Medical Diagnostics

Tutorial 5 (0): Intro

Spring 2025

Faculty of Biotechnology and Food Engineering
Technion Israel Institute of Technology

Agenda

1. About the course (Administration, Goals, etc…)
2. ChaptGPT Do’s and Don’ts
3. Homework Assignments & Grading
4. How to ~~survive~~ ace the course

About the course

- Intro to Machine Learning (ML) and Deep Learning (DL)
- 4 Weeks, Frontal
- Pre-class videos
- Paper-driven teaching
- No midterm/exams: 2 HWs and a final project

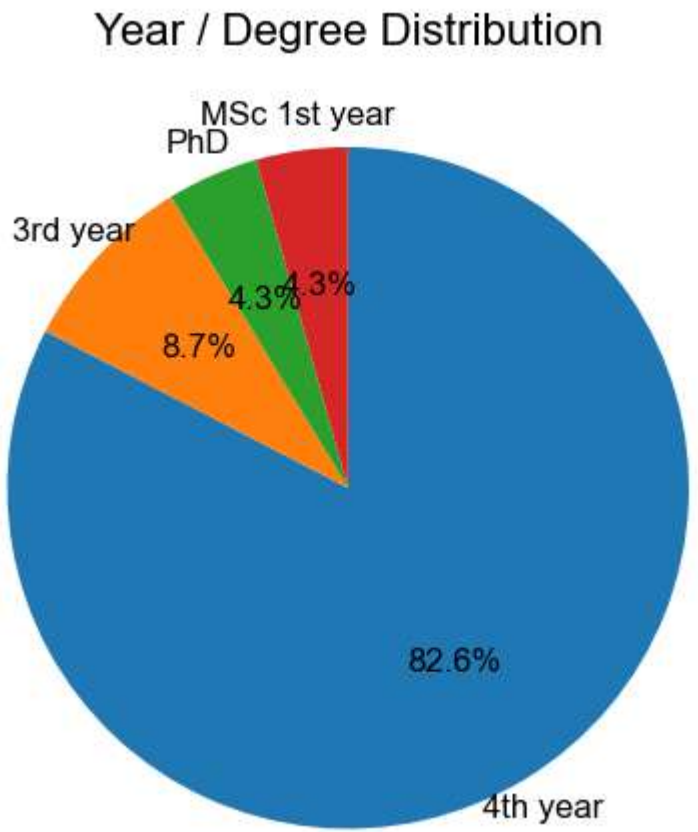
Tutorials Goals: YES

- **Learn:** concepts in Machine and Deep learning (ML/DL)
- **Understand:** Data driven publications (some)
  - How to read the docs (software documentation)
  - How to leverage LLMs (Large Language Models)
- **Implement:** methods described in literature to solve real-lab problems
- **Evaluate:** modeling results
- **Report:** your findings in a clear and concise manner

Tutorials Goals: NO

- **Write :** code from scratch
- **Use:** specific tools, libraries (pytorch, pandas, scikit-learn), software or frameworks

