Beyond Deep Learning: Selected Topics

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Chair of Computer Vision and Artificial Intelligence
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Agenda

● Who am I

● What are the topics we will cover?

● How is the course organized?

● How to apply?
Felix Wimbauer

Background:

- 3rd year PhD student
- TUM, University of Oxford

Research Interests:

- (Dynamic) 3D Reconstruction, Object-centric learning, Diffusion Models, Bayesian Approaches, MCMC

Website:

vision.in.tum.de/members/wimbauer
Topics
Diffusion Models
- Dall E 2, Ramesh et al, 2022
- Dhariwal et al 2021
- …
DINO - Student-teacher models for self-supervised rep. learning
- DINO, Caron et al 2021
- ...
CLIP - Representation Learning for Text and Images
(1) Contrastive pre-training

- Pepper the aussie pup

![Diagram of contrastive pre-training process involving text and image encoders, with examples of image and text representations.]

- Clip, Radford et al., 2021
- SigLIP, Zhai et al., 2023
- ...

(2) Create dataset classifier from label text

- A photo of a plane
- A photo of a car
- A photo of a dog

(3) Use for zero-shot prediction

- A photo of an object

![Diagram of creating a dataset classifier using text and images, with examples of text and image encoders.]

- I_1
- I_2
- I_3
- ...
- I_N

- I'_1
- I'_2
- I'_3
- ...
- I'_N
Multimodal Language Models
- PaLM-E, Driess et al., 2023
- Many more
Segment Anything and Follow-Ups
- Segment Anything, Kirillov et al., 2023
- GroundedSAM, UnSAM
- Many more
Datasets and Dataset Curation
Course logistics
Course Organization

Course website: https://cvg.cit.tum.de/teaching/ws2024/bdl

Course email (for now): felix.wimbauer@tum.de

Course structure:

- Kick-Off Meeting with all the topics (default date: Oct 16th)
- Matching to the topics
- Read the papers and do a literature search and elaborate on the topic you are provided with
- Get optional help, if you did not understand the paper
- Send a first draft of the presentation and get optional feedback
- Presentations take place mid January
- Final report will be due one week after the presentations
Prerequisites

- Machine learning & deep learning knowledge:
  Basic ML concepts and ML/DL models
  **Min. Requirement**: passed one ML/DL related course (I2ML, I2DL, ADL4CV, PGM ...)

- Soft skills:
  Manage regular workflow and communicate with tutors efficiently

- We also value:
  - solid basis & interest for maths
  - prior experience with ML/DL projects
How to apply

1. **Apply via the TUM Matching system** (until July 16th, 2023)
   - If you like our course, make sure to give it a high priority :)

2. **Send us an email** to show your interest and fulfillment of prerequisites
   - Crucial for us to give you a priority

- The email should be sent to us **latest on July 16** with the title
  “[BDL] <Firstname> <Lastname>” and contain
  - Filled information form (template on course website, rename to “firstname_lastname.xlsx”)
  - Transcript
  - CV

- Course Website: [https://cvg.cit.tum.de/teaching/ws2024/bdl](https://cvg.cit.tum.de/teaching/ws2024/bdl)
Thank you! Questions?