Introduction to the AI Master Class

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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: <u>you doing your best possible work</u>

Overview of the Master Class, 2023

* 04/09/2023 — *Introduction, how to do research questions, and CSSC*

* 18/09/2023 — *Doing structured literature reviews, how to read a research paper*

* 02/10/2023 — *How to write a thesis*

* 16/10/2023 — *Using HPC at NTNU, Reproducibility*

* 30/10/2023 — *How to do qualitative empirical research and how to write a paper*

* 13/11/2023 — *Sustainability in AI*

* Week 2, 2024? — *Computer Science Student Conference (exam)*

Computer Science Student Conference

❖ January, 2024?

❖ One day conference for computer students at IDI

❖ Everybody publish an *extended abstract* of their work

❖ Everybody contributes *reviews* and *questioning*

❖ IDI supports the conference with logistics and food

❖ You fill all remaining roles

❖ This is your conference (and exam)

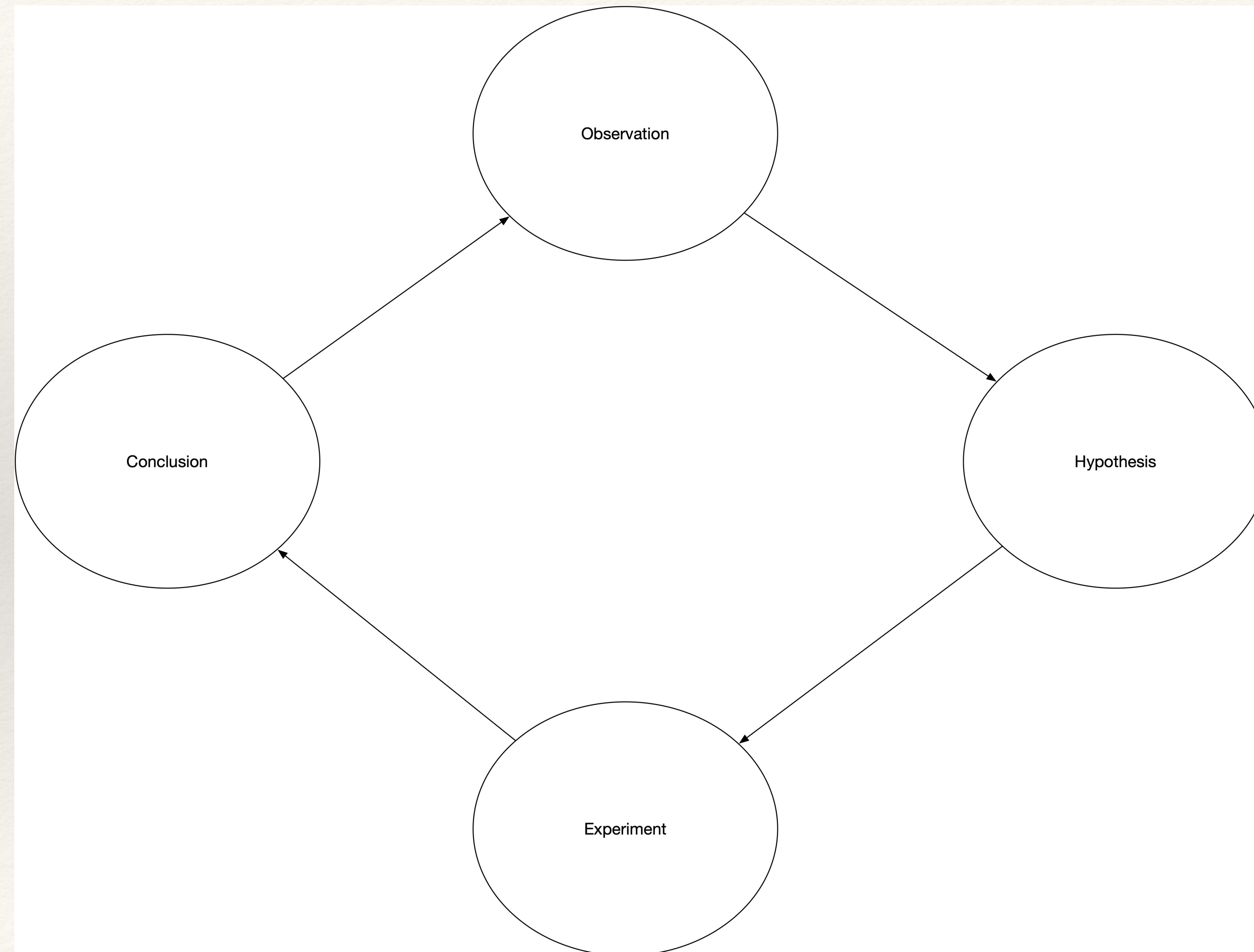https://i.ntnu.no/wiki/-/wiki/Norsk/ TDT70+-+AI+Masterclass
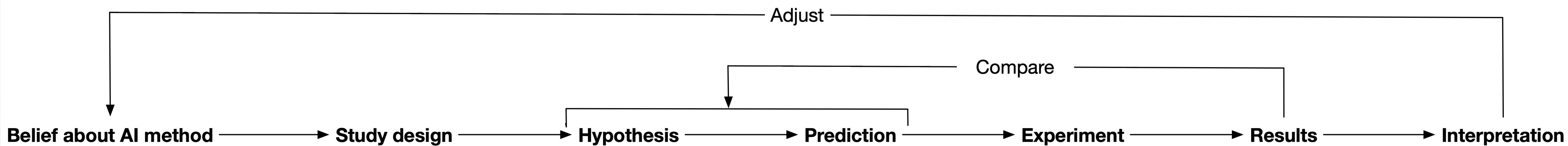
Computer Science