About the Students



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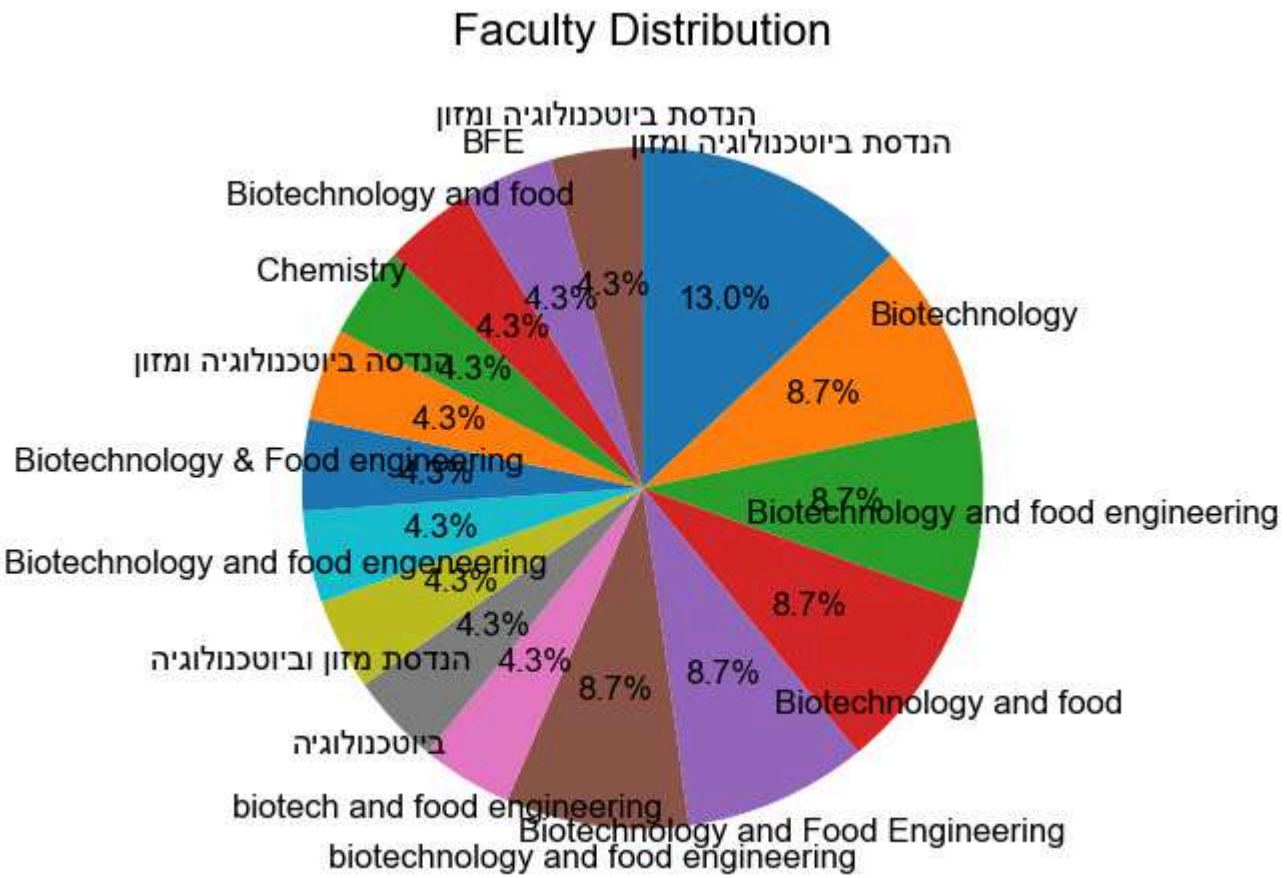
Faculty


Faculty Distribution
הנדסת ביוטכנולוגיה ומזון
13.0%
Biotechnology
8.7%
Biotechnology and food engineering
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Biotechnology and food
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Background & Motivation

About the TA (me)

Mattan Hoory

- *Past life*: QA → Developer (C-linux)
- *Plot twist*: B.Sc. in CS (+Bioinformatics)
  - *iGEM* 2022 member · exchange at *National Taiwan University*
- *Now*: M.Sc. candidate in Prof. Roee Amit's lab
- Courses I liked: Organic Chemistry, Labs (Genetics/Biomol), and of *course*, this one!
- Passions: food, travel, history and languages!

Course History

Spring 2025: first time this part of the course is taught

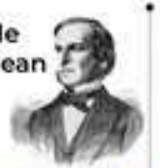
MACHINE LEARNING TIMELINE

1764 — **Bayes' theorem** is published.

$$P[A_n/B] = \frac{P[B/A_n] \cdot P[A_n]}{\sum P[B/A_i] \cdot P[A_i]}$$

1842 — **Ada Lovelace** lays the foundations of the **first algorithm.**

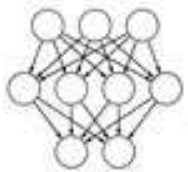
1847 — **George Boole** creates **Boolean Logic.**



