AI MASTER CLASS

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DART AND LABS
DATA AND ARTIFICIAL INTELLIGENCE GROUP

- People
  - 22 faculty, 8 post doc, 14 PhD, 6 adjoint positions
- Labs
  - Big Data Lab
  - Telenor AI lab
  - Gemini Applied Artificial Intelligence centre
  - Gemini Big Data Centre
- SFI/SUF centres
  - Centre for exposed aquaculture operations
  - Centre for scalable data access in the oil and gas domain
  - Centre for excellent IT Education
MOTIVATION – WHY WORKING WITH THE AI-LAB

- Access to relevant projects – both basic and applied
- To allow wide variety of areas and problems
- Cross-disciplinary projects

- lab-affiliated events
- access to real-world problems and datasets
- research collaboration
- state-of-the-art infrastructure
- doctoral and masters’ education
- cloud-scale experiments
- lab-scale experiments
OVERVIEW OF MASTER CLASS

- 02/10 – Welcome to DART / How to formulate a research question
- 06/11 – Structured literature review / Reading a scientific paper
- 20/11 – How to write a paper / Using HPC at NTNU
- 27/11 – How to write a thesis
- 04/12 – Quantitative research / Reproducibility
- 16/01 – DART master student conference
THE THESIS

- You might save the planet. If you don’t know *how* and *why*, and can’t describe it, you won’t get a good grade!
- The average student can reproduce knowledge
- The above average student can add to knowledge
- The good student can reflect on the addition

- All of this is in your thesis!
METHOD IS OUR FRIEND
RESEARCH QUESTIONS
WHAT?

• Research questions
  • How
  • What
  • Why
• How to evaluated your work!
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
‣ They guide your choice of evaluation method, which guides your choice of research questions
RESEARCH QUESTIONS

‣ How to chose your 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
FIRST QUESTION…

- … is always: "have anybody been doing this before?"
- The answer is (almost) always yes!

- How to evaluate?
METHOD IS OUR FRIEND

‣ In this case we can approach figuring out who did what, and how in a systematic manner
‣ Stay tuned for September 18th
SECOND QUESTION...

- … is always: "what is my contribution?"
- This is not formally a research question

- How to evaluate?
THIRD QUESTION...AND BEYOND
EXAMPLE (FROM SINGLE-OBJECTIVE TO MULTI-OBJECTIVE)

- **Goal** Create a multi-objective metaheuristic 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 increase 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 behavior?
EXAMPLE (SLIDING DOORS)

- **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 motorized 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?
EXAMPLE (THE FAIRY TALES OF THE ANT PRINCESSES)

- **Goal1** Increase the number of public transportation passengers by making urban transit networks more efficient

- **RQ1** What is the state-of-the-art in solving vehicle routing problems using swarm intelligence methods?

- **RQ2** How does the proposed algorithm’s computational results compare to results published in the literature?

- **RQ3** What are the potential advantages and disadvantages of using a graph database in our implementation?
WHAT’S YOUR POISON?