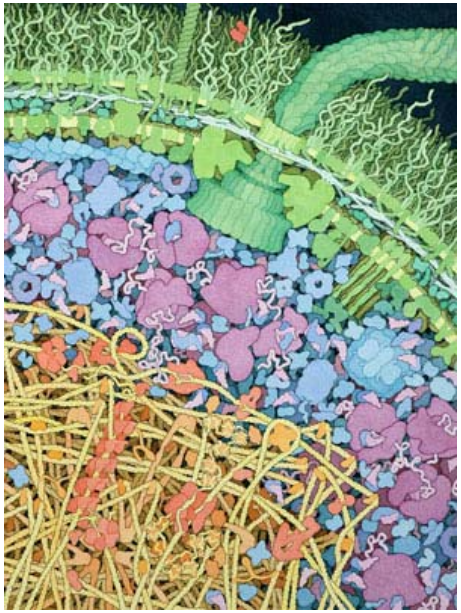
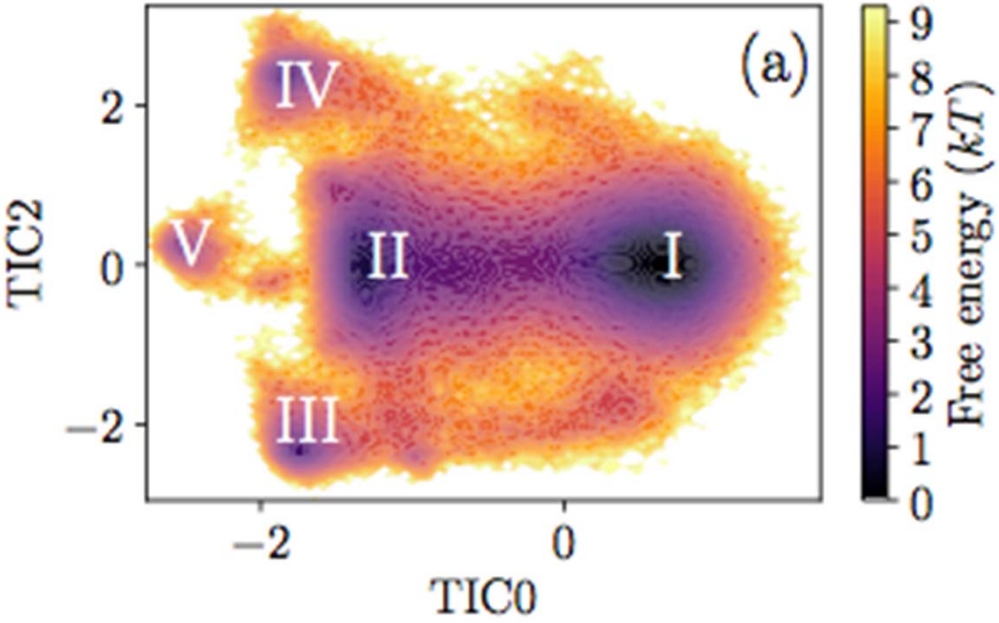
Macromolecular simulations

