Introduction to Deep Learning (I2DL)

Tutorial 1: Organization

The Team

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Today's Outline

- **Organization**
  - Lectures, tutorials and schedule
  - Exam
  - Communication
- **Exercises**
  - General overview
  - Exercise 1

3. Numpy Introduction

Numpy is a high performance framework for operations on multi dimensional arrays.
life as a Data Scientist in general.

In [12]:
```
# Create a simple (2, 3) numpy array
# [[ 1  2  3]
#  [ 4  5  6]]
a = np.array([[1,2,3], [4,5,6]])

# Print the data type of this array
print(a.dtype)

# print the shape of this array
print(a.shape)
```

```
int64
(2, 3)
```

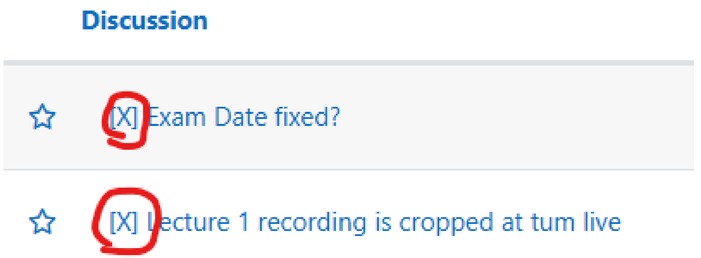
Organization

Lecture Material

- **Lectures**
  - On-site every Monday from 14:00 to 16:00
  - MI HS 1, Friedrich L. Bauer Hörsaal
  - Live stream and recordings available
- **Exercises (Tutorial session + Homework)**
  - Recordings + slides + homework uploaded Thursdays 10 AM
  - Homework due following Wednesday 23:59
  - There will be no real-time sessions
- **Useful links**
  - Lecture live and recordings: https://live.rbg.tum.de/
  - Course webpage: https://niessner.github.io/I2DL/
  - Course forum: https://www.moodle.tum.de/
  - Exercise submission: https://i2dl.vc.in.tum.de/

Moodle

- All announcements, Lecture Q&A via Moodle
- Participation in discussions is correlated with success in the exam
- Search for duplicates, or try to solve yourself before posting new topics
- We let tutors track questions with a prefix on the title:



- Edit the prefix to "[ ]" whenever you post a follow-up question in the post.
- Do not post exercise solutions before solution release.

Websearch and Use AI Tools

- Do websearch / ask AI for questions and coding before asking in the forum
- NOTE: Web-info / AI can be misleading, judge yourself.
- NOTE: Terminologies for deep learning may differ between our lecture and other discussion environments. In the course forum and in the exam, we will stick to the terminologies of the lecture.

Exam FAQ

- **Date**
  - July 29 (Wed), 8:30 – 10:00
- **Place**
  - On-site at the Garching campus
- **Retake?**
  - None this semester; you can participate in the exam of next semester's class

Exam FAQ

- **Do we get access to previous exams?**
  - Yes, at around week 10
- **What about my bonus?**
  - Bonus from any previous iteration of I2DL will be transferred automatically to this class and all future exam attempts (regardless of I2DL lecturer)
- **For whom?**
  - TUM / LMU students (who will get a certificate)

Office Hours

- Daily office hours offered by the tutors
- Link and times — Moodle
- Casual, ask anything, be considerate
- Starting next Monday

Contact the Staff

- Use Moodle for all lecture and organizational topics
- **Only if you have personal questions, contact us at:**
  - i2dl@vc.in.tum.de
  - Emails sent to individuals (Prof., TAs, tutors) may be ignored

If you are not a registered student

- **You can:**
  - Participate in lectures as well as exercises
  - Exercises have evaluations in the notebooks
- **You can't:**
  - Access our submission system
  - Take part in Moodle discussions or attend office hours
  - Participate in the exam

General Exercises & Bonus

Exercises – Tentative Schedule

Lectures

Introduction

- 0: Organization
- 1: What is Deep Learning?
- 2: Machine Learning Basics

Neural Networks

- 3: Introduction
- 4: Optimization
- 5: Stochastic Gradient Descent
- 6: Training Neural Networks 1/3
- 7: Training Neural Networks 2/3
- 8: Training Neural Networks 3/3

Advanced Architectures

- 9: Introduction to CNNs
- 10: More on CNNs
- 11: Sequence Models
- 12: Advanced Deep Learning Topics

