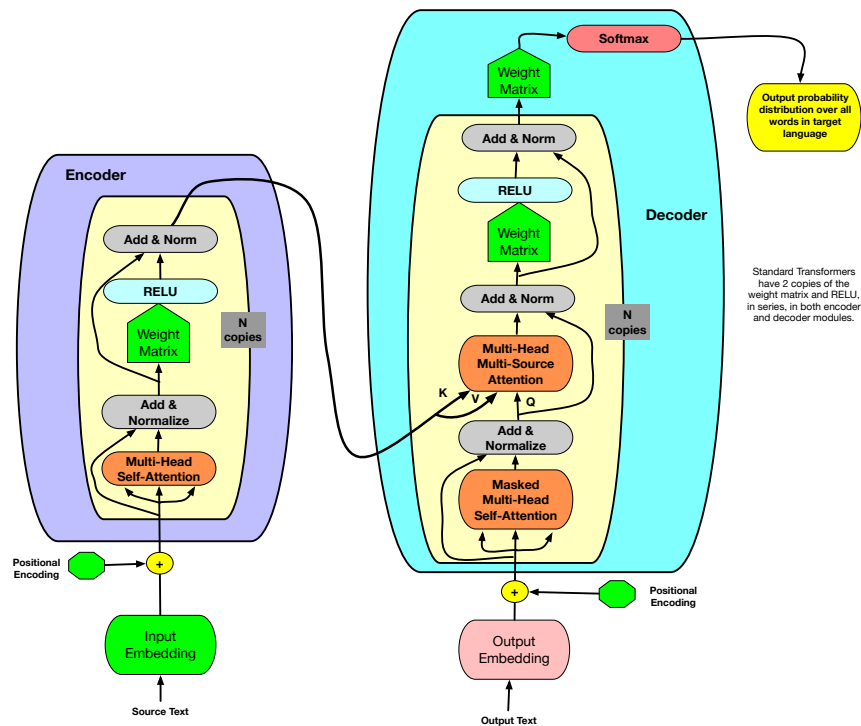


Artificial Intelligence Master Studies at IDI / NTNU

**Generic AI Professor (who can occasionally pass the
Turing Test)**

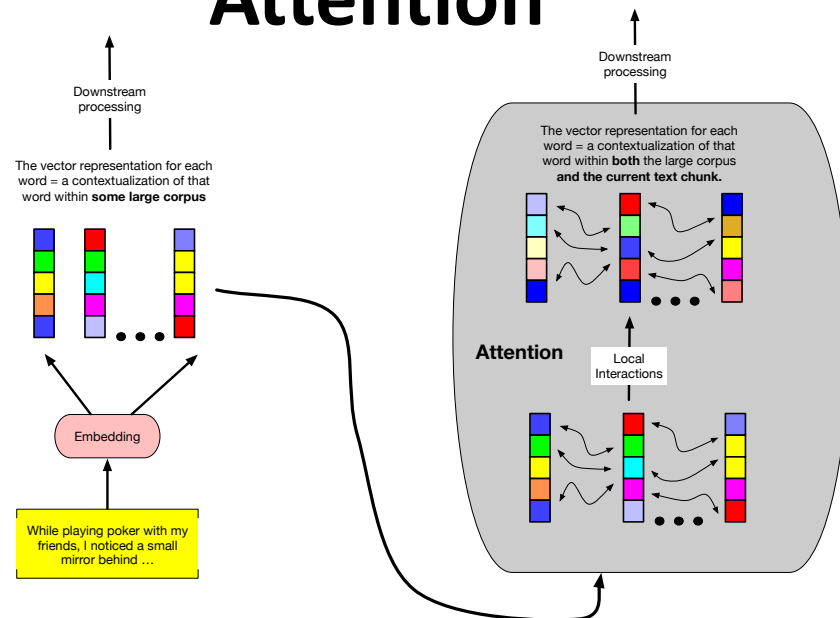
Data and Artificial Intelligence Group (DART)

Transformer

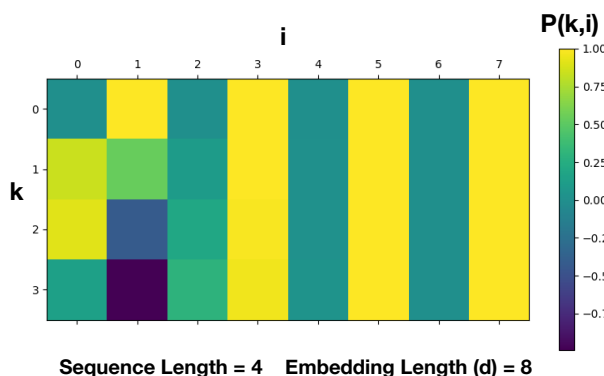


What is all this??

Attention

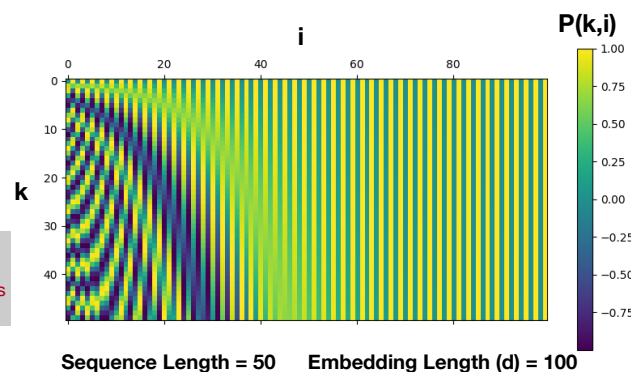


Embedding



Sharp oscillations due to alternation of sin and cosine along each row.

