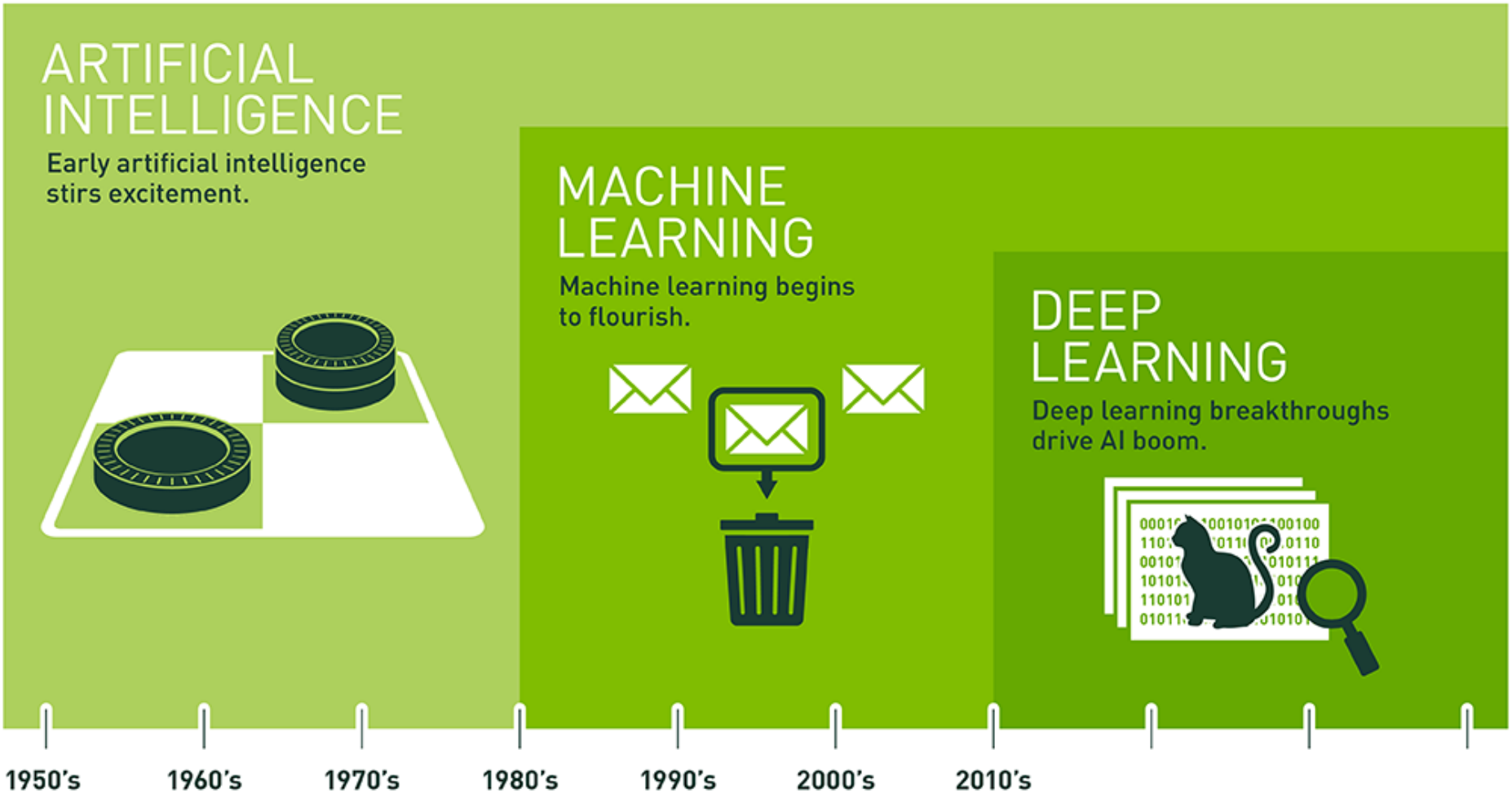
Deep Learning & Applied AI

Introduction

Emanuele Rodolà
rodola@di.uniroma1.it

SAPIENZA
UNIVERSITÀ DI ROMA

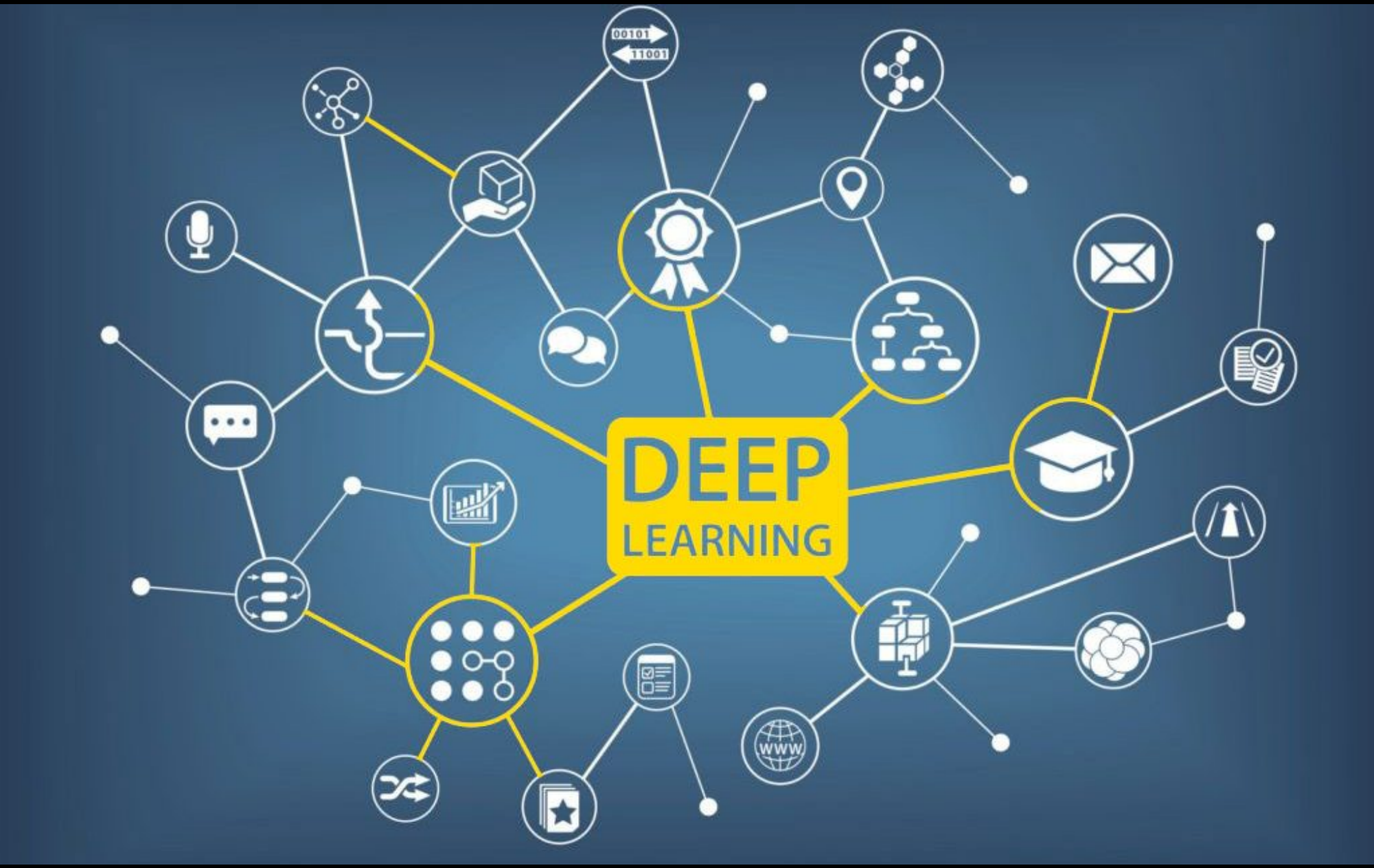
2nd semester a.y. 2019/2020 · February 24, 2020



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

Image: Michael Copeland, NVIDIA

Deep learning is everywhere



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- **Where:** Aula Alfa, via Salaria 113, ground floor
- **Office Hours:** Drop me an email
- **Official website:** https://erodola.github.io/DLAI-s2-2020/
  Check frequently for news and material (code, papers, ...)!