The Scientific Method

Scientific Method in AI Research

Odd Erik Gundersen

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 knowlede**

  * 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!"

AI Master Class, 04/09/2023

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

The Research Box
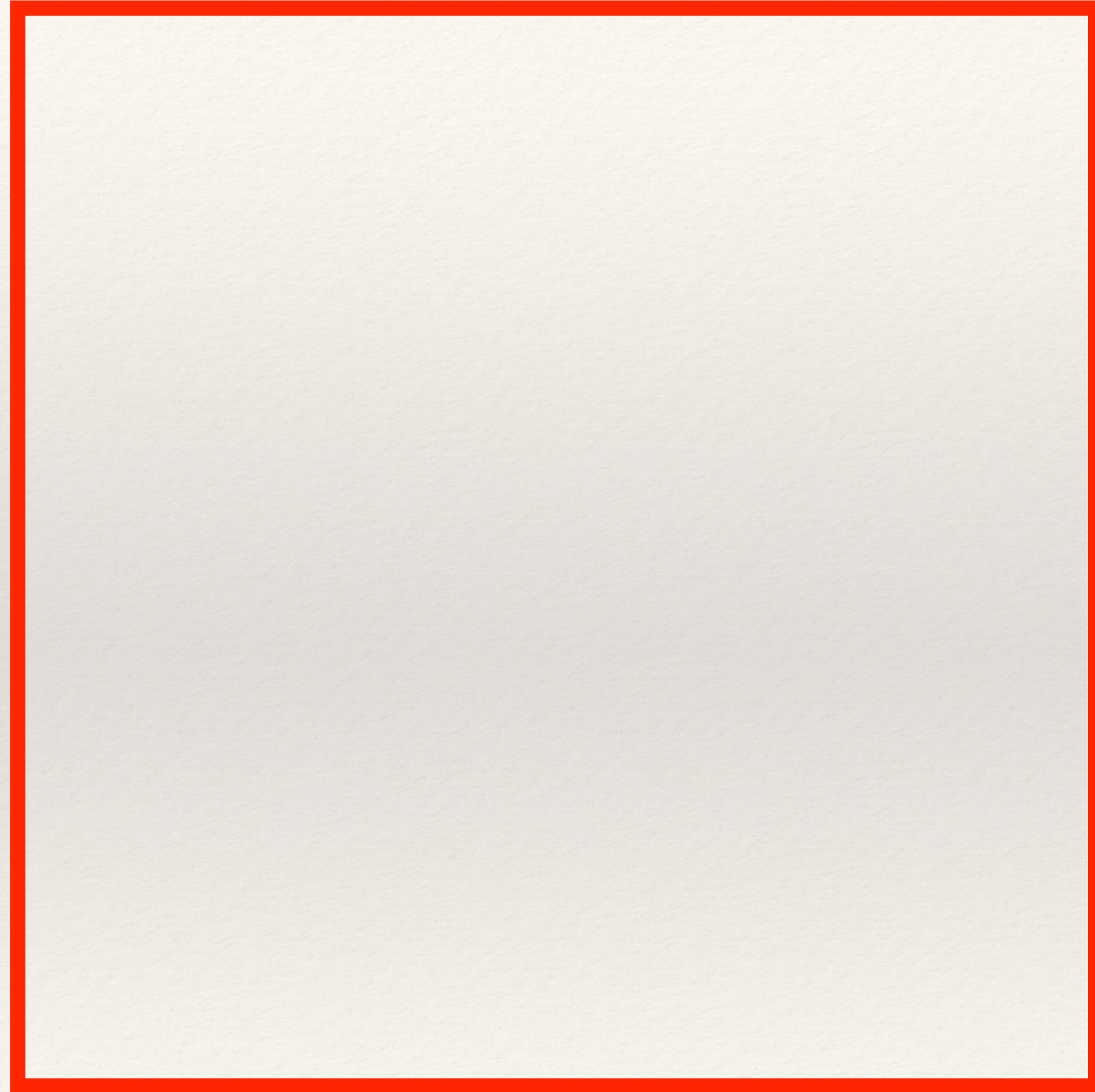
Research Questions

- 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

First Question …

- ❖ … is always: *"have anybody been doing something similar 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.
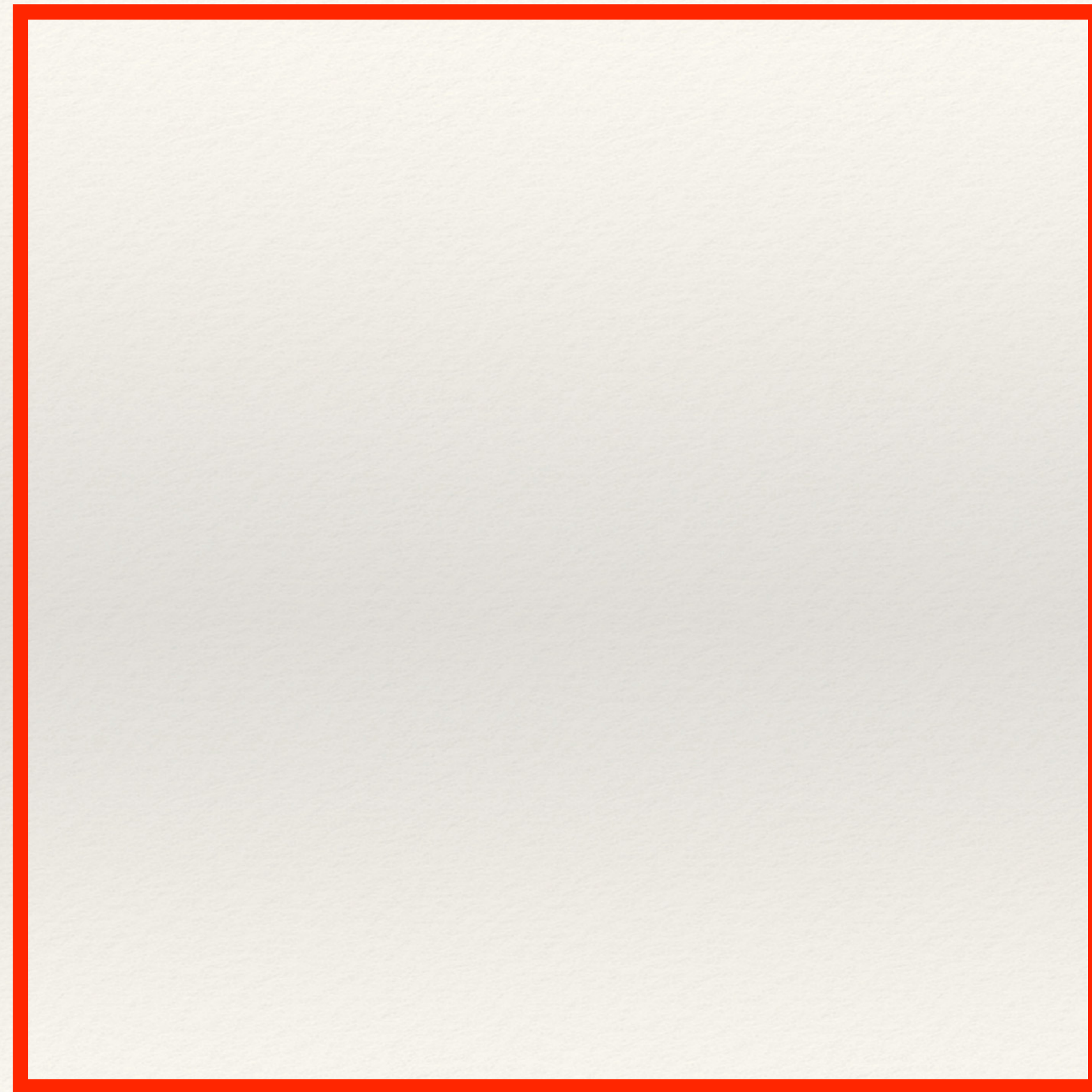
- Stay tuned for September 18th

