Tampereen yliopisto
Tampere University

DELTA/A-WEAR Winter School

”Machine Learning Applications”

15.-17.2.2021

Prof. Jari Nurmi, TAU

Tampereen yliopisto
Tampere University

DELTA = Doctoral training network in ELectronics, Telecommunications and Automation

DELTA universities (and liaisons):

- Aalto University (Riku Jäntti)
- Tampere University (Jari Nurmi, director)
- University of Jyväskylä (Timo T. Hämäläinen)
- University of Oulu (Juha Röning)
- University of Turku (Jouni Isoaho)
- University of Vaasa (Heidi Kuusniemi)

Over 200 PhD students and 70+ supervisors

Funds joint courses (e.g. summer and winter schools), networking workshops, invited lecturers, researcher exchange, etc. (with a fairly limited – and distributed – budget)

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DELTA at Tampere University

Tampere University was born on January 1, 2019 as a merger of UTA and TUT for multi-disciplinary university

The second largest university in Finland

Three focus areas

- Technology
- Health
- Society

DELTA people found in two faculties

Faculty of Information Technology and Communication Sciences (ITC)

- **Electrical Engineering**
- **Computing Sciences**
- *Communication Sciences*
- *Languages*

Faculty of Engineering and Natural Sciences (ENS)

- **Physics**
- *Materials Science and Environmental Engineering*
- *Automation Technology and Mechanical* Engineering

Other Planned DELTA Events in 2021-22

DELTA spring workshop 2021

- **Vaasa, May 2021**

DELTA autumn workshop 2021

- **Turku, October-November 2021**

DELTA Winter School 2022

- Ruka, February 14-16, 2022

Piggybacking / co-organizing summer schools and intensive courses provided by the participating universities

ITN is hiring!

- APROPOS – Approximate Computing for Power and Energy Optimisation
  - An Innovative Training Network coordinated by TAU 1.11.2020 – 31.10.2024
  - Hiring 15 PhD students for 36 months each (with very competitive salary)
  - 14 European universities and companies as the employers
  - Additional 12 companies for hosting cross-sector secondments
  - As a Marie Skłodowska-Curie Action, recruitment cross-border

- In Finland, two positions at TAU, one at Wirepas, one at Univ. of Turku
- Application deadline Feb. 22, job contracts ~summer 2021
- See www.apropos-itn.eu

APROPOS beneficiaries and partners

- Tampere University, FI
- University of Turku, FI
- Wirepas, FI
- KTH, SE
- TU Delft, NL
- University of Amsterdam, NL
- TU Wien, AT
- IBM Research Zürich, CH
- Politecnico di Milano, IT
- Politecnico di Torino, IT
- University Of Bologna, IT
- Queen's University Belfast, UK
- UP Valencia, ES
- Ecole Centrale de Lyon, FR

Associated partners

- Exafore, FI
- Minima Processor, FI
- Methority, SE
- Ericsson, SE
- IS Wireless, PL
- Thales Netherlands, NL
- TTTech, AT
- Arduino, CH
- Xilinx Research, IE
- CERICT, IT
- IBT Systems, IT
- Telefonica, ES