Characterizing protein interactions in cellular environments



D.S. Goodsell, The Machinery of Life



Main (slowest) interaction modes identified by

- Time-lagged independent component analysis
- Markov modeling

D. Nilsson, S. Mohanty & A. Irbäck, J. Chem. Phys. (2018)

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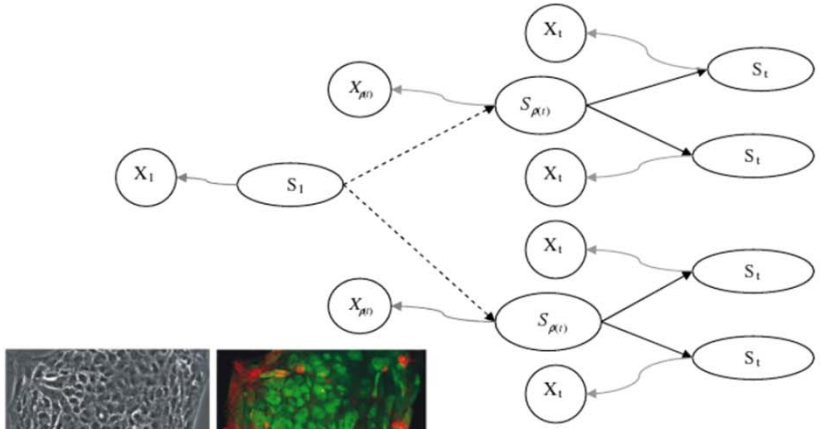
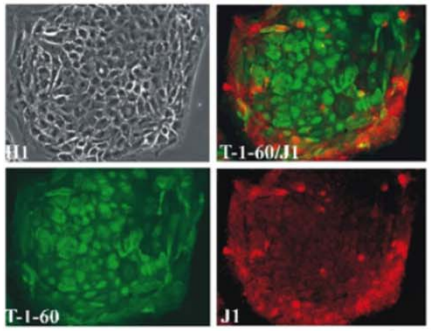
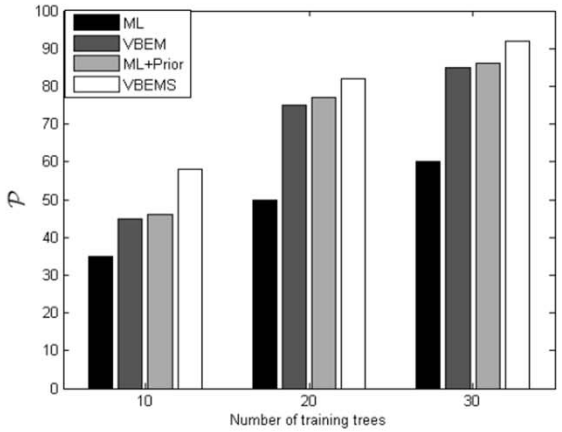
Systems Biology

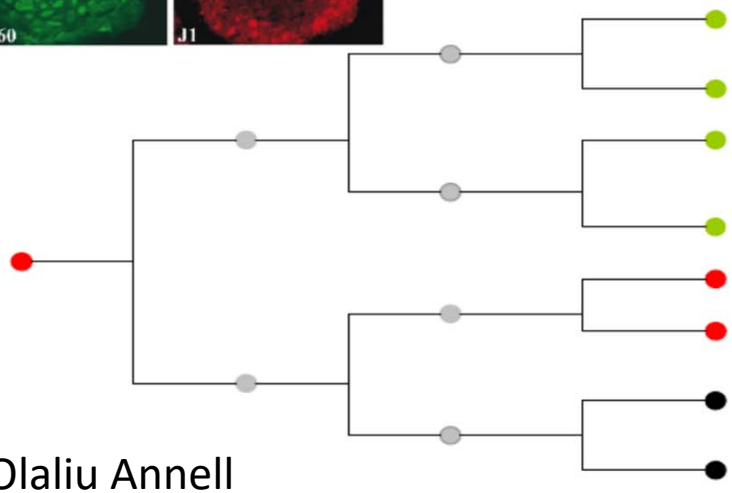
Victor Olariu Annell
Carsten Peterson
Carl Troein
(Henrik Jönsson)
Tomas Martin-Bertelsen
Adriaan Merlevede

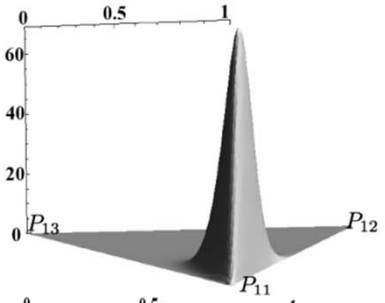
Variational Bayesian Hidden Markov Tree with Smoothed Probabilities for Stem Cell Lineages.

