Basic Artificial Intelligence

Part 1: Introduction to Python

- **Why Python Programming**
    - Learn why we program.
    - Learn how programming with python is unique
    - History, future and scope of Python
- **Data Types and Operators**
    - Understand how data types and operators are the building
      blocks for programming in Python
    - Use the following data types: integers, floats, Booleans, strings, lists, tuples, sets, dictionaries.
    - Use the following operators: arithmetic, assignment, comparison, logical, membership, identity.
- **Control Flow**
    - Implement decision-making in your code with conditionals.
    - Repeat code with for and while loops.
    - Exit a loop with break and skip an iteration of a loop with continue.
    - Use helpful built-in functions like zip and enumerate.
    - Construct lists in a natural way with list comprehensions.
- **Functions**
    - Write your own functions to encapsulate a series of commands.
    - Understand variable scope, i.e., which parts of a program variables can be referenced from.
    - Make functions easier to use with proper documentation.

- o Use lambda expressions, iterators, and generators.
- **Scripting**
  - o Write and run scripts locally on your computer.
  - o Work with raw input from users.
  - o Read and write files, handle errors, and import local scripts.
  - o Use modules from the Python standard library and from third-party libraries.
  - o Use online resources to help solve problems.

- **Classes**
  - o Object Oriented programming provides a few benefits over
    procedural programming. Learn the basics by understanding how to use Classes.

Part2: Anaconda, Jupyter-Notebook, Numpy, Pandas and Matplotlib

- **Anaconda**
  - o Learn how to use Anaconda to manage packages and environments for use with Python.
- **Jupiter Notebooks**
  - o Learn how to use Jupyter Notebooks to create documents combining code, text, images, and more.
- **Numpy Basics**
  - o Learn the value of NumPy and how to use it to manipulate data for AI problems.
  - o Mini-Project: Use NumPy to mean normalize an ndarray and separate it into several smaller ndarrays.
- **Pandas Basics**

- Learn to use Pandas to load and process data for machine learning problems.
- Mini-Project: Use Pandas to plot and get statistics from stock data.

- **Matplotlib Basics**
  - Learn how to use Matplotlib to choose appropriate plots

Advance Artificial Intelligence

Part1: Linear Algebra Essentials

- **Introduction**
  - Learn the basics of the beautiful world of Linear Algebra and learn why it is such an important mathematical tool.
- **Vectors**
  - Learn about the basic building block of Linear Algebra.
- **Linear Combinations**
  - Learn how to scale and add vectors and how to visualize them in 2 and 3 dimensions.
- **Linear Transformation and Matrices**
  - Learn what a linear transformation is and how is it directly
    related to matrices. Learn how to apply the math and visualize the concept.
- **Linear Algebra in Neural Networks**
  - Learn about the world of Neural Networks and see how it relates directly to Linear Algebra.
- **Labs**
  - VECTORS LAB - Learn how to graph 2D and 3D vectors.
  - LINEAR COMBINATION LAB - Learn how to computationally
    determine a vector's span and solve a simple system of equations.

o LINEAR MAPPING LAB - Learn how to solve problems computationally using vectors and matrices.

Part2: Calculus Essentials

- **Introduction**
  - Visualize the essence of calculus. Learn why it is such a powerful concept in mathematics
- **Derivatives Through Geometry**
  - Learn about the derivative, one of the most important tools
    in calculus.
  - See how a derivative can measure the steepness of a function
    and why it is such an important indicator in the world of machine learning
- **Chain Rule and Dot Product**
  - Learn how to find the derivative of a composition of two or more functions, a very important tool in training a neural
    network.
- **More on Derivatives**
  - Learn more about derivatives while focusing on exponential
    and implicit functions.
- **Limits**
  - Learn about the formal definition of a derivative through understanding limits.
- **Integration**
  - Learn about the formal definition of a derivative through understanding limits.

- **Calculus in Neural Networks**
  - Learn more about the world of neural networks and see how it
    relates directly to calculus through an explicit example.

PART3: Machine Learning

- Supervise Machine Learning
  - Learn about supervise machine learning techniques to build your machine learning model
  - Linear Regression
  - Logistic Regression
  - Navie Bays Algorithms
  - K-nearest Neighbors
  - Support Vector Machines
  - Decision Trees
  - Random Forest
- Un-Supervise Machine learning
  - Learn About Un-Supervise Techniques to extract features or cluster data
  - PCA- Principle Component Analysis
  - K-Means Clustering
  - Dimensionality Reduction

Part4: Neural Networks

- **Introduction to Neural Networks**
  - Acquire a solid foundation in deep learning and neural networks. Implement gradient descent and backpropagation
    in Python.

- **Training Neural Networks**
  - Learn about techniques for how to improve training of a neural
    network, such as: early stopping, regularization and dropout.
- **Deep Learning with Keras**
  - Learn how to use Keras for building deep learning models.