TDDE19
Advanced Project Course – AI and Machine Learning
Introduction

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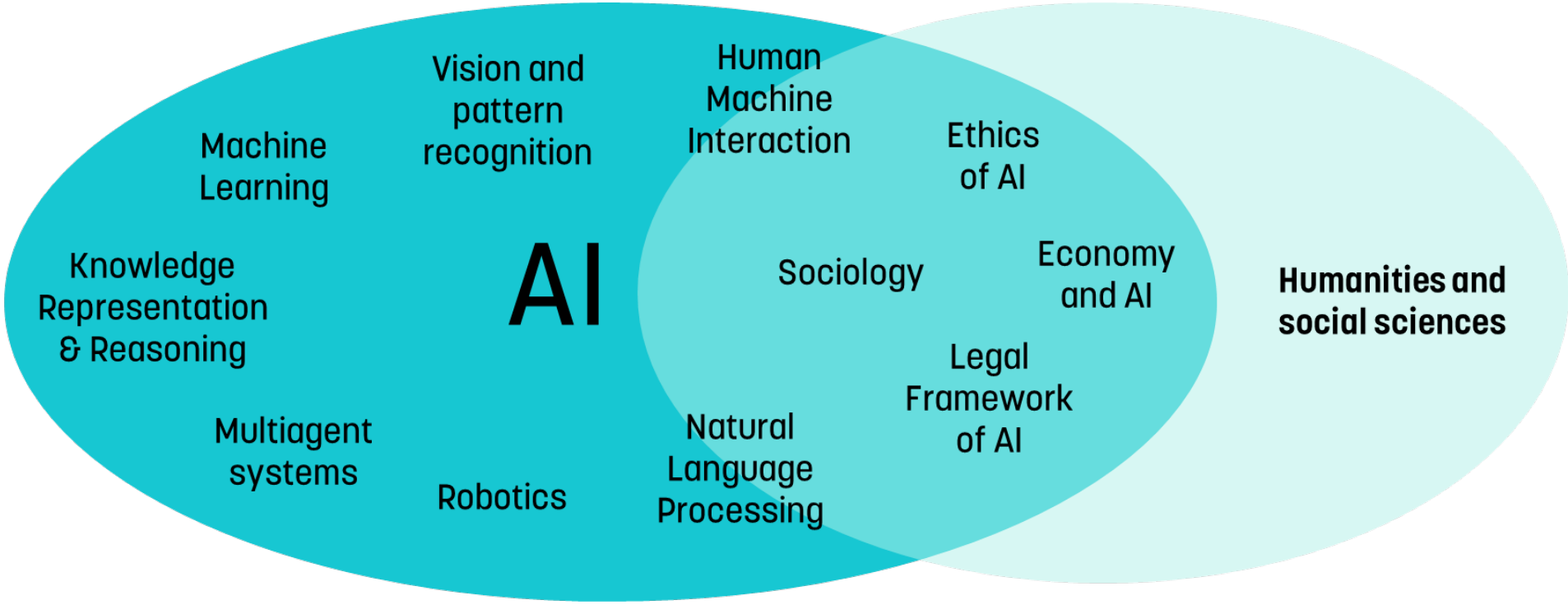
ARTIFICIAL INTELLIGENCE AND INTEGRATED COMPUTER SYSTEMS
AIICS

Erik Sandewall

- First professor of Computer Science in Sweden
- Introduced AI in Sweden after doing research in the US at Stanford and MIT with the founders of AI
- AI is part of CS education since the first program in 80’s

https://liu.se/artikel/erik-sandewall---den-envise-visionaren

LiU | AI


Machine Learning
Vision and pattern recognition
Human Machine Interaction
Ethics of AI
Knowledge Representation & Reasoning
AI
Sociology
Economy and AI
Humanities and social sciences
Legal Framework of AI
Multiagent systems
Natural Language Processing
Robotics