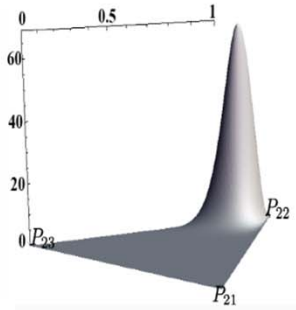


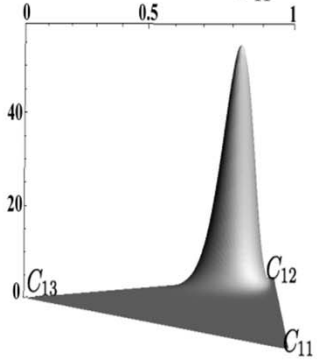


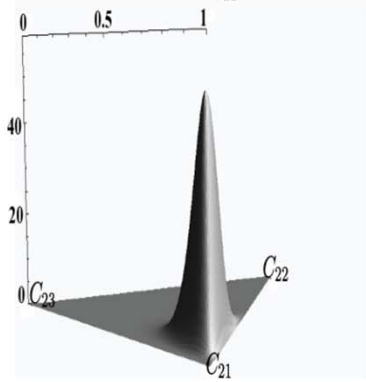












Victor Olaliu Annell

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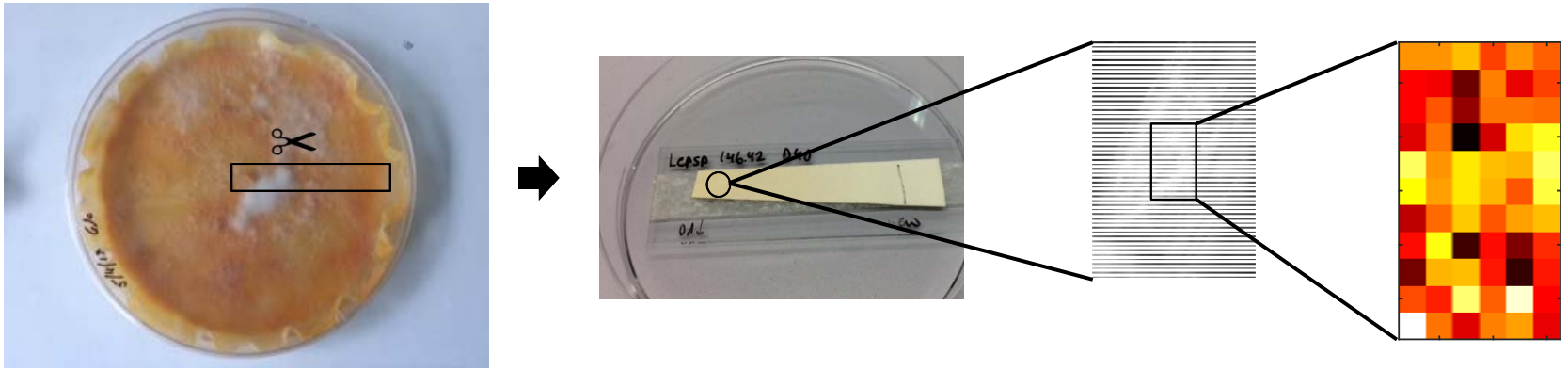
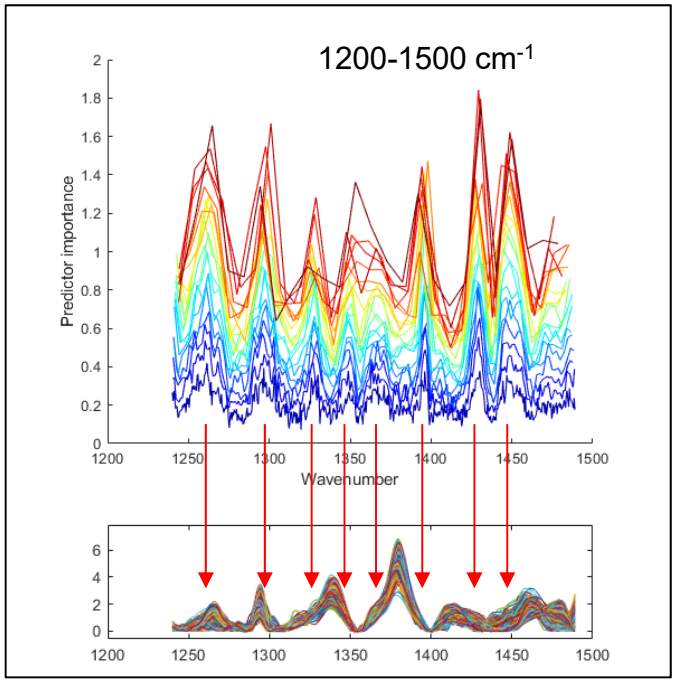
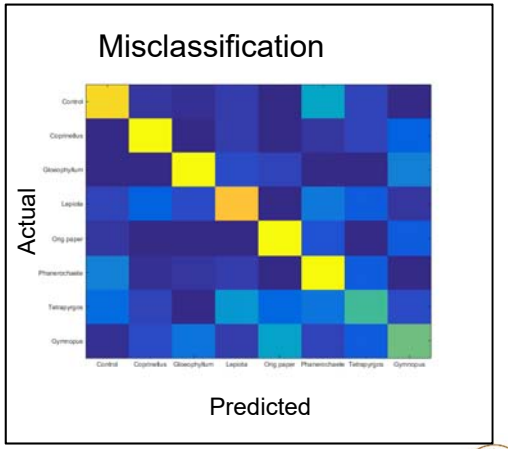
Raman spectra of fungal cellulose decomposition