Disclaimer

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- Possible overlap with other courses
- No material from past years
- No lecture notes
- Lecture material is completely novel and up-to-date
- Topics include latest advancements

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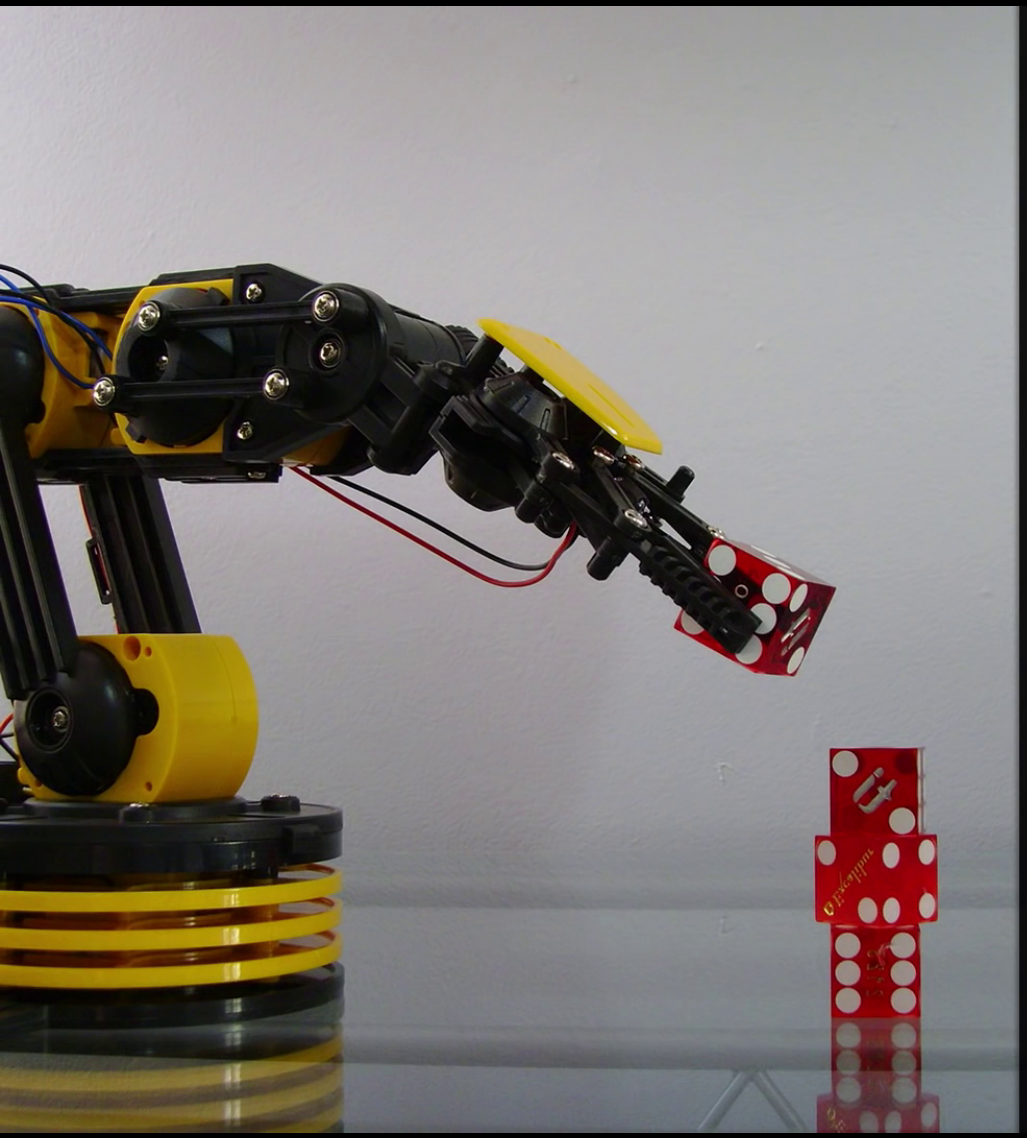
If you spot errors – please let me know!

Who am I?

- Had research positions at U Tokyo, TU Munich, U Lugano and visiting positions at Harvard, Stanford, Ecole polytechnique, Technion among others
- Research: digital geometry processing, geometric deep learning
- Team: ∼15 members from physics, engineering, computer science
- Passionate about anything that is new, cool, and/or crazy
- Approach me for projects and theses!

Geometric deep learning?

Showcase



TWO MINUTE PAPERS

WITH KÁROLY ZSOLNAI-FEHÉR (KZF)

10 MORE COOL DEEP LEARNING APPLICATIONS

Disclaimer: I was not part of this research project,
I am merely providing commentary on this.

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Specific references will be given throughout the course in the form of book chapters and scientific articles.