LiU | The AI Innovation, Competence and Research Ecosystem

TrustLLM

TAILOR

AI SWEDEN

AI INNOVATION of Sweden

Elements of AI

AI Competence of Sweden

WASP ED

WASP—HS

WASP WALLENBERG AI, AUTONOMOUS SYSTEMS AND SOFTWARE PROGRAM

CHALMERS UNIVERSITY OF TECHNOLOGY

KTH VETENSKAP OCH KONST

LINKÖPINGS UNIVERSITET

LUNDS UNIVERSITET

UMEÅ UNIVERSITET

UPPSALA UNIVERSITET

ÖREBRO UNIVERSITY

AI4EU

European AI-on-demand Platform and Ecosystem

TAILOR

AI DIH network

Artificial Intelligence Digital Innovation Hubs Network

Humane-AI-Net

VISION

network of AI networks

AI4Media

eu ROBOTICS

Promoting excellence in European robotics

The AI Data Robotics Association

BDV BIG DATA VALUE ASSOCIATION

ellis

EurAI

European Association for Artificial Intelligence

CLAIRE

Confederation of Laboratories for Artificial Intelligence Research in Europe

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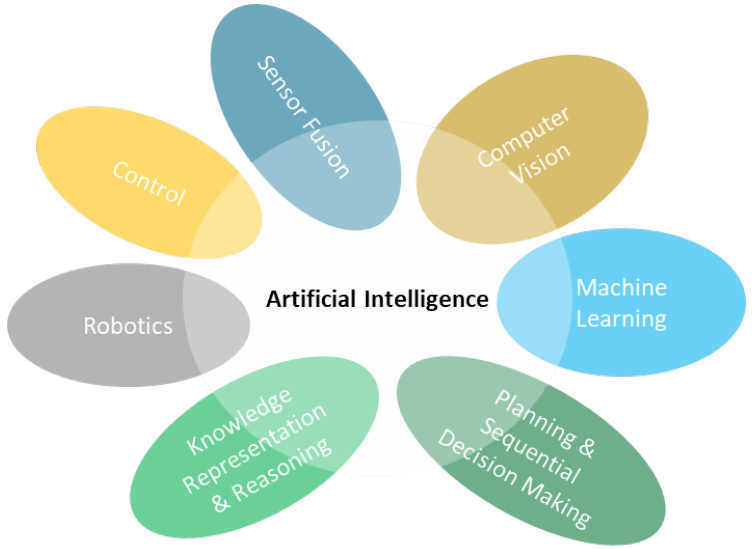
SWEDISH ARTIFICIAL INTELLIGENCE SOCIETY

AI och Integrerade Datorsystem (AIICS)

- High & Full Autonomy
- Deployable Real-world AI
- Continual Adaptation
- Human-AI Collaboration
- Ethical and Trustworthy AI
- Safe, Secure and Reliable AI



Humanoid Lab

AI Academy

Field Robotics Lab

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https://www.ida.liu.se/divisions/aiics/

20+ Years of Experience Building Fielded AI Systems

RoboCup 2000-2017

UAS Research 2000-

WARA PS 2017-

Lecture content

- Course overview
- Projects
- Resources and practical matters

What is the course about?

- Practice to do a real-world AI / ML project
- Show that you can build on your previous experience/knowledge and gather new as needed in order to solve problems and build things
- Demonstrate that you can organize and work together as a development team and produce a resulting artifacts of high quality

Intended learning outcomes

The project should have significant technical level that requires in-depth subject knowledge in artificial intelligence and machine learning, should be carried out in a professional manner, and should develop and consolidate the participants' skills in the following areas:

- Analyze and structure problems in the area of artificial intelligence and machine learning.
- Apply knowledge and methods from a wide range of previous courses in the areas of artificial intelligence and machine learning.
- Independently acquire new knowledge, as required by the project.
- Integrate knowledge from many disciplines and apply them in the context of artificial intelligence and machine learning.
- Formulate a requirement specification for the project based on a project directive and thereby assess the feasibility of the project in terms of technical solutions and available resources.
- Present the project results for teh client as well as for other students, which can not be presumed to be specialists in the techniques used.
- Actively contribute to a well functioning project group.
- Demonstrate the ability to lead the project work with the support of a project model, and with limited access to supervisory resources.
- Plan, implement and monitor a project in the area of artificial intelligence and machine learning.