Random forests

- Decision trees; one variable at a time.
- Ensemble of tree classifiers





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Medical Informatics

Mattias Ohlsson
Patrik Edén
Johan Nilsson
Carsten Peterson
Najmeh Abiri
Björn Linse

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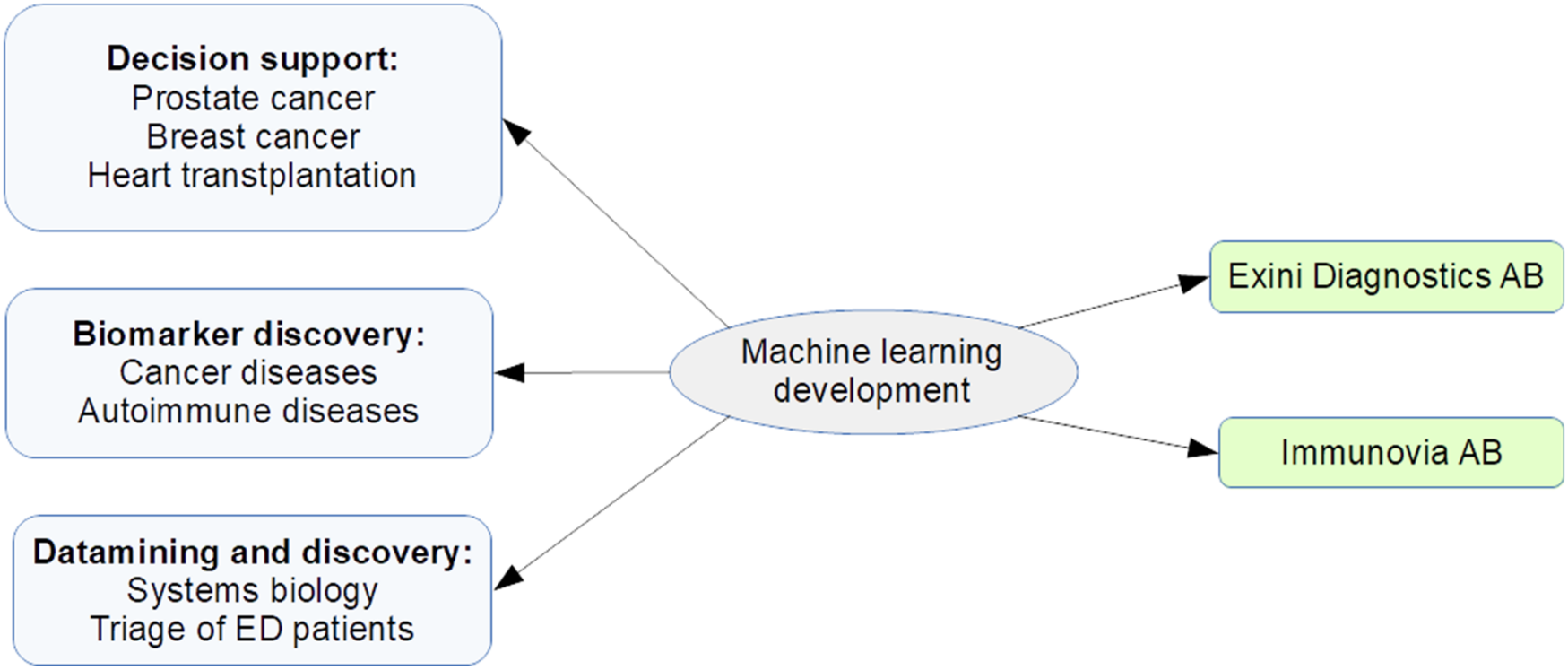

