

Project topics for Deep Learning for Computer Vision 2023

In this document, we have filtered out a list of recent research topics in the along with references that you can pick for your course project. The references will provide you with background knowledge to select a viable problem statement. As explained in the previous document, you can select either algorithmic, application or theoretical project in any of these topics. You are free to explore variations and combinations of these topics such as NeRF + Domain Adaptation. This is not a comprehensive list and you are welcome to explore other areas that are not listed here.

Machine Learning

1. Domain Adaptation
 - a. [MIT 6.S191: Taming Dataset Bias via Domain Adaptation - YouTube](#)
 - b. [Tutorial 6 - Transfer learning & Domain adaptation | Deep Learning on Computational Accelerators - YouTube](#)
 - c. [TUM AI Lecture Series - Understanding and Mitigating Bias in Visual Recognition \(Judy Hoffman\) - YouTube](#)
2. Transformers
 - a. [Attention Is All You Need!](#)
 - b. [The Illustrated Transformer – Jay Alammar](#)
 - c. [End-to-End Object Detection with Transformers](#)
 - d. [Course on transformers in computer vision](#)
 - e. [How does vision transformer works?](#)
3. Bias and Fairness in Computer Vision:
 - a. [Fairness in Computer Vision: Datasets, Algorithms, and Implications](#)
4. Knowledge Distillation
 - a. [Lecture on Knowledge distillation](#)
5. Few-shot learning
 - a. [Basic Understanding of Few Shot Learning](#)
6. Multimodal Understanding
 - a. [Tutorial on Recent Advancements on Vision and Language Pretraining](#)
 - b. [\[CLIP\] - Connecting Text and images](#)
 - c. [Explanation of CLIP paper](#)
 - d. [Survey paper on vision language pre-trained models](#)
7. Self-supervised Learning
 - a. [Self-Supervised Learning: Self-Prediction and Contrastive Learning | Tutorial | NeurIPS 2021 - YouTube](#)
 - b. [Masked autoencoders are useful for learning rich image representations](#)

8. Adversarial Robustness
 - a. [NeurIPS 2018 tutorial](#)
 - b. [Adversarial robustness talk](#)

Computer Vision:

1. Neural Radiance Fields (NeRFs)
 - a. [Representing scenes as Neural Fields for View Synthesis](#)
 - b. [NeRF Tutorial ECCV 2022](#)
 - c. [Dynamic NeRF](#)
 - d. [Implicit representation for Images](#)
2. Object Detection, semantic segmentation
 - a. [RCNN family](#)
 - b. [Semantic Segmentation](#)
 - c. [DeTR](#)
 - d. [DatasetGAN \[2\]](#)
3. Generative Adversarial Networks (GANs)
 - a. [StyleGANs](#)
 - b. Image/Video Manipulation with StyleGANs [\[1\]](#), [\[2\]](#), [\[3\]](#)
 - c. Conditional GANs [\[1\]](#),[\[2\]](#)
 - d. Single sample GANs [\[1\]](#),[\[2\]](#),[\[3\]](#)
4. Latent Variable Models (VAEs, VQVAE, VQGAN)
 - a. Auto-encoders [\[1\]](#), [\[2\]](#)
 - b. VAE [\[1\]](#), [\[2\]](#)
 - c. VQVAE [\[1\]](#), VQGAN [\[2\]](#), [\[3\]](#)
 - d. [Auto-regressive models](#)
5. Diffusion models
 - a. [GitHub - huggingface/diffusion-models-class: Materials for the Hugging Face Diffusion Models Course](#)
 - b. [Tutorial on Denoising Diffusion-based Generative Modeling: Foundations and Applications - YouTube](#)