Exercises

Exercise 01: Organization
Exercise 02: Math Recap

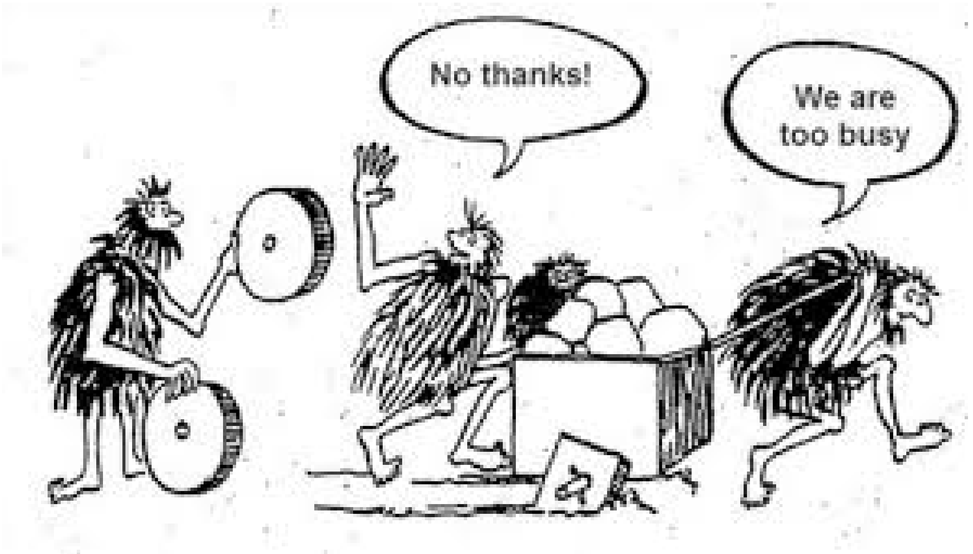
Exercise 03: Datasets
Exercise 04: Linear Regression
Exercise 05: Neural Networks
Exercise 06: Hyperparameter Tuning

Exercise 07: Introduction to PyTorch
Exercise 08: Autoencoder

Exercise 09: Convolutional Networks
Exercise 10: Semantic Segmentation
Exercise 11: Transformers (1/2)
Exercise 12: Transformers (2/2)