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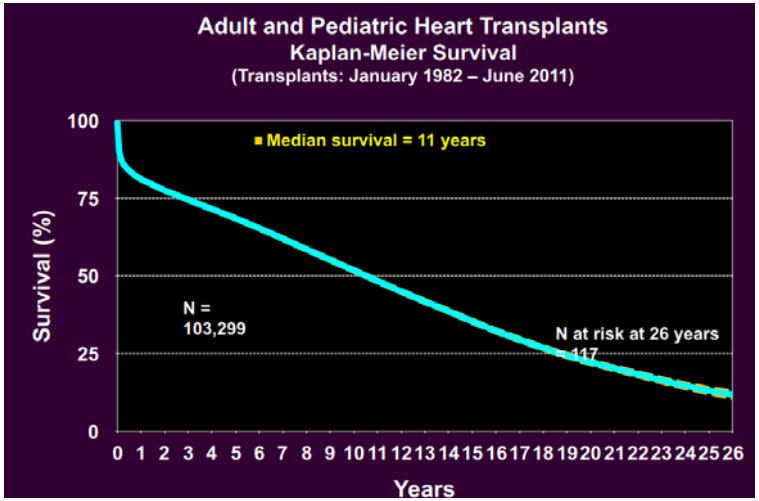
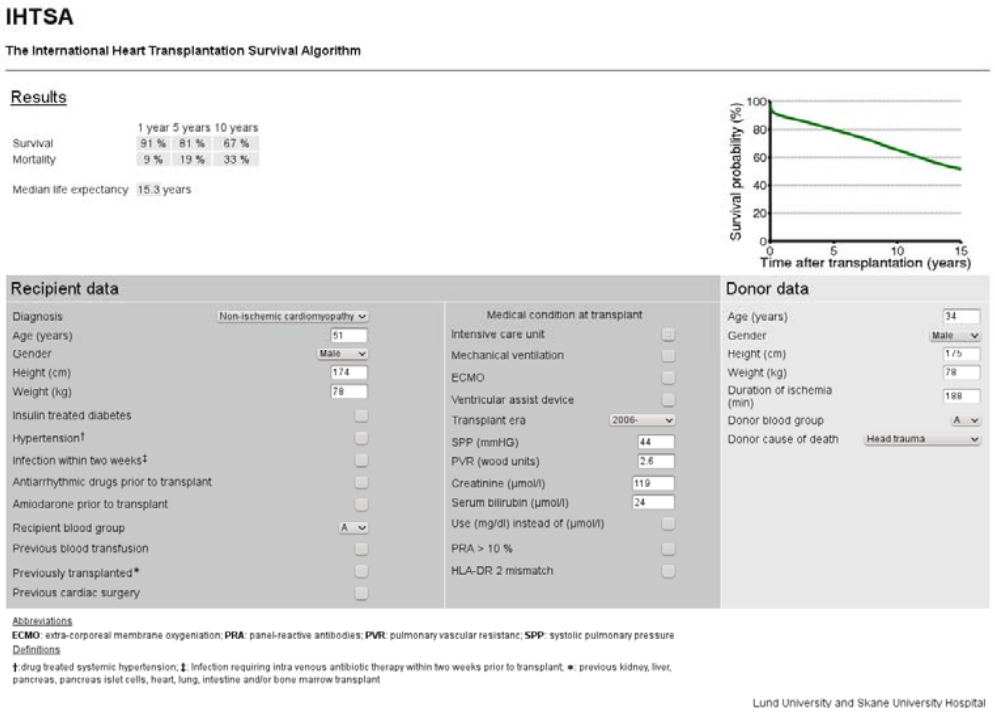
Matching of donor and recipient in cardiac transplantation