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Pre-requisites:

- **Programming fundamentals**. We will use Python
- Welcome (not mandatory): linear algebra, calculus

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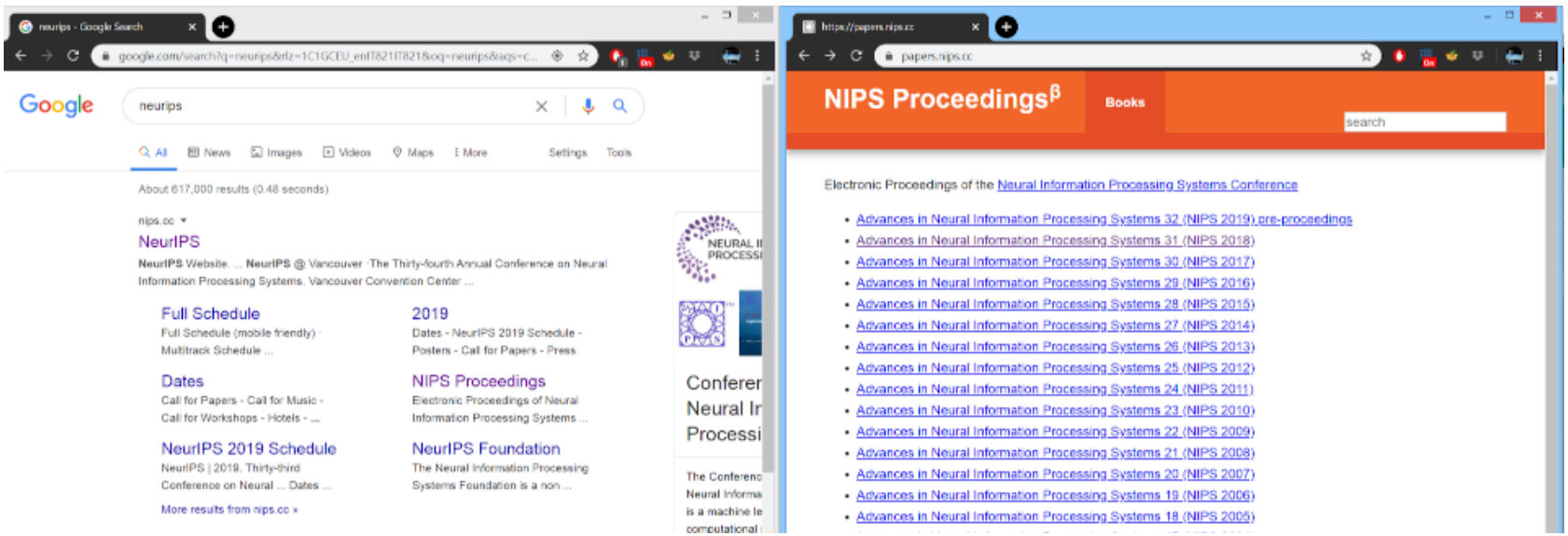
Main source: specialized conferences and journals:

NeurIPS, ICML, ICLR, JMLR, CVPR, etc.