Oscillation frequency increases vertically (with k) and decreases horizontally (with i)



**Answer:
The guts of
ChatGPT
(as best
we know)**



Me: Write a 6-line poem to welcome new AI students in the style of a Norwegian weatherman.

ChatGPT (3.5):

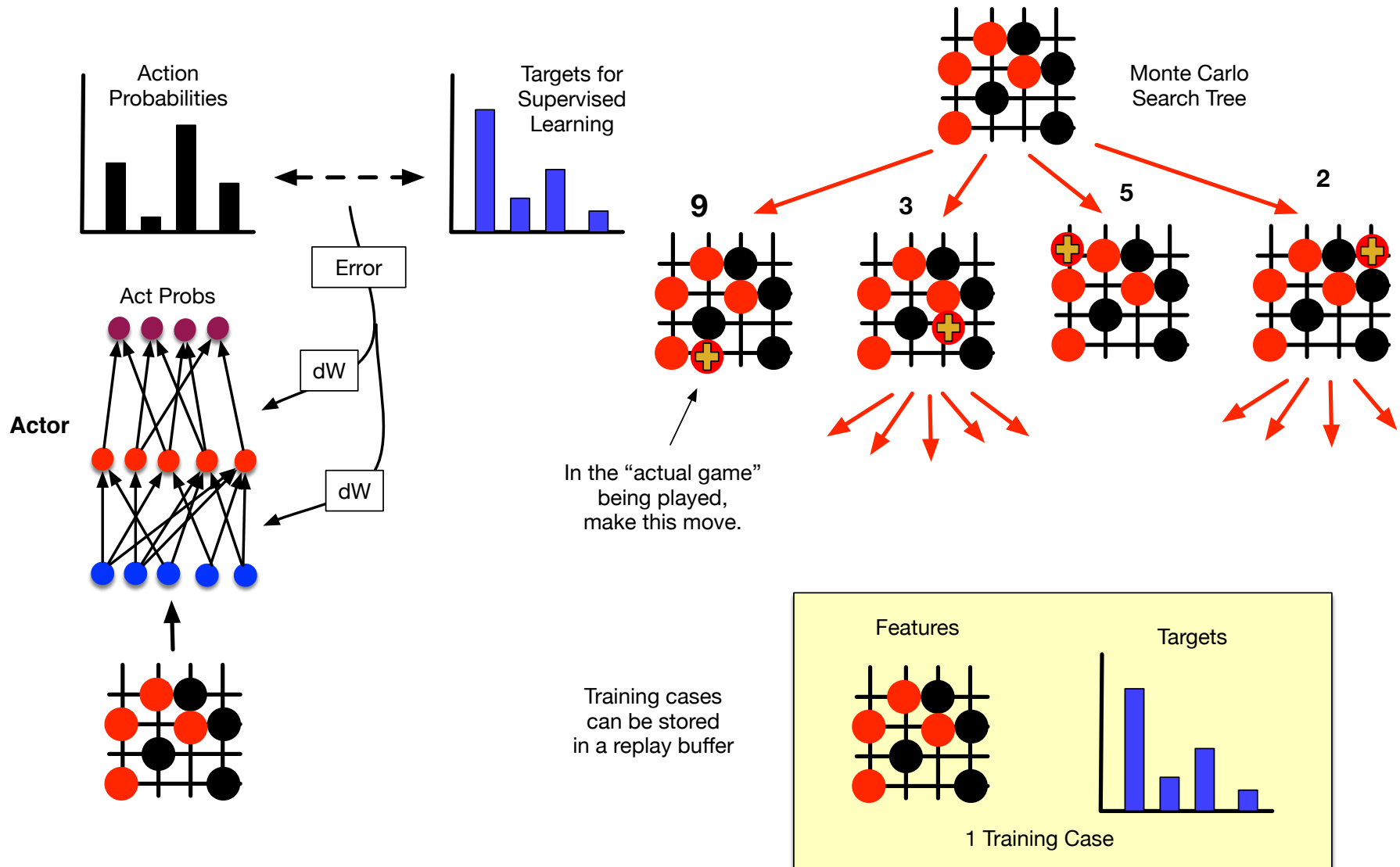
Greetings, budding minds, to AI's embrace,
As code and circuits intertwine in grace.
Like fjords and forests, mysteries unfold,
In algorithms' dance, a story yet untold.
With neural skies and data's winds to steer,
Welcome, students, to AI's frontier!

Me: Could you make it a little less welcoming and a little more threatening?