Johan Nilsson, Pierre Nugues,
Thoracic surgery, Computer Science

Aim: Better match between donor and recipient
Utilize more donated hearts





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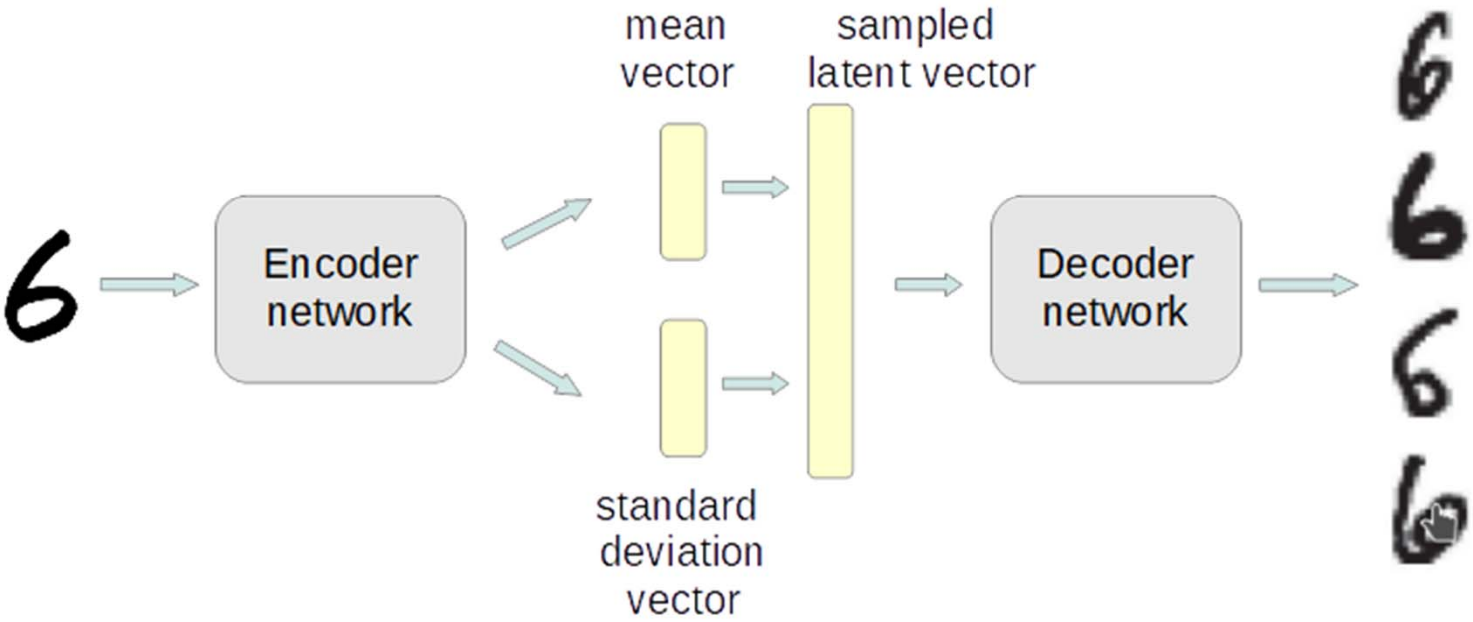
Variational autoencoder for multiple imputation (generative model)