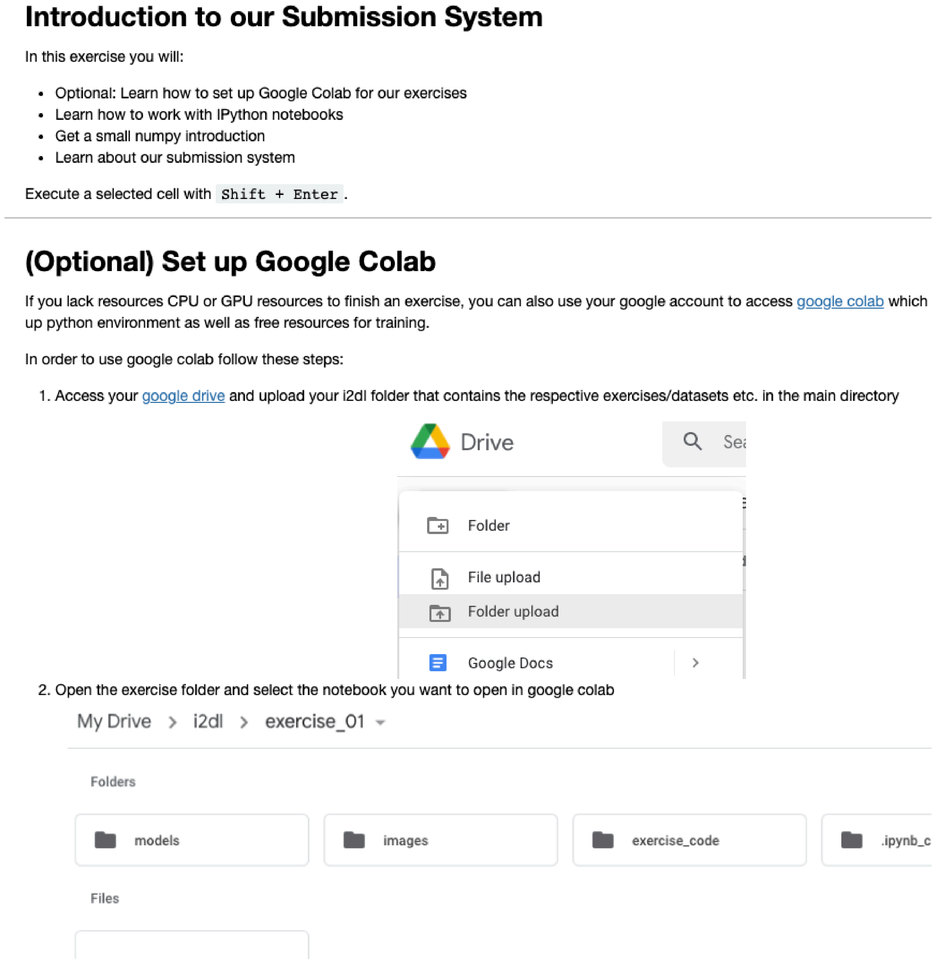
Exercises – Goal

- **Goal**
  - Gather enough experience to start your own individual (research) project
- **Focus**
  - Reimplementations
  - Introduction to common libraries
  - Applications



Tutorial Sessions & Exercise Format

- **Presentation**
  - Video with slides, posted to the webpage and Moodle
- **Video length**
  - Tutorial sessions are usually much shorter than the lecture
- **Exam**
  - All tutorial sessions and bonus-irrelevant exercises (including coding) are exam-relevant
- **Main work**
  - Interactive coding notebooks — don't underestimate them, start early!



Introduction to our Submission System

In this exercise you will:

- Optional: Learn how to set up Google Colab for our exercises
- Learn how to work with IPython notebooks
- Get a small numpy introduction
- Learn about our submission system

Execute a selected cell with `Shift + Enter`.

(Optional) Set up Google Colab

If you lack resources CPU or GPU resources to finish an exercise, you can also use your google account to access google colab which up python environment as well as free resources for training.

In order to use google colab follow these steps:

1. Access your google drive and upload your i2dl folder that contains the respective exercises/datasets etc. in the main directory

2. Open the exercise folder and select the notebook you want to open in google colab

Exercises – Tech Stack

- **Python**
  - Jupyter notebooks
  - NumPy
- **Deep Learning library**
  - PyTorch
- **Hardware requirements**
  - Minimum: CPU
  - Preferred: NVIDIA GPU
  - Alternative: Google Colab

Extra Spice: Leaderboard (Ex 6, 9–11)

- Compete against your fellow students on our datasets for a variety of tasks
- Some of the best solutions will be featured in exercise discussions (you can also post on Moodle yourself)

Leaderboard

The leaderboard shows for each exercise the highest scoring submission from each user. Only valid submissions are displayed.

Exercise 1 | Exercise 3 | Exercise 4 | Exercise 5 | Exercise 6 | Exercise 7 | Exercise 8 | Exercise 9 | Exercise 10 | Exercise 11

#	User	Score
1	a0005	68.77
2	a0010	64.41

Submissions & Bonus

- **Bonus-related exercises**
  - 9 out of 12 exercises are labelled as bonus-related
  - Each submission has a fixed deadline, usually one week, by which it must be solved and successfully uploaded
- **Bonus**
  - Passing exam grade gets a −0.3 bonus
  - You need to have passed 8 out of the 9 bonus-related exercises

Exercises – Content

Exercise 01: Organization Exercise 02: Math Recap	**Intro**
Exercise 03: Dataset and Dataloader Exercise 04: Solver and Linear Regression Exercise 05: Neural Networks Exercise 06: Hyperparameter Tuning	**NumPy (Reinvent the wheel)**
Exercise 07: Introduction to PyTorch Exercise 08: Autoencoder	**PyTorch / Tensorboard**
Exercise 09: Convolutional Neural Networks Exercise 10: Semantic Segmentation Exercise 11: Transformers (1/2) Exercise 12: Transformers (2/2)	**Applications (Hands-off)**

Exercise 1

Exercise 1 – Overview

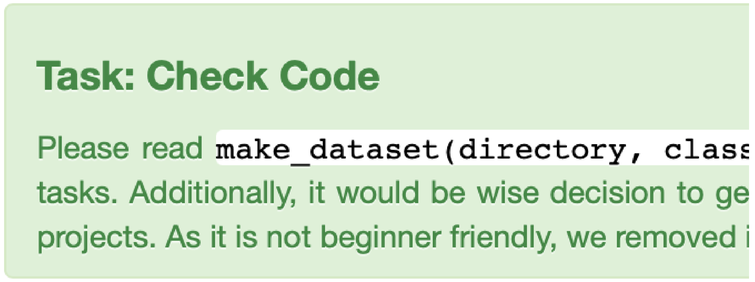
- **Goal**
  - Get your Python environment up and running
  - Familiarize yourself with our notebooks and submission system
  - It's short and technical
- **Content**
  - First experience with our environment and submission system
  - Optional: Python refresher
- Counts for the bonus (one of the 9 bonus-related submissions)