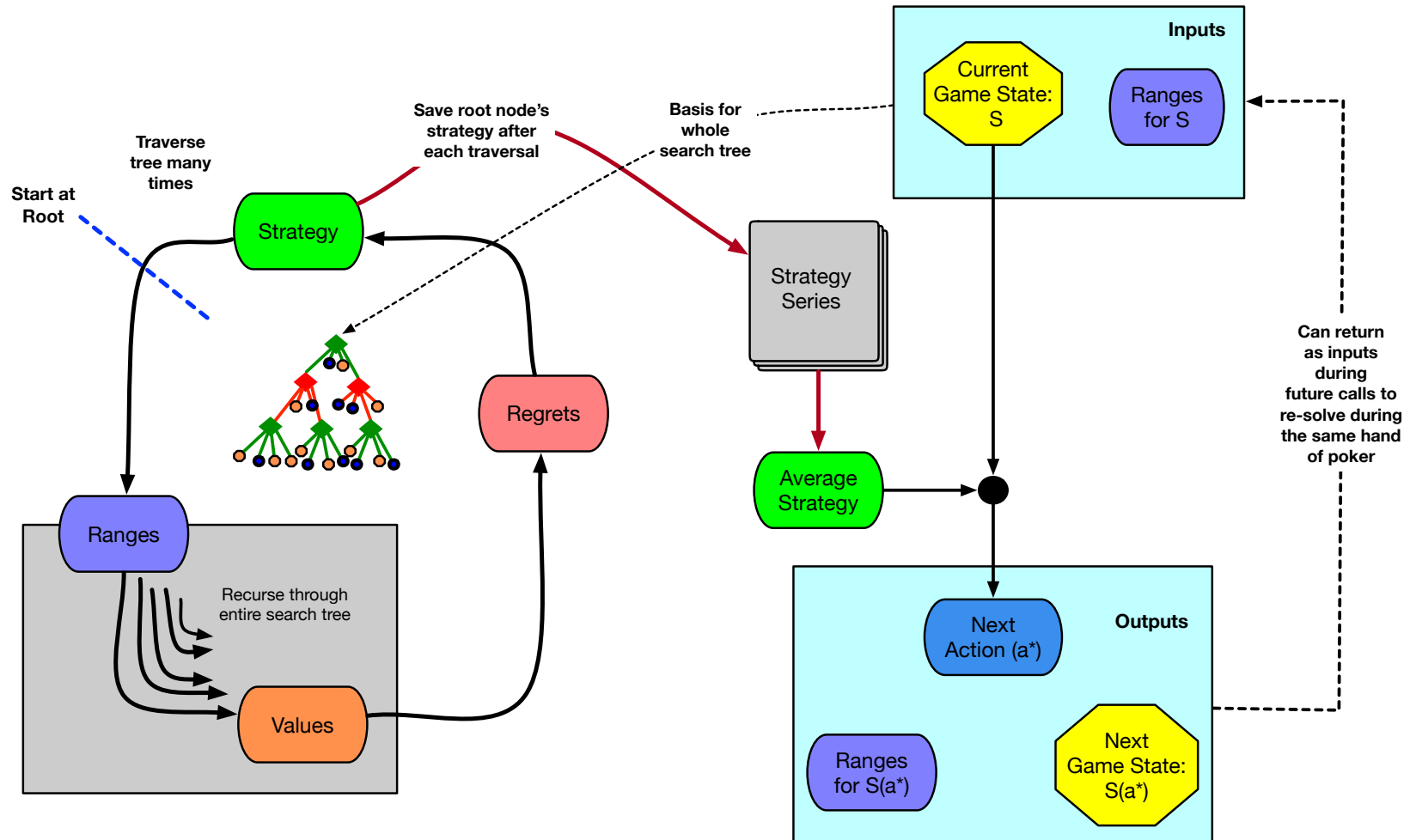
ChatGPT (3.5):

Beware, newcomers, to the realm of code,
Where AI's power and mysteries erode.
In tangled circuits, secrets may arise,
As algorithms weave their cunning lies.
Dark currents lurk beneath the digital sky,
Forge ahead, or in shadows you may lie.

AlphaGo (2016)



DeepStack (2017)



Today, many people want a relationship to/with Artificial Intelligence

Good News / Bad News

- [+] Employers want AI students for their AI skills, and not just as clever programmers
- [-] They don't really know what AI can / can't do
- [-] Competition for spots in AI Masters program
- [+] There's some AI in ALL of IDI's study lines.

AI skill = understanding + building, not just using.

Words from The Masters

“... there is currently a war for the scarce AI talent...”

+ “AI is the new electricity.”

– Andrew Ng, Professor at Stanford

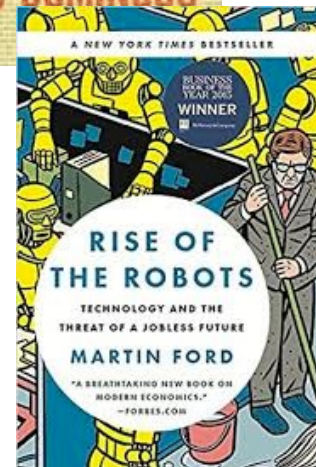
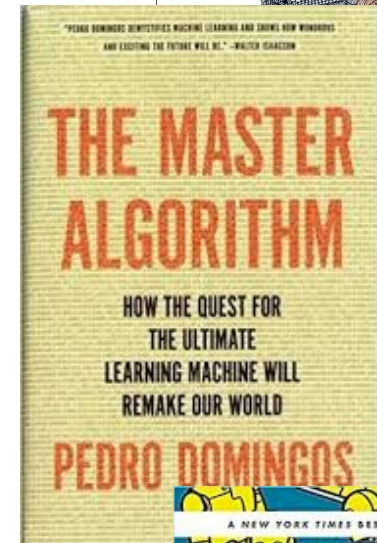
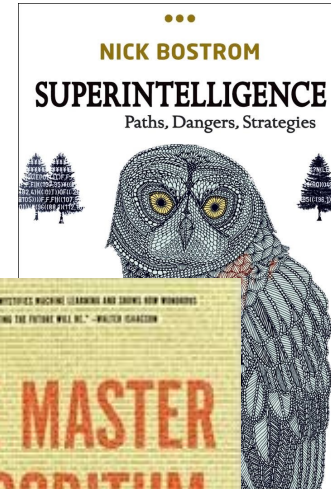
“The rise of powerful AI will be either the best or the worst thing ever to happen to humanity. We do not know which.” – Stephen Hawking, famous physicist.