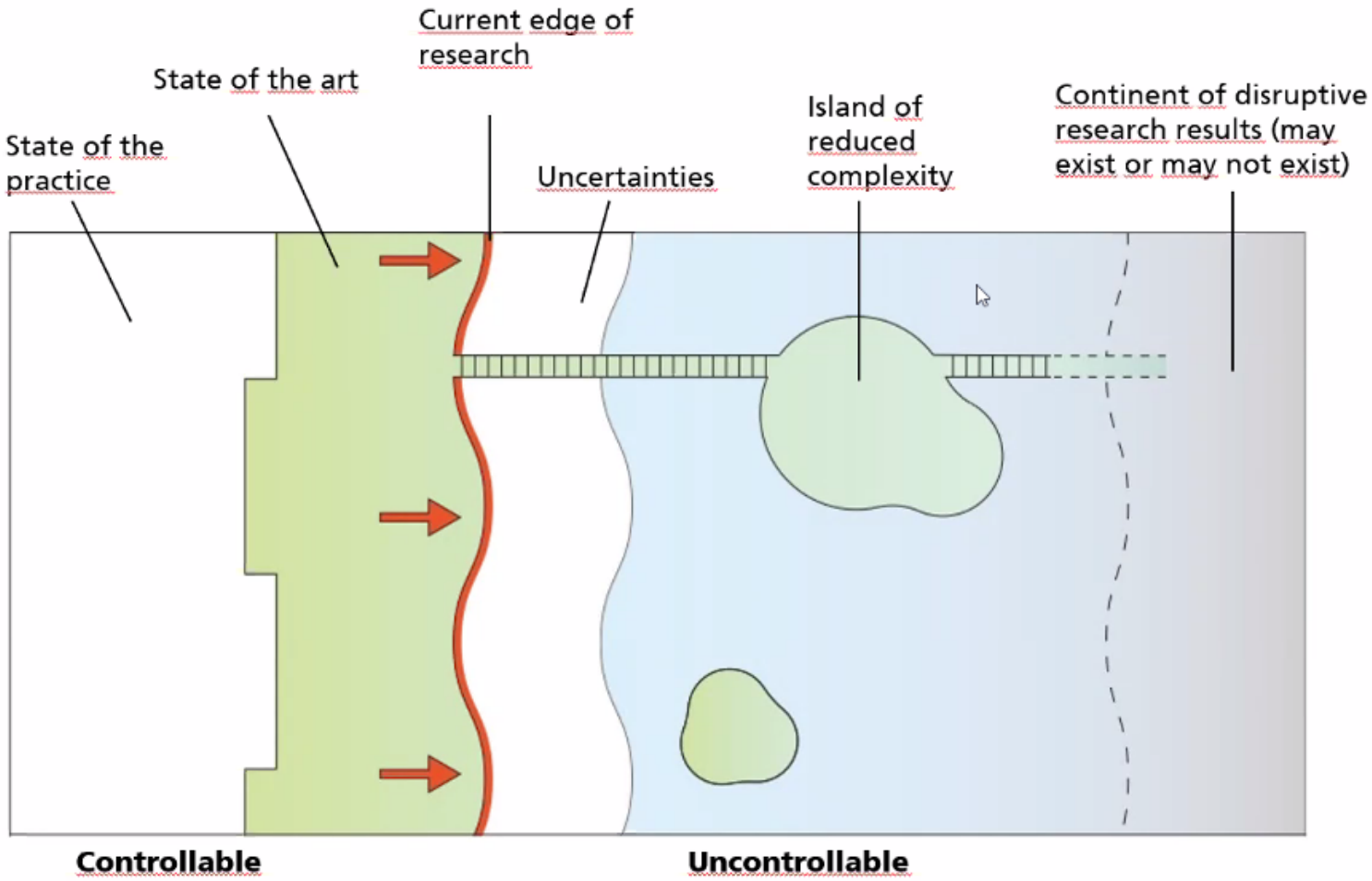
Machine Learning and Artificial Intelligence

- Definition: Artificial intelligence (AI) is intelligence demonstrated by machines
- AI research goals include, e.g., reasoning, knowledge representation, planning, learning, natural language processing, perception and the ability to move and manipulate objects
- Machine Learning (ML) is a subset of AI, but the terms are often used interchangeably (correct or not…)
- There are many brands of ML (and even more of AI)
  - Supervised learning
  - Unsupervised learning
  - Semi-supervised learning
  - Reinforcement learning
  - Deep learning
  - …

Prominent ML applications

- Speech recognition
  - Digital assistants
  - Voice-controlled interfaces
- Text analysis
  - Recommendations, targeted advertisements
  - Chatbots
- Image classification
  - Medical image interpretation
- Automation
  - Machine vision
  - Autonomous vehicles

Essence of research



Source: Peter Liggesmeyer, Fraunhofer IESE – DATE 2021 panel on autonomous systems

Tampere University

Agenda 15.2.

9:00 Opening

9:15 Mohammed Elmusrati, UWASA: Introduction to ML (on-line videos)

10:45 Break

11:00 Mohammed Elmusrati, UWASA: Discussion and Q&A on the introduction, conclusions on the online lectures

11:45 Long break

13:00 Jani Boutelier, UWASA: Explainable AI

13:45 Satu Tamminen, UO: Understandable AI

15:15 break

15:30 Francesco Morandin, Parma University: Deep learning methods: a practical approach

17:00 End of day

Agenda 16.2.

9:00 Antti Oulasvirta, Aalto: Human AI

10:30 Break

10:45 Vagan Terziyan, JYU: AI under Attack: Adversarial Machine Learning

(slides available at JYU AI website)

12:15 Long break

13:45 Andrei Costin, JYU: Machine learning in IoT/Embedded system security

15:15 Break

15:30 Juha Röning, UO: Why NOT AI in information security

17:00 End of day

Agenda 17.2.

9:00 Joni Kämäräinen, TAU: The major open problems of computer vision – Past and present

10:30 Break

10:45 Simo Särkkä, Aalto: ML in Positioning

12:15 Long break

13:45 Jukka Heikkonen, UTU: Sensor fusion based situational awareness for autonomous ships and forest machines

15:15 break

15:30 Jukka Talvitie, TAU: ML for 5G

17:00 End of school

Assignment

For students, 2 credits available against the return of an assignment:

- Write a learning diary on the lectures and discuss what are the main take-aways for your own work
- Target: 3-5 pages
- Deadline February 28, 2021
- Don’t forget to include your student number.

Return to jari.nurmi@tuni.fi