Deep Larning Syllabus

Course ML-520-01

Embark on an exhilarating journey through the world of machine learning in this dynamic course designed just for you! Get ready to unlock the hidden potential of deep learning and neural networks as we unravel the mysteries of Artificial Neural Networks (ANN). Dive headfirst into the fascinating realm of Convolutional Neural Networks (CNN) for the thrilling world of image analysis.

But that's not all – we won't stop there! Buckle up as we venture into the exciting realm of Recurrent Neural Networks (RNN) to conquer sequential data. We'll even uncover the secrets of Self-Organizing Maps, Boltzmann Machines, Autoencoders, and various regression and classification techniques and LLMs.

By the time you reach the end of this course, you won't just understand these advanced concepts; you'll master them. You'll be fully equipped to create and deploy your very own neural networks, setting you on a course for an exciting future in the captivating world of artificial intelligence.

Dates (12-May until 28-Ju, 2024)

- Intro **12-May** 2024
- Start **14-May** 2024, end **7-Jul** 2024 (Two weekly meetings of 3 hours each)
- Project start **9-Jul**, end **28-Jul** – Agile weekly Meetings (One weekly meeting 1.5 of hours)

Target Audience

- BSc computer science graduates or students
- Programmers
- Individuals who may not be familiar with machine learning (ML)

Welcome

- Welcome Challenge
- What is Deep Learning

Regression & Classification

- Simple Linear Regression Intuition
- Simple Linear Regression Intuition
- Multiple Linear Regression Intuition
- Logistic Regression Intuition

Artificial Nural Networks (ANN)

- Intuition – Neurons, Gradient Descent and Neural Networks work
- Building ANN

Convolutional Neural Networks work (CNN)

- CNN Intuition
- Neural Networks work?
- Convolution Operation
- ReLU Layer/ Pooling/ Flattening/ Full Connection
- Building a CNN

Recurrent Neural Networks

- What are Recurrent Neural Networks
- The Vanishing Gradient Problem
- LSTMs
- Building RNN/ Evaluating the RNN / Improving the RNN

Self Organizing Maps

- How do Self-Organizing Maps Work?
- K-Means Clustering
- How do Self-Organizing Maps Learn?
- SOM example
- Building a SOM

Boltzmann Machines

- Energy-Based Models (EBM)
- Restricted Boltzmann Machine
- Contrastive Divergence
- Deep Belief Networks
- Deep Boltzmann Machines
- How to get the dataset
- Building a Boltzmann Machine

Auto Encoders

- What is Autoencoders
- Biases
- Training an Auto Encoder
- Overcomplete hidden layers
- Sparse Autoencoders
- Denoising Autoencoders
- Contractive Autoencoders
- Stacked Autoencoders
- Deep Autoencoders
- Building Autoencoders

Large Language Models (LLMs)

- Preprocessing And Self Attention
- LLM Model Output - LLM Training
- LLMs Training - Masking
- Advanced LLM Concept
- LLM Fine Tuning
- LLMs Fine Tuning

Practical Project

- Industrial Project
- Building a “Specific Task” application
- Finetuning Trained Model
- Working With Hugging Face