Instructions

- Download the zipped folder
- **Extract the zip locally and follow the instructions in the README.md file to:**
  - Install Anaconda to create a new Python environment
  - Set up your env using the `requirements.txt` file
  - Run `jupyter notebook` in the i2dl folder. We recommend VS Code if you want an IDE.
- New Python users: Scientific Python Lectures

Hitchhiker's Guide: Notebooks

- Run cells from top to bottom
- Be careful when changing notebook cells
- **Edit external code in your browser or in your favourite IDE**
  - Don't code outside our boxes in `exercise_code` files
- **Checking other code**
  - Generally optional
  - Look out for green boxes



Google Colab Instructions

You really don't need Colab for the first five exercises.

(Optional) Set up Google Colab

If you lack resources CPU or GPU resources to finish an exercise or have issues setting up a local python environment, you can also use your google account to access google colab which provides an already set up python environment as well as free resources for training.

In order to use google colab follow these steps:

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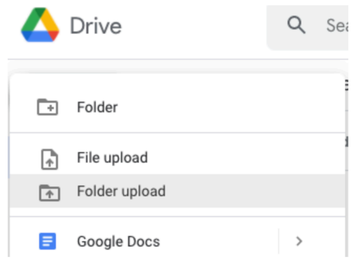

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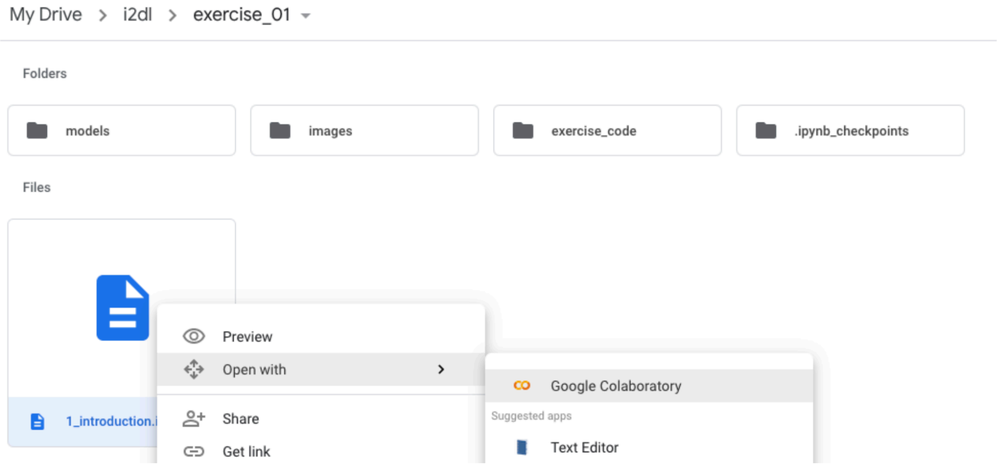

Exercise Submission

- **Register on the submission webpage https://i2dl.vc.in.tum.de/**
  - Sign up with a valid matriculation number
  - You'll receive your ID and password by email (which also reveals your email address)
- **Submit models**
  - Upload the generated zip file
  - Note: you submit your whole code folder as well

FAQ

- **I don't want to code in notebooks. Can I use my favourite IDE?**
  - Yes
- **Cool, so I can just change the whole code structure?**
  - No
  - You can write any helper functions, but keep the skeleton classes intact (don't rename important functions or variables)
  - You will upload all files, and they will be archived on our end

FAQ

- **How do I know that I passed?**
  - Once you submit a score that surpasses the threshold, you'll receive a confirmation email
- **Help, I got this message a second time!?**
  - You'll receive this message every time you submit an exercise that beats the threshold
  - Your best-performing model counts toward the bonus, not the latest submitted one

FAQ

- **Where can I get assistance?**
  - Web search / AI
  - Moodle — someone may have already asked the same question
  - Office hours
  - Other students
  - Note: tutors aren't on call until the deadline — start early and ask early

Upcoming Lecture

- Next lecture: Lecture 2 — Machine Learning Basics
- Next tutorial: Math Recap (+ math exercise sheet)

See you next time!