The result of the project work should:

- Attain high technical quality and be based on modern knowledge and practices in the relevant field of technology.
- Be documented in relevant project documents and relevant technical documentation.
- Be presented orally.
- Meet the requirements stated in the specification.

Course evaluation and improvements (2024)

- Students were generally satisified
  - But there is room for improvements
- Good with a project process (e.g. SCRUM)
  - But SCRUM / the execution of SCRUM was not good

New last year:

- Multiple customers
- Each customer is a projecy supervisor (and a subject matter expert)
- Projects were now have connection to on-going research
- A more suitable project process for AI projects was used

Course evaluation and improvements (2025)

- Only 9/41 students answered the evaluation
- Varied scores, some really loved it and some not so much
  - ➢ But all viewed the course as highly relevant to their education
- Some raised issues with confusion with what/how to actually do AI/ML projects
- Some raised issues with different difficulty levels of different projects – hard to do anything about

New this year:

- Intro-session on how to do AI/ML projects in practice (**15/9**)
- Intro-session to AI-assisted software develppment (**15/9**) (https://cursor.com/students)
- Additional expectation that everyone commits work on git under their own name
  (or swap regularily if working together)

Project Work

- A project group: ~6 students
- Common theme (a project), different tasks within the group
- Expected work load: 160h
- Customer/supervisor
- Regular meetings with customer/supervisor: ~1h/week
- Emphasis on *integration* and *operational constraints*

Dividing work load

- Some projects can involve preprocessing / visualization / ”getting others code to work”, make sure to spread that load among the student group.
- Subgroup of maximum 2-3 students
- Designate a project leader
  - Responsible for the *active planning document* and its weekly update
  - Make sure that coordination and integration works smoothly
  - Everyone must sync (report to) the project leader each week.

Project Deliverables

- **Planning report**
- **Individual and collective activity update of *active planning document***
- **Half-time report**
- **Code** (on gitlab)
- **API and installation documentation** (on gitlab)
- **Group report** presenting AI techniques and results

Project Deliverables | Planning report

Why?

As an individual

- To get you to think about the whole and the details

As a group

- To get you to decide your part and understand what other members are doing

Examination and guidance

- To grasp what each individual should do
- To catch group related problems early

Project Deliverables | Active planning document

As a group and individually

For every week:

- What do you plan to do?
- How many hours do you plan to work?
- What was done?
- How many hours did you work?

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45	**Timmar plannerade**			…
	Timmar gjorda			…
	Plannerat			…
	Gjort			…
46	**Timmar plannerade**			…
	…			…
47	**Timmar plannerade**			…
…	…	…	…	…

Make a plan for all weeks of the project

- Concrete/detailed close in time
- More vague further into the future

> Update ahead of each weekly meeting <

everyone (not just the project leader)

Project Deliverables | Code and Readme

- **Each group will get a Gitlab repository**
- Access will be granted for
  - Group members
  - customer/supervisor
  - examiner
- License: MIT
- At the end of the project, the result has to be **reproducible** by following the **Readme instructions**

