

# Introduction to Deep Learning (l2DL)

## Tutorial 1: Organization

# The Team

Lecturer



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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)
```

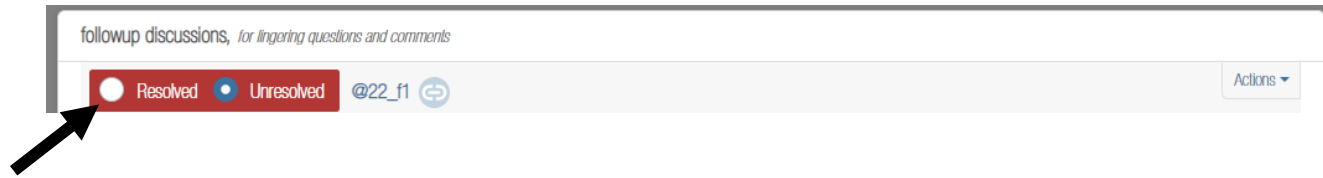
# Organization

# Lecture Material

- Useful links
  - Lecture live and recordings: <https://live.rbg.tum.de/>
  - Course webpage: <https://niessner.github.io/l2DL/>
  - Course forum: <https://piazza.com/class/mgmbpeqcamr5cd/>
  - Exercise submission: <https://i2dl.vc.in.tum.de/>
- Lectures
  - On-site every Tuesday 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

# Piazza

- All announcements, Q&A, private questions via Piazza
- Participation in discussions is correlated with success in the exam
- Mark your follow-up questions as (un-)resolved accordingly if attention is needed by the instructors – resolve otherwise.



- Set the visibility to stuff-only for personal questions

Post Type  Question if you need an answer  Note if you *don't* need an answer  Poll/In-Class Response if you need a vote

Post To  Entire Class  Individual Student(s) / Instructor(s)

Enter one or more names...  Select **Instructors** to include all instructors.

- Do not post exercise solutions before solution release.

# Exam FAQ

- Date  
TBD
- Place  
On-site in campus Garching
- Retake?  
None this semester, 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?

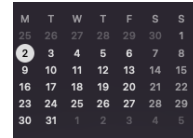
Bonus from any previous iteration of I2DL will be transferred to this class and all future exam attempts (regardless of I2DL lecturer)

- For whom?

TUM/LMU students (who will get a certificate)

# Office Hours

- Daily office hours offered by the tutors
- Via zoom  
Link and times - Piazza
- Casual, ask anything, be considerate
- Starting Next Monday



# Contact the staff

- Use piazza for all communication
  - Send private note/question to instructors for individual issues

The screenshot shows the Piazza interface for creating a post. Under "Post Type", there are three radio button options: "Question" (selected, with the subtext "if you need an answer"), "Note" (with the subtext "if you *don't* need an answer"), and "Poll/In-Class Response" (with the subtext "if you need a vote"). Below this, under "Post To", there are two radio button options: "Entire Class" and "Individual Student(s) / Instructor(s)" (selected). A text input field below "Post To" contains the placeholder "Enter one or more names..." and a dropdown arrow. To the right of the input field, it says "Select 'Instructors' to include all instructors." The "Individual Student(s) / Instructor(s)" option and the word "Instructors" in the instruction are highlighted in yellow.

- Only If you cannot use piazza to contact us:
  - [i2dl@vc.in.tum.de](mailto:i2dl@vc.in.tum.de)
  - Please only use it if you cannot access piazza

# If you are not a registered student

- You can:
  - Participate at lectures as well as exercises
  - Exercises have evaluations in notebooks
- You can't:
  - Have access to our submission system
  - Take part in online discussions on Piazza 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

7: Training Neural Networks

8: Training Neural Networks

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&12: Transformers

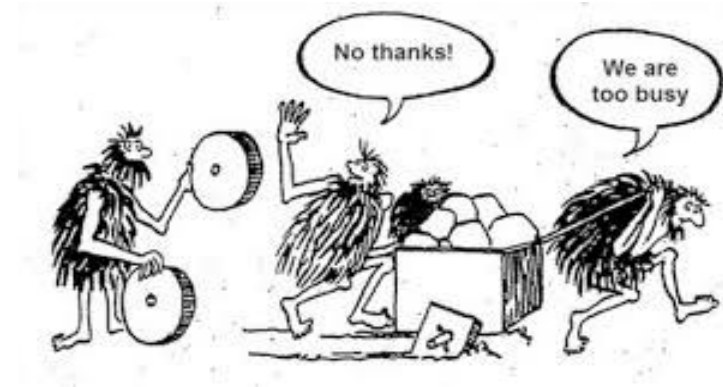
# Exercises - Goal

- Goal

Gather enough experience to start your own individual (research) project

- Focus

- Reimplementations
- Introduction to common libraries
- Applications



# Tutorials Sessions & Exercises Format

- Presentation: video w/ slides  
Posted to webpage and Piazza
- Video length  
Tutorial sessions are usually much shorter than the lecture
- Exam  
All tutorial sessions and optional exercises (incl. 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

