AI: Machine Learning Foundations

Syllabus

Summer Semester

Tuesday and Thursday 5:45 - 8:45 PM, June 4th - August 27th

Virtually via Microsoft Teams (Teams Link)

Course Information

Instructor: Pat Lacey

Office Hours: TBD 4:30 - 5:30 PM Tuesday/Thursday, or 1 - 2 PM Friday

E-mail: placey@albanycancode.org

Phone: 518-238-6808 ext. 717

Course description

In this course, explore the exciting world of Human-AI Interaction! We'll delve into the foundations of AI, including chatbots and prompt engineering. Learn how AI models work and how to integrate them with coding tasks. We'll explore powerful AI applications like Natural Language Processing and Computer Vision. Get hands-on building your own AI tools using frameworks and APIs. We'll also discuss the ethical considerations and future of AI. This course is packed with exercises and projects, giving you the skills to confidently navigate the future of AI.

Software Requirements

Visual Studio Code

Visual Studio Code Python Extension

Python 3.X

We will cover the installation of this software during the class.

Course Structure

The structure of this course will be a mix of lecture and in-class examples and exercises. There will be regular hands-on code creation and breakdowns. We will have both in-class exercises and two small projects spaced out over the weeks. The class will end

with a Final Project. I strongly encourage interaction during class, as I believe some of the best learning comes from collaboration.

My two main sources of communication will be email and Microsoft Teams. I will utilize the chat function during class and private messages outside of chat. The best way to reach me is by email (listed above) or sending a chat through Teams. My phone number is there as well if needed to reach me.

Course Goals and Objectives

Goals

- Students can understand and incorporate efficient workflows with current AI tools.
- Students can code their own AI tools for real-world use.
- Students can understand the inner workings of neural networks and which architectures can yield the best results.

Objectives

At the end of class students will:

- Write code to interact with AI models to accomplish everyday tasks.
- Create their own chatbots with function calling and multimodal capabilities.
- Understand the landscape of AI technology and be able to specialize in further learning.

Technologies

- Visual Studio Code
- Python 3
- PIP
- OpenAI, HuggingFace, and LangChain APIs

Weekly Schedule

Week 1 - Introduction, Chatbots, Prompt Engineering
Week 2 - Model Quality, Benchmarks, AI Tools
Week 3 – NLP, Tabular Processing, Computer Vision, Audio Processing
Week 4 – API Utilization, OpenAI API Capabilities

Week 5 - Project 1
Week 6 – LangChain Framework Capabilities, Retrieval Augmented Generation
Week 7 – Neural Network Components (Neurons, Weights, Bias, Cost, Backpropagation, Gradient Descent)
Week 8 – Neural Network Architectures (RNN, LSTM, CNN, GAN, Autoencoders, Transformers)
Week 9 - HuggingFace API Capabilities, Compute Processing (CPU, GPU, TPU)
Week 10 - Ethics, Safety, Future Expansion
Week 11 - Project 2
Week 12 - Project 2 Continued