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Future

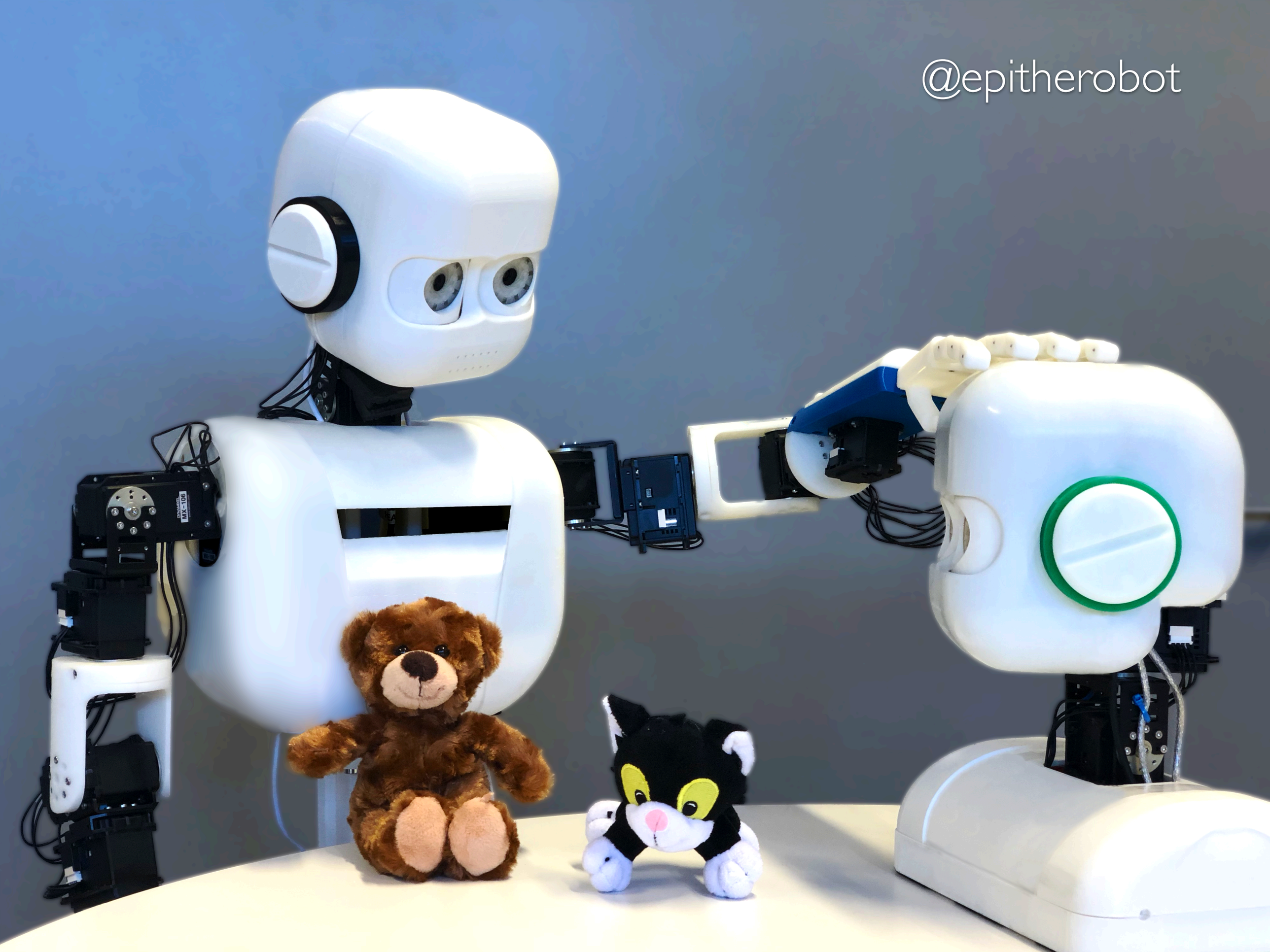
DEPARTMENT OF PHILOSOPHY

PEOPLE & RESEARCH

- Christian Balkenius
- Ingar Brinck
- Peter Gärdenfors
- Birger Johansson
- Trond Arild Tjøstheim

- developmental/epigenetic robotics
- system-level brain models
- deep learning
- social interaction
- conceptual spaces

@epitherobot



CURRENT COURSES

- Cognitive Science: Introduction (KOGM01)

- Neural models, cognitive robotics and agents (KOGP05/MANM10)

- Cognition, learning and advanced technology (KOGP10/MAMN15)

AI in medicine at Lund University

A rather incomplete survey

(overlapping, missing, incorrect,..)