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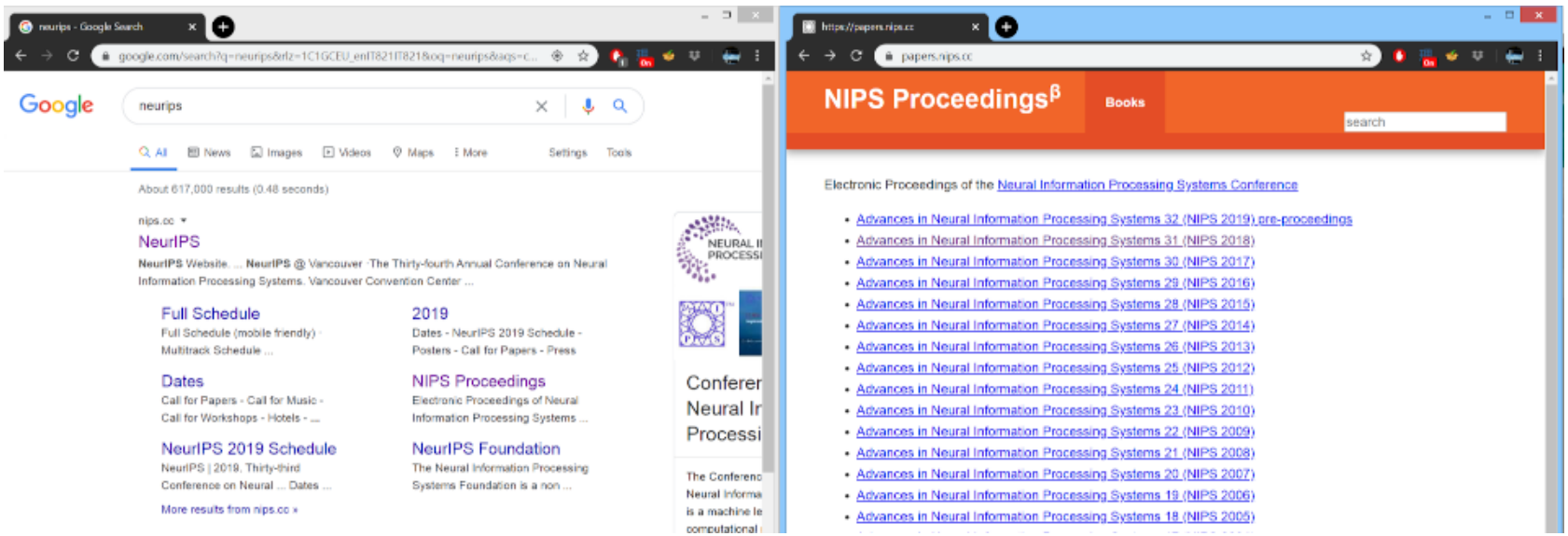

Applications: we'll mostly illustrate things in the areas of computer vision, geometry processing, and graphics. Possibly something with graphs / social networks, and something with sounds and audio as well.

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- Take notes: not everything will be on the slides
- When asked, bring your laptop: we'll do live coding sessions

Risky challenge for the brave

Optional: Join our efforts for the Abstraction and Reasoning Challenge!

`https://www.kaggle.com/c/abstraction-and-reasoning-challenge/overview`

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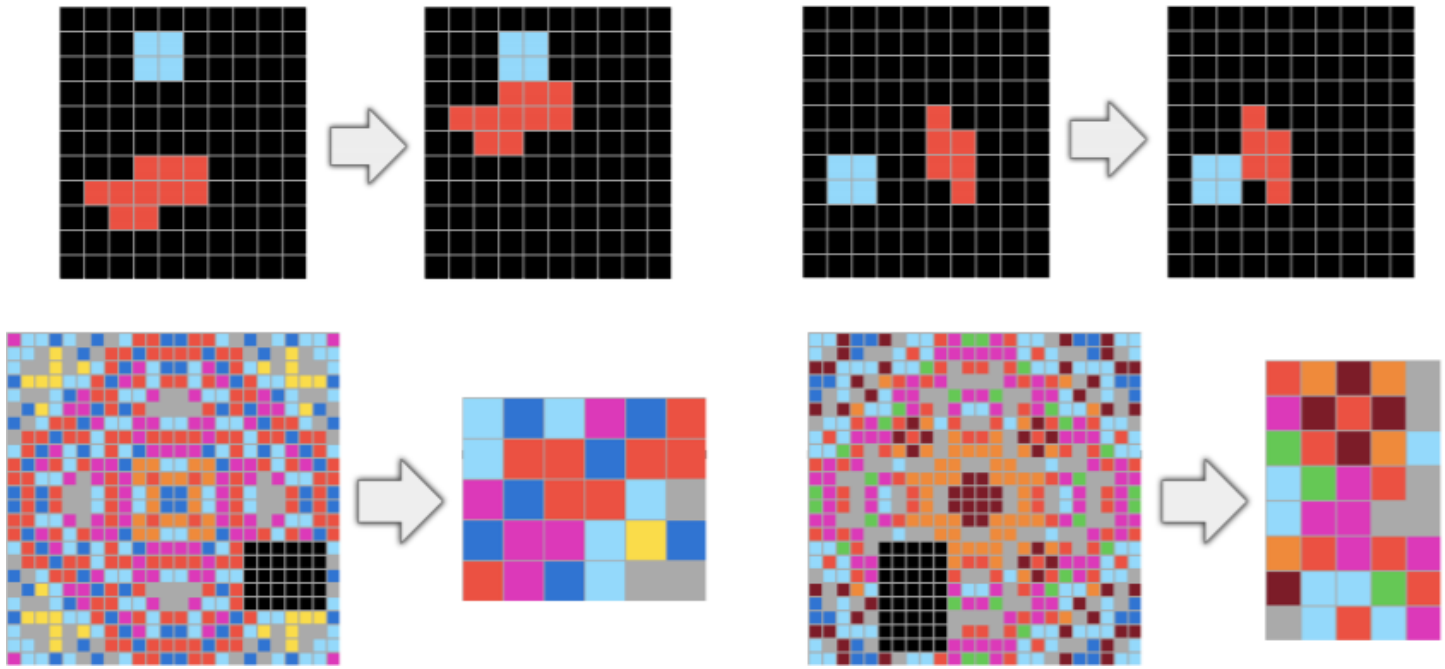