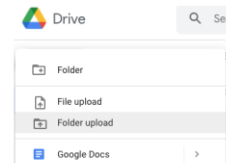
Execute a selected cell with `Shift + Enter`.

## (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

My Drive > i2dl > exercise\_01

Folders

models

images

exercise\_code

ipynb\_c

Files

# Exercises – Tech Stack

- Python
  - Jupyter notebooks
  - Numpy
- Deep Learning library
  - Pytorch
- Hardware requirements
  - Minimum: CPU
  - Preferred: Nvidia GPU
  - Alternative: Google Colab



**NVIDIA**

# Extra Spice: Leaderboard (Ex6, 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 Piazza 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

- Submissions
  - 9 (out of 12) exercises labelled as *submissions*
  - submissions have a fixed, mostly one week due date until they have to be solved and successfully uploaded.
- Bonus
  - Passing exam grade get's a *-0.3* bonus
  - Need to have passed **8/9** submissions

# 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

Exercise 12: Transformers 2

Applications  
(Hands-off)

# Exercise 1

# Exercise 1 Goal

- Get your python environment up and running
- Familiarize yourself with our notebooks
- Familiarize yourself with our submission system
- It's short and technical

# Overview

- Content
  - First experience with our environment and submission system
  - Optional: python refresher
- Counts for the bonus (i.e it's one of the 9 submissions for the bonus)

# Instructions

- Download the zipped folder
- Extract 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
  - Execute `jupyter notebook` in the i2dl folder. We recommend using VSCode if you want an IDE.

New python users: <http://nbviewer.jupyter.org/github/jrjohansson/scientific-python-lectures/blob/master/Lecture-1-Introduction-to-Python-Programming.ipynb>

# Hitchhiker's Guide: Notebooks

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

## Task: Check Code

Please read `make_dataset(directory, class_tasks)`. Additionally, it would be wise decision to get projects. As it is not beginner friendly, we removed i

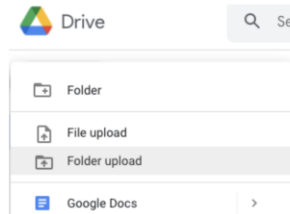
# Google Colab Instructions

## (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](https://colab.research.google.com/) which provides an already set up python environment as well as free resources for training.

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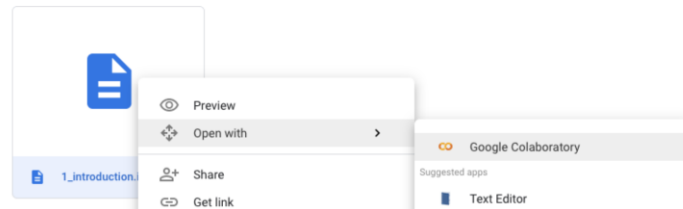
2. Open the exercise folder and select the notebook you want to open in google colab

My Drive > i2dl > exercise\_01 ▾

Folders



Files



You really don't need colab at all for the first five exercises

# Exercise Submission

- Register on submission webpage  
<https://i2dl.vc.in.tum.de/>
  - Sign up with valid matriculation number
  - Get id and password via email (it will display the email address)
- Submit models:
  - Upload created zip file
  - Note: You will 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 (i.e., don't rename important functions or variables)
  - You will upload all files and those will be archived on our end

# FAQ

- How do I know that I passed?
  - Once you submit a score that surpasses the threshold, you will receive an email that contains a message which tells you that you passed this submission
- Help, I got this message a second time!?
  - You will receive this message every time you submit an exercise that exceeds the score
  - Your best performing model will count, not the latest submitted one

# FAQ

- Where can I get assistance?
  - Piazza. Ask there. Maybe someone has asked the same question before.
  - Office hours
  - Other students
  - Note: the tutors are not responsible to help you til the last minute. So start doing the exercise and ask questions early.

# Upcoming Lecture

- Next lecture: Lecture 2: Machine Learning basics
- Next Tutorial: Math Recap (+ Math exercise sheet)

See you next time