Einar Heiberg

2018-05-29

Dept. Clinical Physiology *Elin Trägårdh* Eigenvision *Johannes Ulén*	New imaging biomarkers for PET/CT.
Dept. Clinical Physiology *Einar Heiberg* *Ellen Ostenfeld* Medviso AB *Helen Fransson*	AIDA project: Platform for efficient processing of large study cohorts. Status ongoing.
Emergency medicine *Ulf Ekelund*	Improved triage in patients with chest pain with decision support by integrating patient electronic records. Status grant application submitted.
Centrum för primärvårdsforskning *Artin Entezarjou* *Patrik Midlöv*	Digital Tools & Artificial Intelligence for Effective Primary Care. Project ongoing

Dept for psychology Worddiagnostics *Oskar Kjell* *Katarina Lundberg* *Sverker Sikström*	Tools for language analysis of mental illness. Price by Sparbanksstiftelsen.
Computational Biology and Biological Physics *Mattias Ohlsson*	Machine learning for medical decision support and analysis, including Breast and Prostate cancer, Alzheimer's disease, Cardiac surgery and transplantation, Machine learning for survival analysis
Centre for Mathematical Sciences *Anders Heyden* *Kalle Åström* *..*	AIDA project: Decision Support for Classification of Microscopy Images in Digital Pathology Using Deep Learning Applied to Gleason Grading.
Dept of Medical Radiation Physics *Peter Mannfolk* *Olof* *Theo*	Alzheimer´s disease using both MR and PET data. Supervised and unsupervised learning, with the intention to study if these methods better can classify patients and normal subjects. Currently using PET data and plan to use this to group MR data for further analysis.

Dept of diagnostic radiology *Sofia Zackrisson* *...*	AI in breast cancer detection and prognosis. • Ethical approval to build database with all breast screening images in Malmö from 2004 and onwards for annotation, cancer detection etc. Approximatly 400.000 exams. • Database with 15.000 breast images from prospective study Malmö Breast Tomosynthesis Screening Trial • Application to AIDA to build infrastructure and a fellowship
Dept of Thoracic Surgery	Improve matching between donor and recipient in heart transplants. Project Artificial Intelligence in CardioThoracic Sciences (AICTS).
Dept of Surgery *Lisa Rydén* *Looket Dighe* *(Mattias Ohlsson)*	Better prediction for lymph node diagnostics in conjunction with breast cancer

Dept of Diabetes and endocrinology *Damon Tojjar* EasyDiabetes	Support system for type 2 diabetes. Received Medtech4Health Innovation award 2018
Dept Radiation Science *Petra Ambolt* *Lars E Olsson* Spectronic Medical Carl Sievers	Create synthetic CT images based on MR images for radiotherapy dose planning.
Cardiolund *Jacob Svensson* Coala Life, Zenicor	Automated ECG analysis for atrial fibrillation
Escan Academy *Lars Edenbrandt* *Eigenvision?*	Automated bone and organ segmentation in CT images. Bone metastasis detection.

Please help to continue the inventory

einar@heiberg.se

Societal perspectives on AI

MARIA HEDLUND
DEPARTMENT OF POLITICAL SCIENCE
LUND UNIVERSITY

Responsible AI through democratic processes?

- Who is reponsibile when AI becomes expert?
- How do we make sure superintelligent AI is friendly?
- Which moral should guide the behaviour of a driverless car?
- And how do we settle such issues?

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Project ideas

- Risks and autonomous systems: How will the risk landscape change and how can we adapt to the new situation?
- Responsible AI: How will different distributions of responsibility affect the long-term development of AI?
- Conceptual and societal implications of new, human-created life (synthetic and/or machine life)

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Current initiatives

- Development of inter-disciplinary master course on societal perspectives on AI
- Samtech: think tank with a social science perspective on digitalisation and new technology

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Thank you for your attention!