Welcome to DART — Introduction to the AI Master Class

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DART — Data & Artificial Intelligence Group

- People
  - 25 faculty, 19 PhD students, 1 post doc, 5 scientific assistants, 7 associated
- Labs
  - Norwegian Open AI Lab
  - Norwegian Research Centre for AI innovation
- A bunch of externally funded research projects and cooperations
AI Master Class

❖ We do computer science
  ❖ Science is about method over results
  ❖ Science is about theory over belief
❖ We need to
  ❖ know what we know
  ❖ be thorough in our approach
  ❖ be able to argue our results
❖ This is what the AI Master Class is about: you doing the best possible work
Overview of the Master Class, 2021

- 14/09/2021 — Welcome to Dart, introduction and how to do research questions
- 28/09/2021 — Doing structured literature reviews and how to read and write a research paper
- 12/10/2021 — How to write a thesis
- 26/10/2021 — Using HPC at NTNU and Reproducibility
- 09/11/2021 — How to do qualitative empirical research (Might change)
The Scientific Method
Scientific Method in AI Research

Belief about AI method ➔ Study design ➔ Hypothesis ➔ Prediction ➔ Experiment ➔ Results ➔ Interpretation

Adjust

Compare
Your thesis

❖ You might save the planet
  ❖ However, if you do not know *how* and *why*, and can’t describe it — it has little value

❖ What do you aim for?
  ❖ The average student can *reproduce knowledge*
  ❖ The above average student can *add to knowledge*
  ❖ The good student can *reflect on said addition*

❖ All of this goes into your thesis!
How to grade ‘science’

❖ A — Excellent
❖ An excellent performance, clearly outstanding. The candidate demonstrates excellent judgement and a high degree of independent thinking.

❖ B — Very Good
❖ A very good performance. The candidate demonstrates sound judgement and a very good degree of independent thinking.

❖ C — Good
❖ A good performance in most areas. The candidate demonstrates a reasonable degree of judgement and independent thinking in the most important areas.

❖ D — Satisfactory
❖ A satisfactory performance, but with significant shortcomings. The candidate demonstrates a limited degree of judgement and independent thinking.

❖ E — Sufficient
❖ A performance that meets the minimum criteria, but no more. The candidate demonstrates a very limited degree of judgement and independent thinking.

❖ F — Fail
❖ A performance that does not meet the minimum academic criteria. The candidate demonstrates an absence of both judgement and independent thinking.
Method is our friend

❖ Say this every morning when you look in the mirror: “Method is our friend!”
How to Formulate a Research Question

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What are Research Questions

- These are the questions that your work should answer
- These are the questions you are evaluated on
- There are the questions your thesis answer
- There are the questions that guide your choice of methods or problem
- They guide your choice of evaluation method, which guides your choice of research questions
Research Questions

❖ How to chose you research question
❖ There is a very difficult(*) and interesting(**) problem that needs to be solved
❖ There is a very interesting(*) and promising(**) method that could be applied on an existing problem
❖ There are some flaws or issues with an existing method
❖ Research questions are all pointing towards the same goal
What is your Goal?
What are your Research Questions?
Going Forward
… is always: “have anybody been doing something similar before?”

❖ The answer is (almost) always yes!
❖ How to evaluate?
In this case we can approach figuring out who did what and how in a systematic manner.

Stay tuned for September 28th
Second Question ...

- ... is always: “what is my contribution?”
- This is formally not a research question.
- How to evaluate?
Third Question ... and beyond
Example: From Single-objective to Multi-objective

❖ **Goal** Create a multi-objective meta-heuristic algorithm based on a single-objective algorithm from the literature.

❖ **RQ1** Which single-objective algorithm has the best potential for multi-objective extension?

❖ **RQ2** Which multi-objective techniques are most suitable for extending the selected algorithm to multi-objective?

❖ **RQ3** How does the proposed algorithm’s performance compare to other competitive algorithms from the literature?
Example: Telenor Watchdog

- **Goal** Create an application that increases users’ ability to maintain privacy on an Android device by informing about actual and possible threats for disclosure of sensitive information.

- **RQ1** Which techniques can be used to detect possible malicious behaviour of third-party applications based on real-time system monitoring and application analysis on an unrooted Android device?

- **RQ2** What is the best way to inform users about threats in installed third-party applications on an Android device and provide them with incentives to uninstall these applications?

- **RQ3** Which user interaction patterns can be employed to make users aware of their privacy-related behaviour?
Example: Sliding Door

- **Goal1** Design a model of features, human behaviour and intentions.
- **Goal2** Design a mechanism for capturing and extracting features according to the model.
- **Goal3** Design a reasoning mechanism for inference of intention.
- **Goal4** Implement software comprising the results from Goal 1, 2 and 3. Develop a complete software application for the operation of a door equipped with sensors giving it the ability to reason.
- **Goal5** Build a motorised sliding door
- **RQ1** What set of computer vision algorithms will meet Goal 2 efficiently?
- **RQ2** What is a well suited reasoning mechanism for this task?
What is your Poison?