Exploring Artificial Intelligence and Machine Learning Algorithms in AP Computer Science A (APCSA)

Unit Duration: 3 weeks

Unit Overview:
In this unit, students will delve into the fascinating world of Artificial Intelligence (AI) and Machine Learning (ML). Through a combination of theoretical concepts and practical applications, students will gain a foundational understanding of how AI and ML technologies work, their real-world implications, and their role in computer science.

Unit Objectives:
Define Artificial Intelligence and Machine Learning: Students will understand the concepts of AI and ML, distinguishing between narrow and general AI, and recognizing the fundamental principles underlying machine learning algorithms.

Explore Applications of AI and ML: Students will explore various real-world applications of AI and ML across different domains, such as healthcare, finance, autonomous vehicles, natural language processing, and robotics. They will analyze case studies to understand the impact of AI/ML on society and industry.

Understand Basic Machine Learning Techniques: Students will learn about different types of machine learning algorithms, including supervised learning, unsupervised learning, and reinforcement learning. They will understand the concepts of training data, features, labels, and the process of model training and evaluation.

Hands-on Programming Exercises: Students will engage in hands-on programming exercises using a Java program skeleton that can be branched and modified and evaluate how the program uses LLMs.

Ethical and Social Implications: Students will discuss the ethical considerations surrounding AI and ML technologies, including issues related to bias, privacy, transparency, and job displacement. They will critically evaluate the societal impact of AI/ML and explore strategies for responsible development and deployment.

Future Trends: Students will explore current trends in AI/ML research and development, such as deep learning, neural networks, and reinforcement learning. They will also investigate various career paths in AI/ML, including data scientist, machine learning engineer, AI researcher, and AI ethics consultant.

Week 1: Introduction
Introduction to training a dataset using [https://sliceofml.withgoogle.com/](https://sliceofml.withgoogle.com/)

- Students will learn the basics of training a dataset
• Students will attempt to train the set to recognize a pizza
• Students will discuss the concepts or overfitting and underfitting the data

Week 2: Looking into specifics of Natural Language Processing
What is natural language processing with https://youtu.be/Qtbz_SHQztY
The mathematics of natural language processing with https://youtu.be/yPJat53xHE and https://youtu.be/0J6B65nJg54
Review the mathematics required to understand NLP.
  • Review of probability
  • Application of probability to text analysis
Exploring a Chatbot
  • Ask it questions
  • Discussion of the responses

Week 3: Review of an NLP algorithm
Understanding the basics of how ChatGPT utilizes NLP algorithms
Introduction to a basic NLP algorithm
Editing/Altering the basic NLP algorithm
Examining the ethical implication of NLP and LLMs
Examining the future of NLP and LLMs

Assessment:
Formative assessments: In-class activities, coding exercises, mathematics exercises and discussions to assess understanding of concepts.
Summative assessments: Altering the provided code to meet specific parameters and reflection.