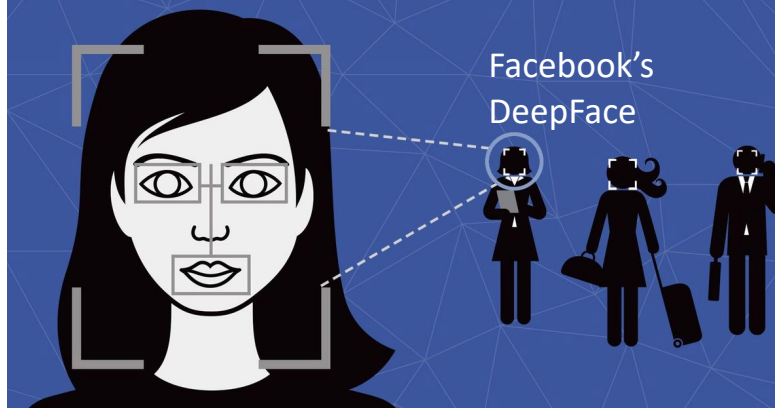
“If you don’t learn AI, you’re going to be a dinosaur within three years.” – Mark Cuban, famous US businessman.

“You won’t lose your job to an AI, but you might lose it to someone who knows AI.” - Scott Galloway (popular tech podcaster)

“In the algorithmic dark, we lose our way. And the machines we built become our prey.” -- ChatGPT (when asked to provide an AI quote in the style of Bruce Springsteen’s (dark) Nebraska album).

The big tech companies now compete to build THE AI platform (Chatbot?) of the future.





