

HP SCDS - ML/AI Talks 2022

Introduction

HP SCDS is happy to announce the HP SCDS Machine Learning & Artificial Intelligence talks, 2022 edition.

Over the course of these talks, you will learn about basic concepts for Machine Learning and Deep Learning, the current state of the art for the field, and how to create your own Deep Learning systems that you can apply to solve real-life problems.

Also, on the contrary of many tutorials and courses that can be found online, in this series of lectures you will actually be able to understand what you are doing and why you are doing it, not just blindly copying and pasting code from somewhere else without having an idea of how it works.

Talks will be the first Friday of every month from 13:00 to 14:30, starting on March and finishing by December. Please find the details about the specific dates below.

Enrollment

If you want to attend these talks, please just send an email to innovation.hpscads@hp.com with the subject "ML/AI Talks" and you will receive appointments and Zoom links for the talks.

Please notice that the dates below are tentative and some of them are subject to change a little depending on holidays, vacations, etc. However, all the sessions will be recorded and shared with the attendees.

Prerequisites

High school math level (basic math) is needed to be able to follow this course.

Also, you will need a Google account to access [Colab](#) because the notebooks are to be run there. You can always use your local environment if you prefer. See [our repository](#) for details on the README.

Session 1 – Basic Math – 4th of March 2022

- Algebra (Vectors, Matrices, Tensors)
- Probability Theory (Probabilities, Distributions, Likelihoods)
- Numerical Computation (Underflow, Overflow, Precision)
- Gradients and Optimization
- Notebook: Tensor Manipulations, Likelihood Computations, Gradient Computations

Session 2 – Machine Learning Basics – 1st of April 2022

- Learning Algorithms
- Capacity, Overfitting and Underfitting
- Maximum Likelihood Estimation
- Notebook: Linear Regressions, Principal Component Analysis

Session 3 – Multilayer Perceptron – 6th of May 2022

- Depth and Non-Linearities.
- Activations (Tanh, Sigmoid, etc.) and Regularizations (Dropout, etc.)
- Cost Functions
- Curse of Dimensionality, Representations, Universal Approximation
- Notebook: Solve a Problem with a Multilayer Perceptron

Session 4 – Optimization Algorithms – 3rd of June 2022

- Back-Propagation, Chain Rule
- Forward Pass, Backward Pass, Computational Graph
- Gradient-Descend, Stochastic Gradient-Descend, Minibatches
- SGD, Adam, Learning Rate Scheduling
- Notebook: Explore Performance of Different Optimization Algorithms

Session 5 – Convolutions – 1st of July 2022

- **Kernels, Filters**
- **Dilations, Receptive Field**
- **Notebook: Solve a Computer Vision Problem with CNNs**

Session 6 – Recurrent Neural Networks – 5th of August 2022

- **Sequences, Recurrence**
- **Recurrent Neural Networks, Vanishing Gradients**
- **Long-Short Memory Term Networks**
- **Notebook: Solve a Natural Language Processing Problem with LSTM**

Session 7 – Attention – 2nd of September 2022

- **Attention Mechanisms, Self-Attention**
- **Transformer, GPT, BERT, ViT**
- **Patches Are All You Need?**
- **Notebook: Image Captioning (CLIP) and/or Image Generation from Text Prompt (GLIDE)**

Session 8 – Practical Methodology – 7th of October 2022

- **Performance Metrics**
- **Default Baseline Models**
- **Gathering More Data**
- **Hyperparameter Tuning**
- **Debugging Strategies**
- **Notebook: More Data vs Model Capacity, Grid Search, Tensorboard**

Session 9 – Unsupervised/Representation Learning – 4th of November 2022

- **Generative Adversarial Networks (GANs)**
- **Variational Auto Encoders (VAEs)**
- **Notebook: Implement GAN and VAE on MNIST**

Session 10 – Deep Reinforcement Learning – 2nd of December 2022

- **Introduction to RL**
- **Notebook: Solve the Rubik's Cube with an RL Agent**