1936 — **Alan Turing** proposes a machine that **can learn.**

1952 — **Arthur Samuel** creates the first computer program at **IBM.**

1959 — **MADALINE,** the first artificial neural network, **is created.**

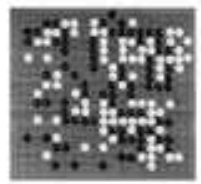


1985 — **Sejnowski and Rosenberg** create the neural network, **NetTalk.**

2006 — **Geofrrey Hinton** invents the term **"Deep Learning".**

2012 — Google creates an **unsupervised neural network.**

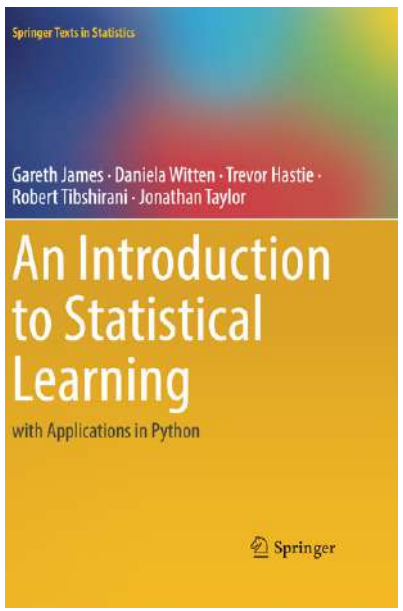
2016 — **AlphaGo** beats the first human player.

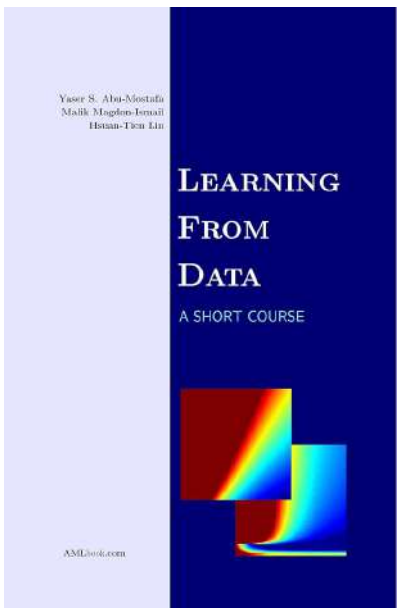


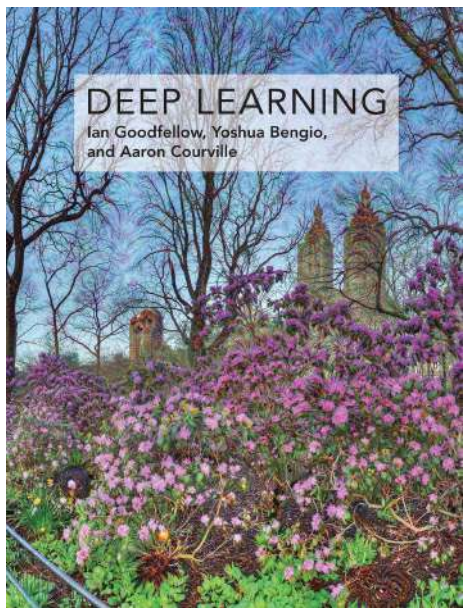
2018 — **AlphaFold 1,** a technology capable of predicting protein structures, is created.

Course Resources

- *Learning from Data: A Short Course*, Y. Abu-Mostafa (Caltech), M. Magdon-Ismail (RPI), H.-T. Lin (NTU)
- *Introduction to Statistical Learning*, G. James, D. Witten, T. Hastie, R. Tibshirani (link)
- *Deep Learning*, I. Goodfellow, Y. Bengio, A. Courville
- **ONLINE**







Homework & Grading

In each assignment, we will implement methods based on a publication, evaluate it, and report our findings.

Submission is **in pairs**!

- HW total (35%): HW 1+2 (10%), final project: (25%)

Grading Breakdown of each HW:

- **Report** (80%):
  - Results (40%) / Explanation & Insight (40%)
- **Leaderboard Performance** (up to 20%) 🏆
- **Bonus Points** (Optional)
- **Penalties**

Course challenges

- Programming
- Linear Algebra
- New terminology
- Semi-Heavy workload
  - **2**xHws + **1**xProject

ChatGPT (and other LLMs)

- Code responsibility: you are responsible for the code you submit.
- Tutor, not replacement
- Can’t really think logically or analyze results well