Second Question …

- ❖ … is always: *"what is my contribution?"*

- ❖ This is 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 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 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?
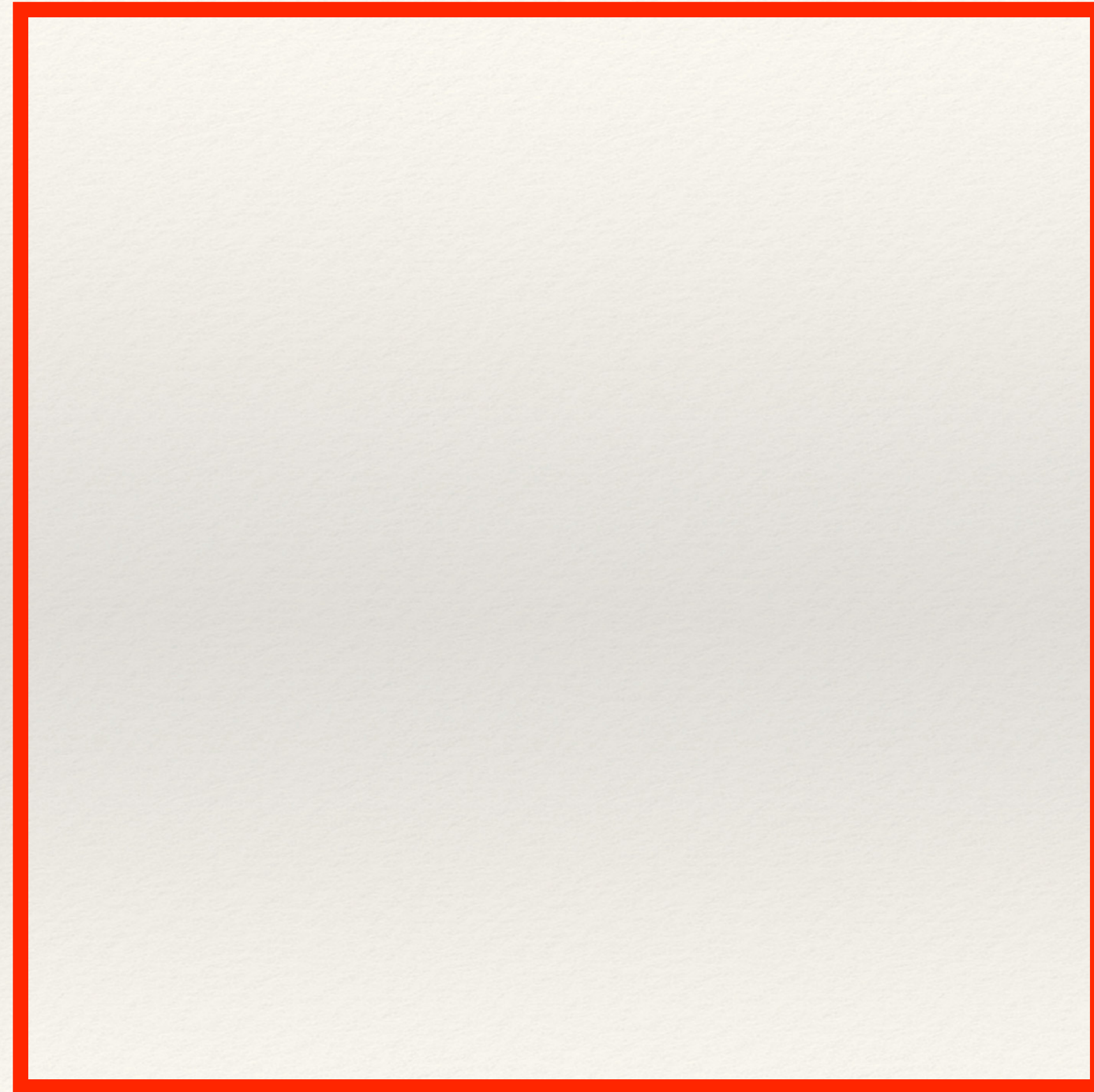
AI Master Class, 04/09/2023

Computer Science Student Conference (CSSC)

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One day conference, January 2024?

- We need organisation

- We need a venue

- We need a program

- We need a key not speaker?

- We need you!

- What should IDI do?

- ….

- …

- ..

- .

-

Why on Earth would we want a conference?

- A conference teaches you to
  - … disseminate science by
    - … summarise your work in written form in very few pages
    - … summarise your work in brief oral form
  - … evaluate science by
    - … evaluate other peoples work from a scientific perspective
    - … contribute in presentations, both giving and receiving
    - … critique information transfer
  - … organise serious events
  - … (have a fun and different exam)
  - …

All of these skills are (also) required in industry!

See you all on September, 18th