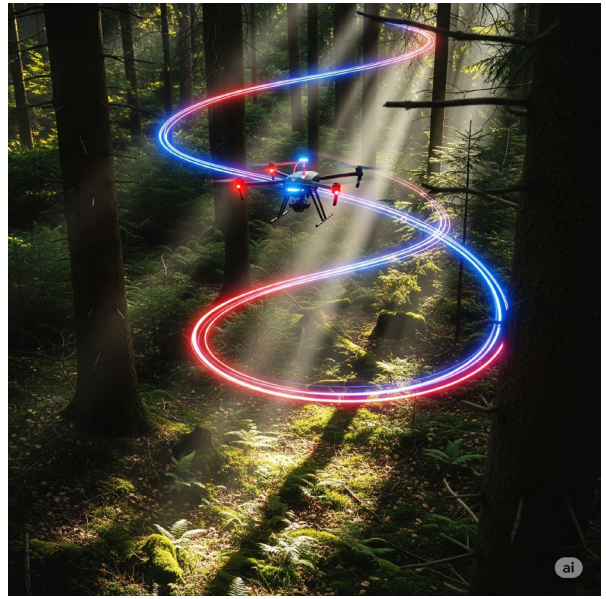
Project Selection

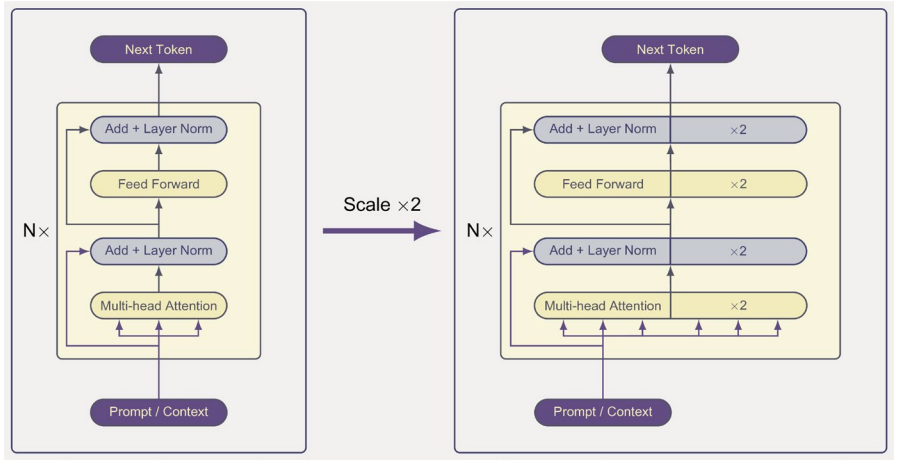
1. After this presentation, you should form groups on your own
   - Sign up on webreg (Group 1-6)
2. **Email me before Wednesday 13:00** with**:**
   - Your group (list all members)
   - A ranked list of **all** projects (1-6, where 6 is highest score)
     1) 2 (Project 1 is given score 2, i.e. the second least favored by the group).
     2) 5
     3) 1
     4) 3
     5) 4
     6) 6
3. I will run the Hungarian method to do an linear-optimal project assignment among the groups.

More info on the course website: https://www.ida.liu.se/~TDDE19/info/projects.en.shtml

Projects

- Semantic mapping
- Raising an LLM
- Mastering the Unpredictable: AI Control with Gaussian Processes
- Personalized natural interface
- Who says?
- FastTalk: Real-Time STT -> LLM -> TTS





Projects

See: https://www.ida.liu.se/~TDDE19/info/projects.en.shtml

Resources and practical matters

- You will get temporary access to AI workstations at the AI Academy lab (E-bulding, next to Gödel).
- RTX 3090TI
- Rootless Docker give you freedom

- No central storage!
  - You can log on to any machine, but the storage for your account is local.

- **Be nice and share**
  - Sometimes you can have multiple machines. Most often: 1 machine per group.
  - Tgere are more than you that use the reasources and who have equal rights to them.

Remember

- Deadline for project preferences is Wednesday 3th of September at **13:00**.
- After this presentation, you should form your groups
  - Add them to webreg: https://www.ida.liu.se/webreg-beta/TDDE19-2025-1/PROJECT
- I will invite you to your planning document and your GIT repo when the groups are assigned

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Institutionen för Datavetenskap

www.ida.liu.se/~matti23/mattisite/research/

www.liu.se/ai-academy

www.liu.se/medarbetare/matti23

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