- Science –vs- Science Fiction of AI
- Today's AI systems: facts -vs- hype

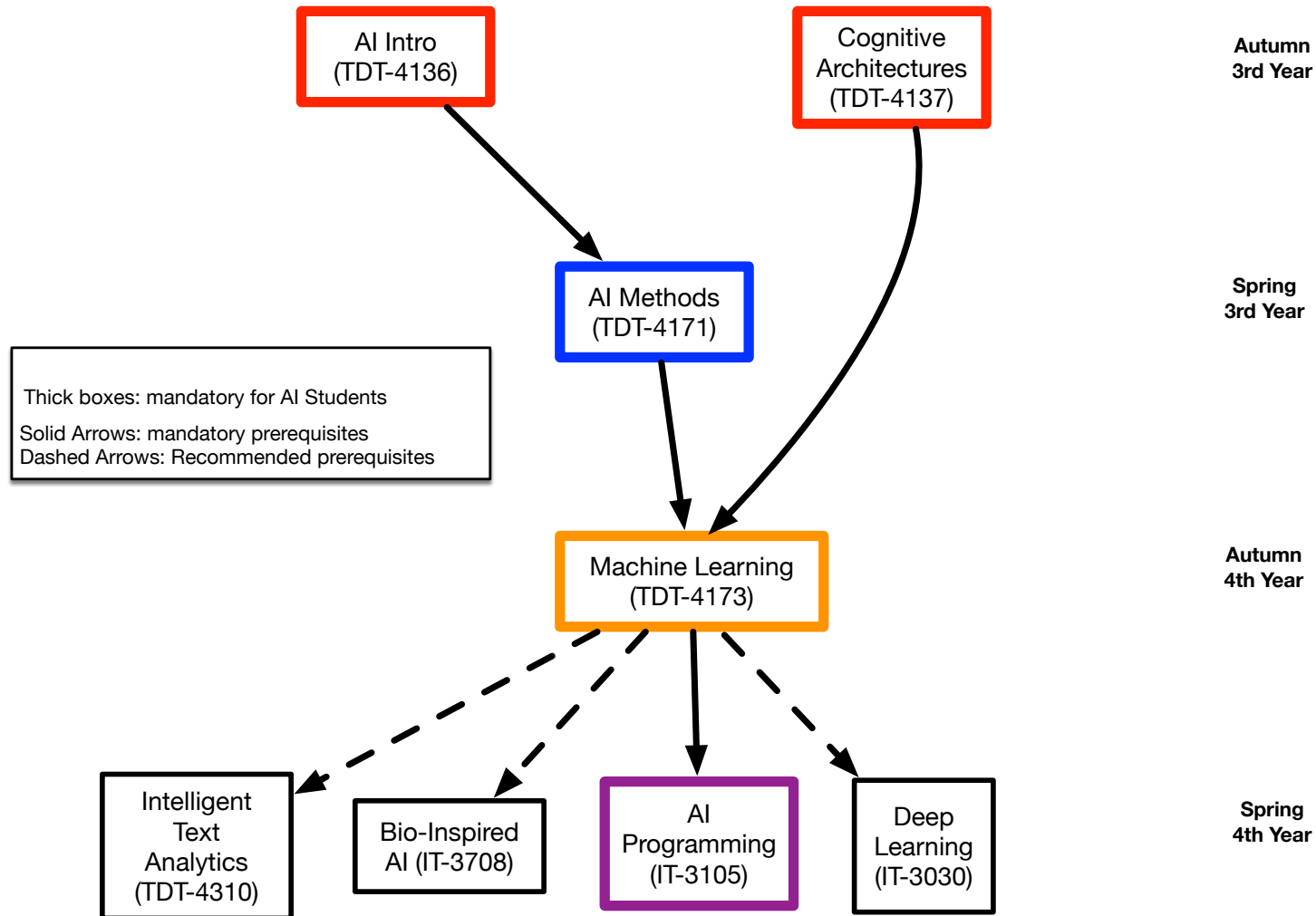


Popular AI Topics at IDI

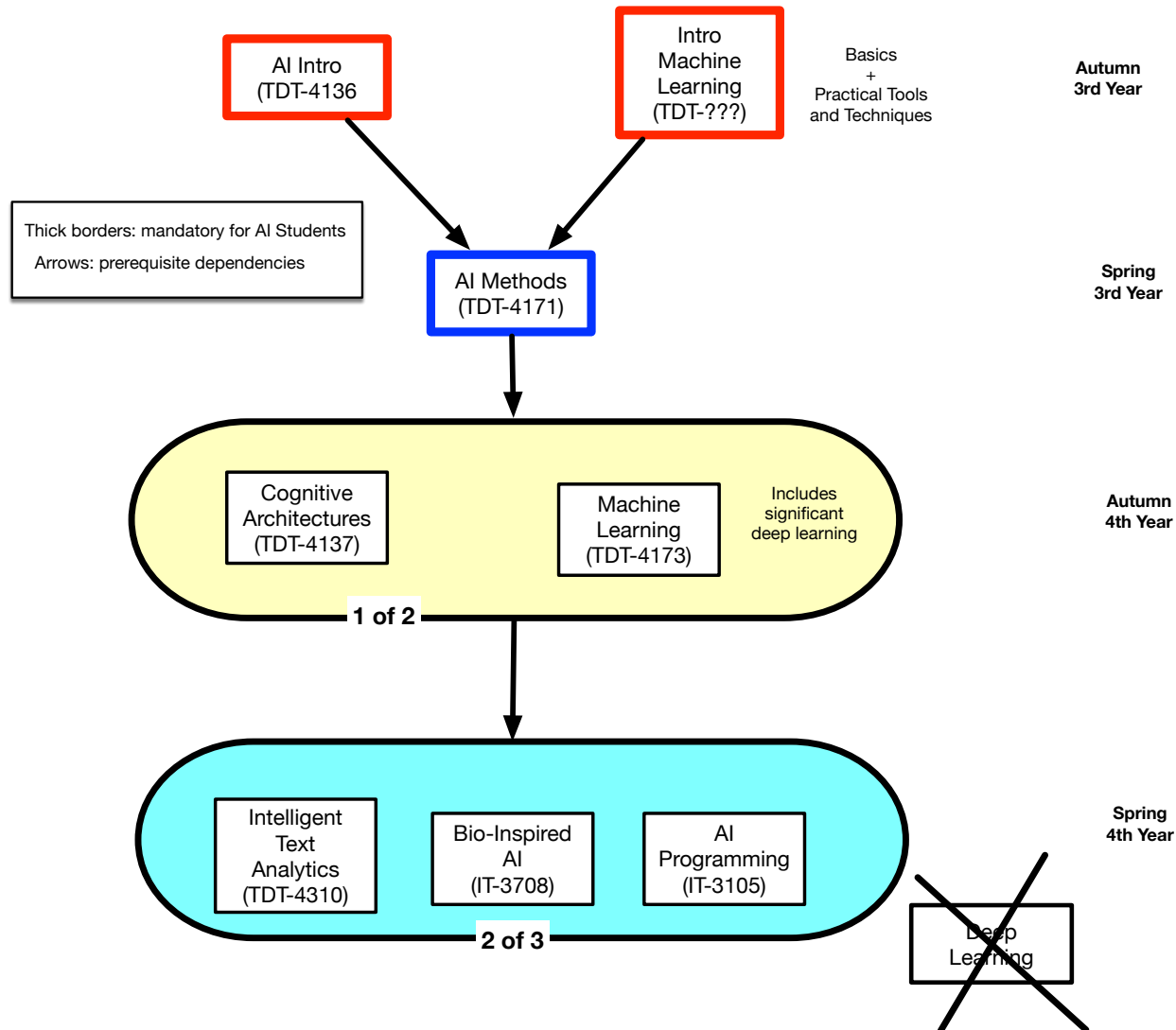
- Deep Learning (Neural Networks)
- Natural Language Processing / Text Analytics
- Bayesian Decision-Making
- Case-Based Reasoning
- Evolutionary Algorithms
- Multi-Agent Systems / Swarm Intelligence

- What's in your toolkit?
- Today, AI is everywhere, and anyone can use it, but you need **special competence** to **understand + develop** it.
- Lots of (fun?) programming.