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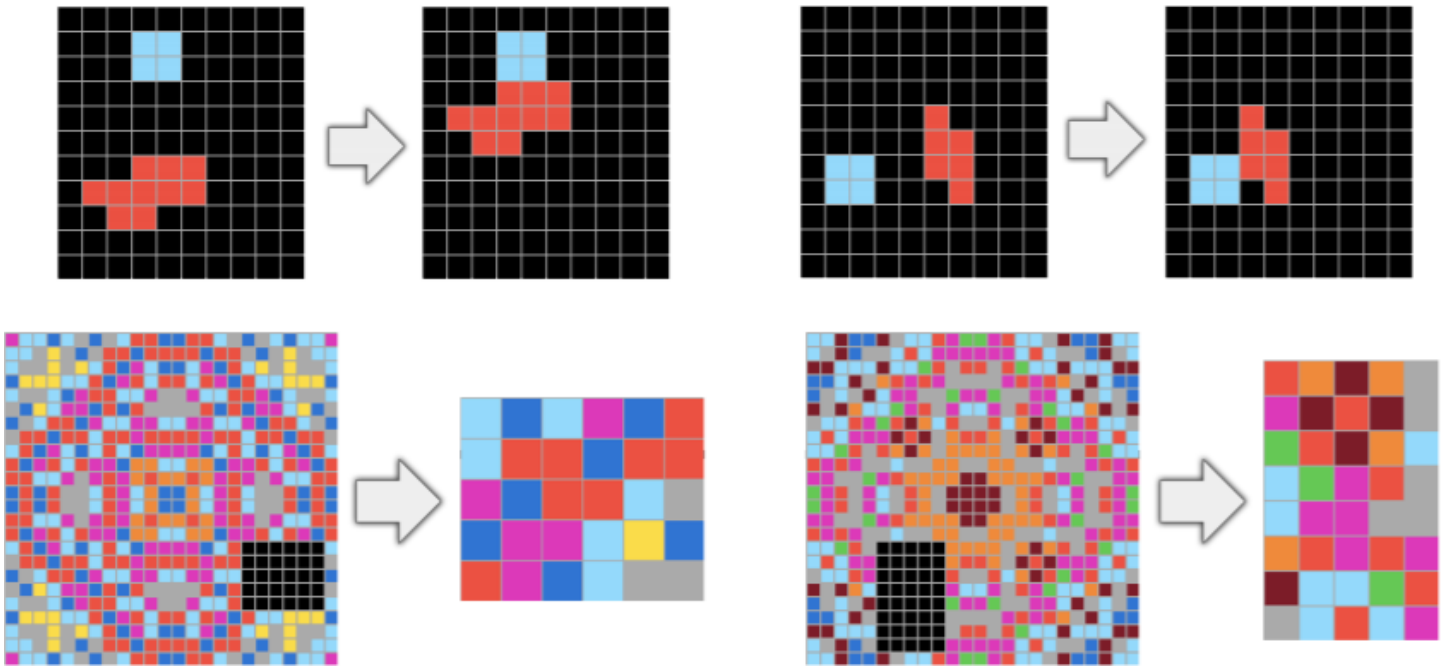

Important: This does **not** replace the final project.

It is an extra thing, and brings **extra rewards**.

worst case: experience and fun!

best case: paper, money, fame

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(if you study)

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- You will get practical development expertise on applied problems


Mathematical tools

- Linear algebra
- Calculus
- Optimization
- Some probability & statistics
- Some metric and differential geometry

This is not an easy course, but results speak for themselves!

We will have to develop ways to evaluate, visualize, and quantify what we are doing. Going blind-folded and regarding learning models as black boxes will not bring us very far!