Introduction to Artificial Intelligence and Machine Learning

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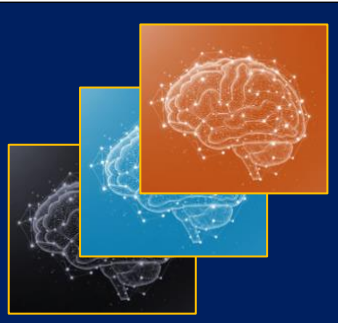

Artificial Intelligence is changing the software job market. It is impacting every specialization: software development and testing, product and project management, regulatory compliance, and more. It is impractical today to further your career without understanding what the capabilities of artificial intelligence are, how machine learning works, and what your role is in this new world.

The course is designed to provide software professionals with a sound grasp of AI/ML fundamentals that will enable them to understand its impact on modern software development, provide better estimates for AI-enabled work, test AI-enabled systems, and participate in machine learning development.

This is a hands-on practical class that involves coding. For every topic save the basics, we will write and execute code.

A wealth of resources – books, websites, blogs, podcasts, and more – will be recommended throughout the course.

Prerequisites

- Basic knowledge of Python
- Basic understanding of statistics

Participants will learn

- ☑ Uses and types of Artificial Intelligence
- ☑ Kinds of Machine Learning
- ☑ Using **Colab** notebooks, one of the most common tools for Machine Learning
- ☑ Performing Exploratory Data Analysis

- ☑ Data visualization
- ☑ Utilizing the most common machine learning libraries
- ☑ Using Machine Learning algorithms for regression and classification
- ☑ Building Neural Networks
- ☑ Interfacing Large Language Models
- ☑ Writing requirements for and testing AI-enabled systems
- ☑ Machine Learning Life Cycle and MLOps
- ☑ At the end of the class,
  participants will have a small portfolio of machine learning code they've developed.

Outline

Artificial Intelligence and Machine Learning – The Basics

- AI: Tumultuous history and state of the art
- Algorithmic Machine Learning and Neural Networks
- Transfer Learning
- Natural Language Processing
- Large Language Models and Generative AI
- AI career impact
  - New team roles introduced
  - Existing team roles impacted

Tech Infrastructure: Python Colab notebooks

- Programming with **Colab**
- Using data in **Colab**
- **NumPy**, **pandas**, and other libraries
- Useful data structures

Data as Key

- The importance of data
- Structured and unstructured data
- Cleaning data
- Exploratory Data Analysis
- Data visualization with **Matplotlib** and **seaborn** libraries
- Data Wrangling: handling data problems
- Normalization and standardization

Machine Learning

- **scikit-learn** library
- Supervised Machine Learning: Linear Regression
- Unsupervised Machine Learning: Logistic Regression
- Interpreting results, model comparison, and evaluation

Neural Networks

- Perceptrons and multi-layer Neural Networks
- Activation, Error, and Loss functions
- Forward- and Backpropagation
- Overfitting and how to cope with it
- **TensorFlow** and **Keras**
- Working with images
- Building, training, and using models
    - For regression
    - For classification

Natural Language Processing

- Overview of the traditional language models
    - RNN, LSTM, Encoder-Decoder

- The Transformer Revolution
- Harnessing GPT: Using OpenAI API
- Retrieval-Augmented Generation

Machine Learning Life Cycle and MLOps

Product Management and A

Testing AI-enabled systems

Responsible AI

- Explainability, sustainability, and more
- The emerging regulatory landscape

Duration

- 3 days, 8 hours each day