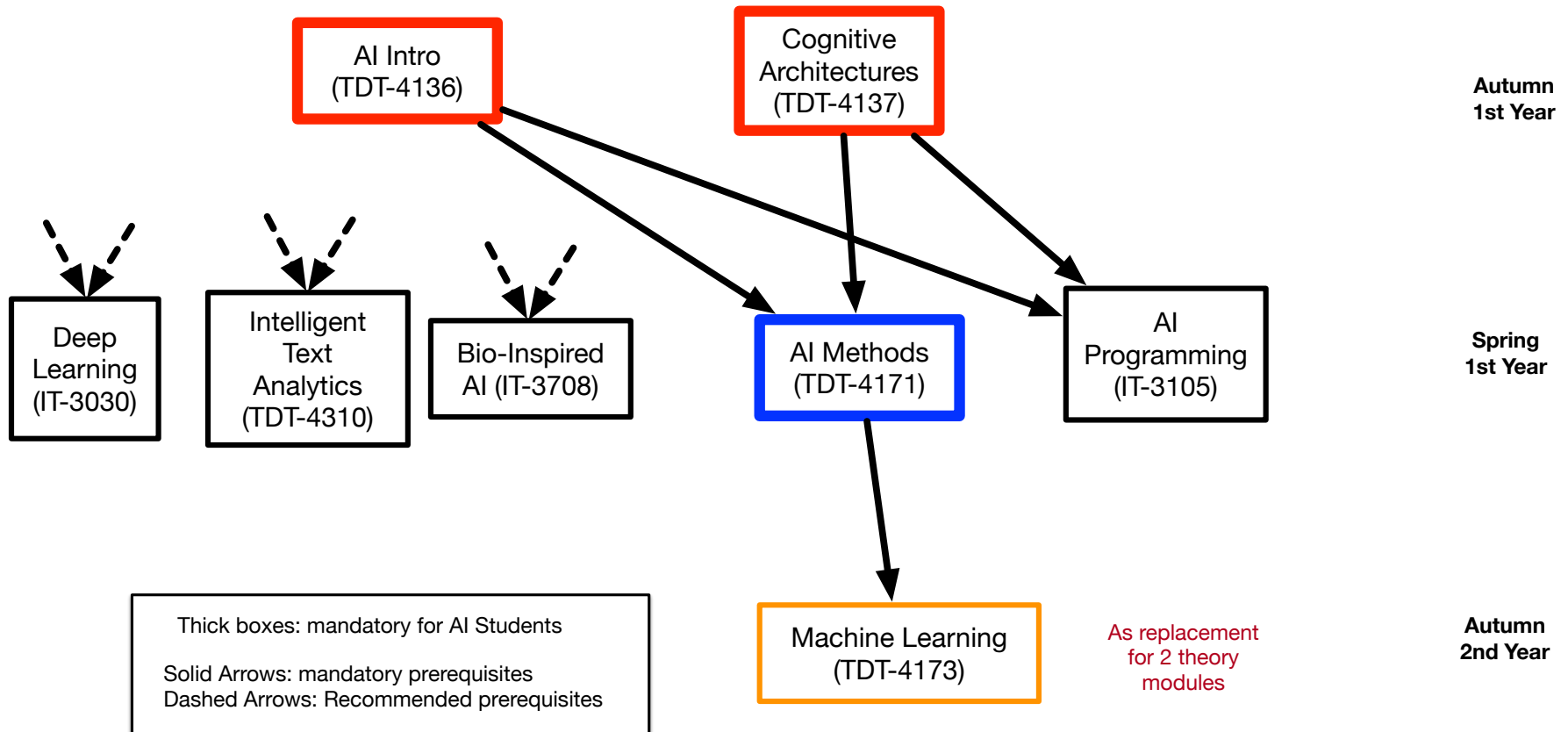
AI Course Structure (Through Spring 2024)



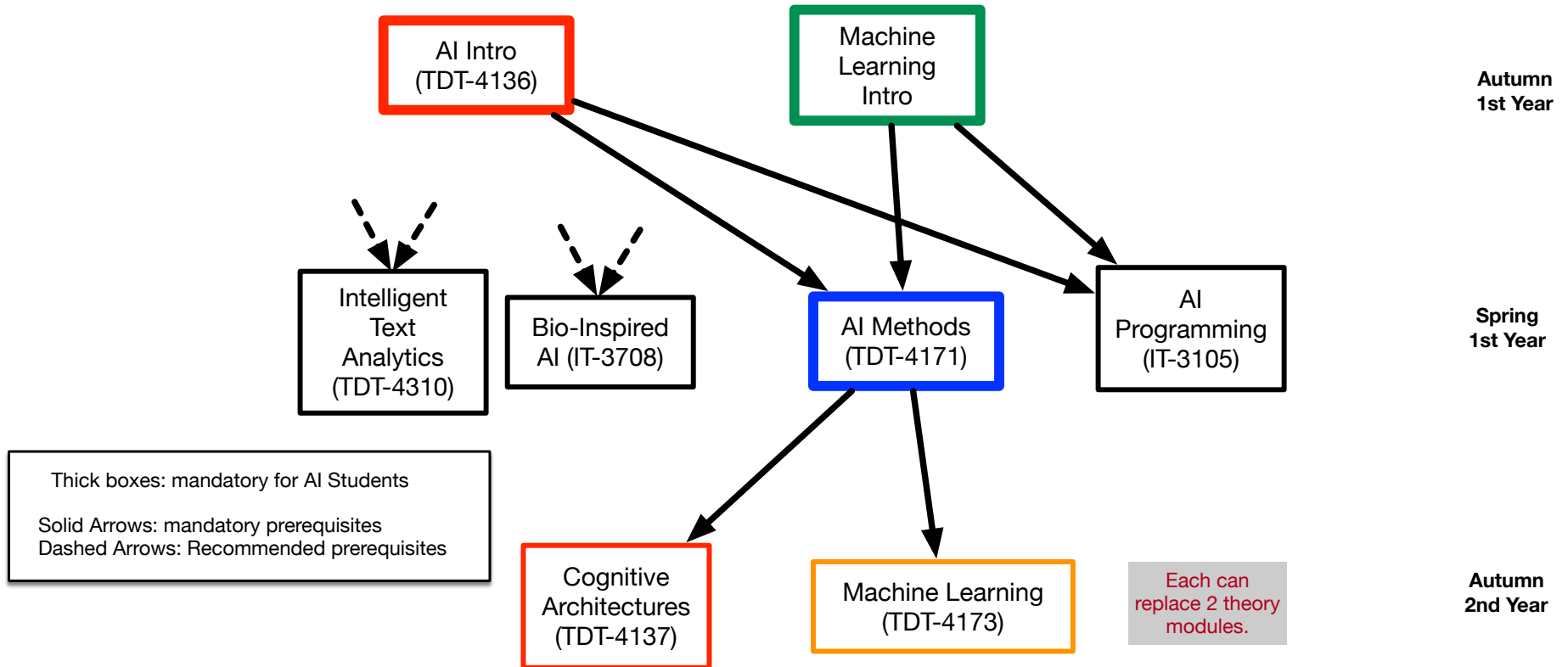
AI Course Structure (From Autumn 2024)



AI Course Structure for 2-year Master (to Spring 2024)



AI Course Structure for 2-year Master (from Fall 2024)