How to get and ask for help

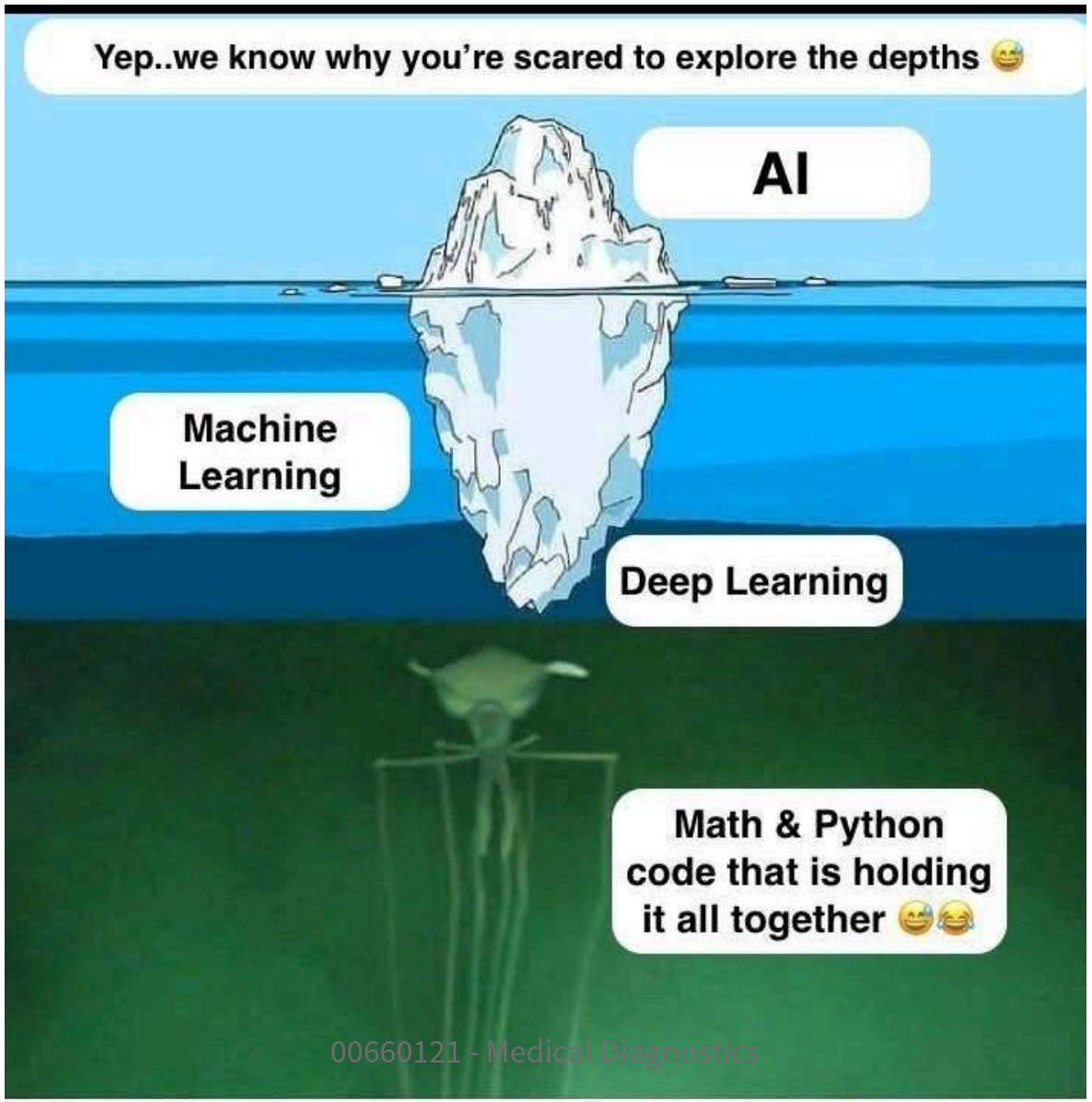
- **Moodle forum** is the best way to get help, emails regarding HW will not be answered.
- TA hours and workshops available on demand.
  - I’m not going to read (all of) your code
- If I speak too fast or too slow - please let me know.
- Ask questions during/after the tutorials
- My email: hoory@campus.technion.ac.il

How to survive the course

- Independent learning, but also asking for help when needed
- Google and ChatGPT are your friends
- Working with your actual friends

1. Examine and understand the data
2. Plan a model pipeline, only then start coding
3. Run the code, and then debug it
4. Repeat

Questions?


Yep..we know why you're scared to explore the depths 😅
AI
Machine Learning
Deep Learning
Math & Python code that is holding it all together 😅😂