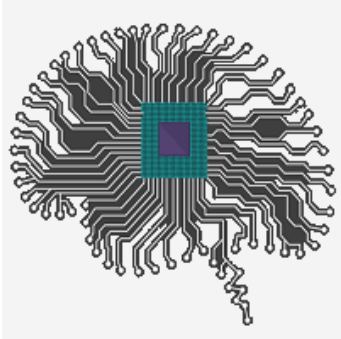
AI Courses

- AI-1 (TDT4136; autumn)
- Cognitive Architectures (TDT4137; autumn)
- Machine Learning (TDT4173; autumn)
- Machine Learning Intro (starting autumn 2024)
- AI-2 (TDT4171; spring)
- AI Programming (IT3105; spring)
- Intelligent Text Analytics and Language Understanding (TDT4310; spring)
- Bio-Inspired AI (IT3708; spring)
- Deep Learning (IT3030; ending spring 2024)
- [Theory Models; 3.5 credits each; autumn]
Applied ML, Advanced Bio-AI, Computational Creativity, Causal Modeling, Advanced NLP, AI for Time-Series Analysis...

Student comments:

- *De mest interesserte og dyktige studentene fra informatikk- og datalinjene flokker seg til disse AI emnene.*
- *Sett av mye tid til faget og du kommer til å lære kjempemye og faktisk ha det moro samtidig.*

AI Research Goals

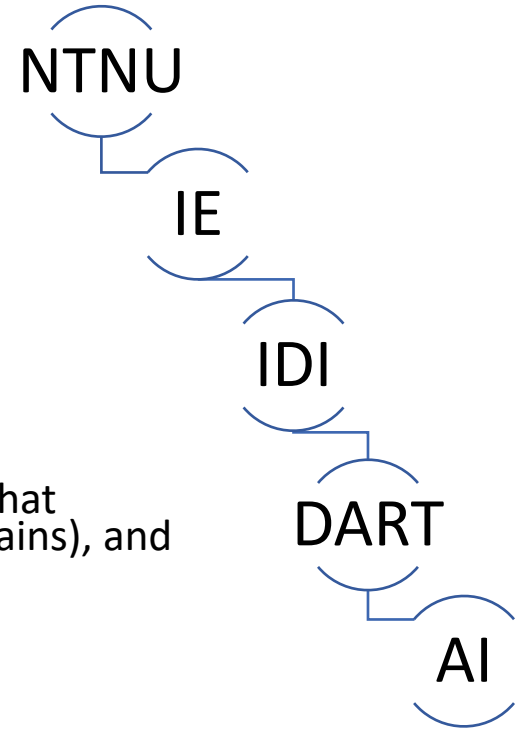


- Technological

- Develop **smart** computer systems: those that behave **intelligently** (often in narrow domains), and which **learn** from experience.

- Scientific

- Increase our understanding of intelligence (in general) in humans, other animals, and machines by designing computational models of sensing, reacting, reasoning and learning.



Recent AI Master's Theses

Build systems that problem-solve, learn, and/or self-organize

"Your project → Your choice" [...within reason 😊]

- Literature-based Knowledge Discovery in Climate Science
- Artificial Immune Systems for Detecting Fake News
- Flocking for Road Traffic Efficiency Improvement: A Concept Study
- Generating Blues Solos with Variational Autoencoders
- Deep Reinforcement Learning for playing Diplomacy
- Swarm Intelligence for Urban Transit Routing
- Deep Learning Classification of Bird Songs
- Human Activity Recognition with Bodily Accelerometer Sensors + Deep Learning.
- Decision Support for Exposed Aquaculture Operations
- Detecting Power-Line Faults with Drones and Deep Learning (**Big Prize Winner !!**)
- Computer Generated Poetry with Inherent Sentiment
- Deep Learning Facial Recognition (**of salmon**)

Same Procedure Every Year...

- Explore topics in your AI courses, online, etc. (3rd year)
- Read IDI's posted projects (spring semester, 4th year)
- Talk to teachers about projects
- Register project priorities online
- Handle acceptances and rejections (late spring semester, 4th year)
- Pick theory modules (early autumn 5th year)
- Define project in detail + investigate related work (autumn, 5th year)
- Deliver report on detailed project goals, background, related work, etc. (December, 5th year)
- Deliver final thesis (June, 5th year)
- Enter real world ... make lots more money than your professors.

Some Useful Master Links

<https://folk.idi.ntnu.no/keithd/ai-masters/ai-master-main.html>



Pinar



Ole Jakob



Björn



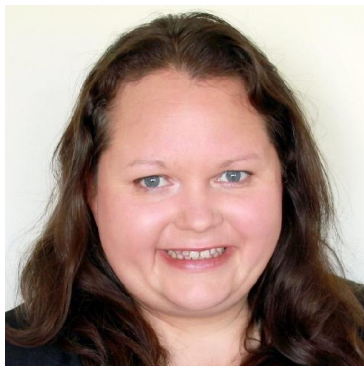
Keith



Rudolf



Pauline



Kerstin



Zhirong



Helge

Norwegian Open AI Lab

- A center for research, innovation and education within Artificial Intelligence
- Established in 2017, as Telenor-NTNU AI Lab with SINTEF
- Ensures collaboration between academia, industry and public sector
- Hosted by the Department of Computer Science, NTNU
- Strong NTNU research team, with a core team of 12 professors, 21 associated professors & 75+ PhD students

OUR PARTNERS



HOW WE COLLABORATE WITH PARTNERS

Projects

- Research
- Innovation

Students

- Master's theses
- PhD projects
- Student events
- Student organisations

Events

- Conferences
- Webinars
- Workshops

Education

- Master's and PhD education
- PhD summer school
- Continuous education (EVU)
- Elements of AI



NorwAI

Center for Research-based Innovation

Enhance technology transfer, internationalization and researcher training through long-term research conducted in close collaboration between research-performing companies and prominent research groups.



NTNU



KONGSBERG



COGNITE

TrønderEnergi®



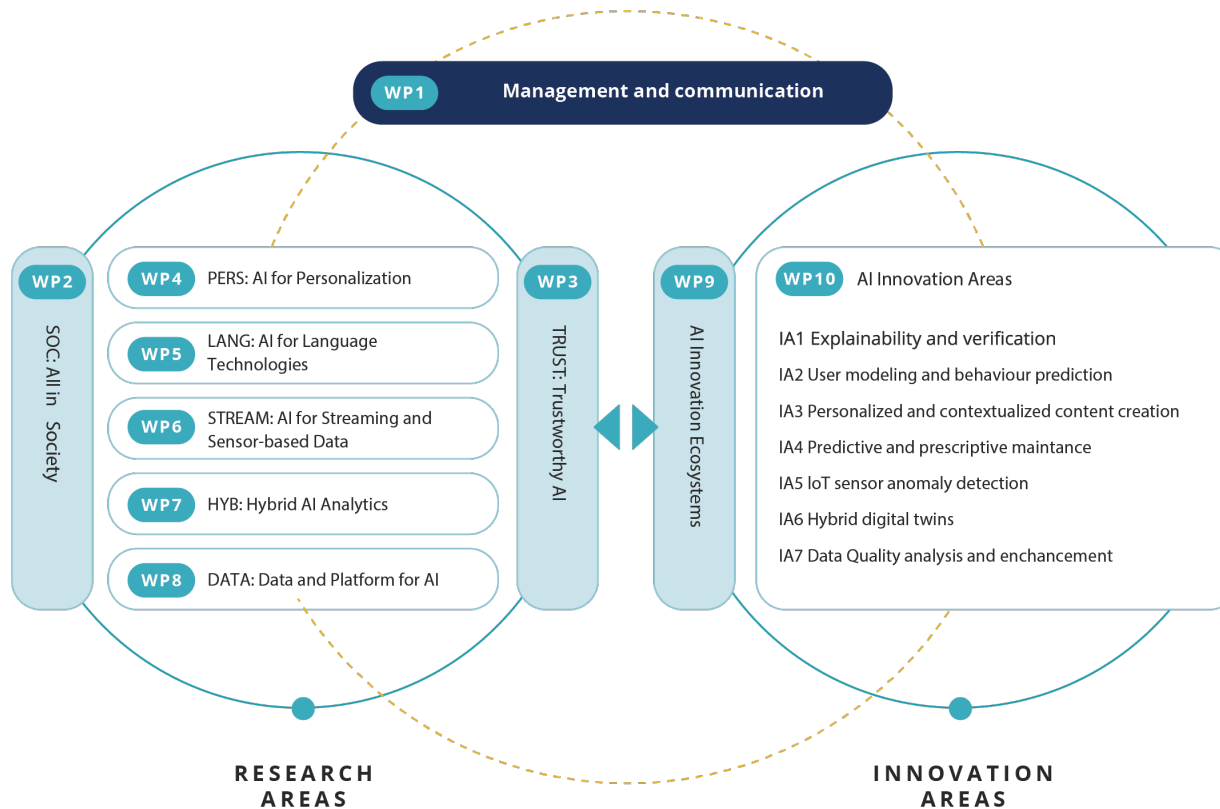
Schibsted



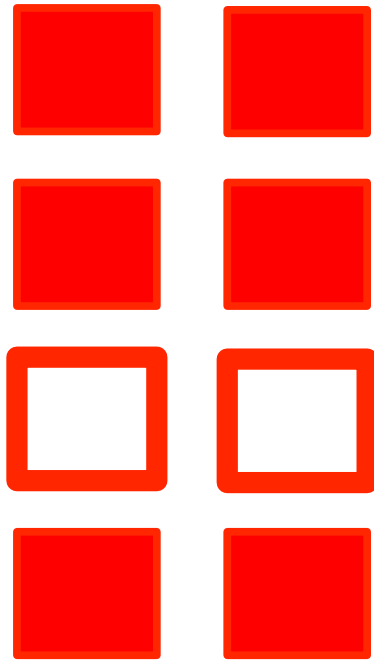
Retriever



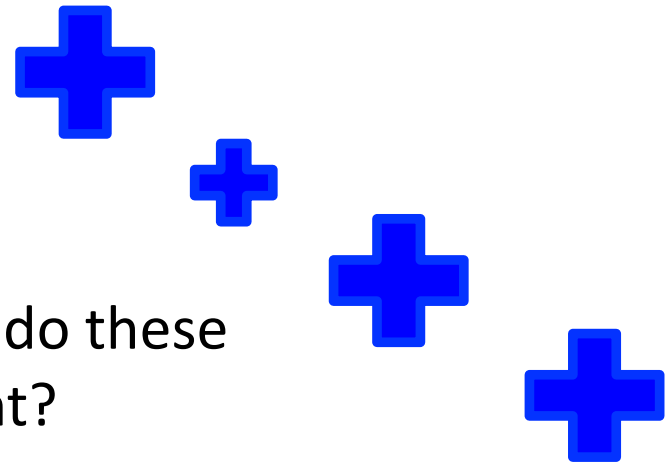
Research and Innovation Areas



Can a Robot ~~Fail~~ Get a C in Math 101 and Still Take Over the World ??



What concept do these
both represent?



How much trust should we put in
a technology with these types of
deficiencies?

Humans are still (**barely**) the masters
of **abstraction & common sense**