Deep Learning with Python

Description

Deep learning is a branch of machine learning that aims to understand patterns in large data sets using complex and multi-layered model structures such as artificial neural networks, and its algorithms are often based on a model called a neural network. This neural network is used to learn complex relationships in the data set. Such models require more data and computational power, unlike previous machine learning techniques, but they are often more effective at getting accurate results.

This 3-day Deep Learning and Applications with Python Training is a training program that teaches participants deep learning concepts and how to implement deep learning applications on the Python programming language.

Outline

Overview of Deep Learning

- **What is Deep Learning?**
- Artificial Intelligence, Machine Learning, and Deep Learning
- Real-Life Examples
- Why Deep Learning
- Recent Developments in Deep Learning

Foundations of Deep Learning

- **Artificial Neural Networks (ANN)**
- Understanding Deep Learning
- Basic Concepts of Deep Learning
- Mathematical Foundations
- Activation Functions
- Gradient Descent Algorithms
- Loss Functions
- Backpropagation Algorithm

- Tensor Operations
- Time Series Data
- Text Data
- Images
- Videos
- Evaluation Metrics for Deep Learning
  - Confusion Matrix
  - Accuracy, Recall, Precision, AP, mAP

Tools and Setup for Deep Learning Development Environment

- Data Labeling Tools
- Python Development Environment
  - Anaconda – Jupyter Notebook
  - Google Colab
- Basic DNN Frameworks in Python
  - Keras
  - TensorFlow
  - PyTorch

Setting Up the Deep Learning Application Environment with Python and First Application

- Defining Deep Networks and Training
- Loading the Dataset and Preprocessing for Network Structure
- Network Models
  - Sequential API
  - Functional API
- Defining Network Layers
- Compiling and Optimizing the Network
- Measuring the Performance of the Trained Network
- Training and Testing Processes
- Saving the Trained Network and Weights

Basic Application Examples

- Binary Classification Example (IMDB Movie Reviews)
- Multiclass Classification Example (News Classification – Reuters)

Convolutional Neural Networks (CNN)

- **Convolutional Neural Networks**
- Layers of Convolutional Neural Networks
    - Convolution Layer
    - Batch Normalization and Activation Layer
    - Pooling Layer
    - Fully Connected Layer
    - Dropout
- CNN Models
- CNN Application Examples
    - Sample Application: Waste Classification
    - Sample Application: Facial Expression Analysis
    - Sample Application: Text Data Processing (IMDB Reviews)

DNN-Based Object Detection Models

- Two-Stage Detectors
- Single-Stage Detectors
    - You Only Look Once – YOLO
- Sample Application: Vehicle Recognition with YOLO

Recurrent Neural Networks (RNN)

- **Recurrent Neural Networks**
- Long Short-Term Memory Networks (LSTM)
- Prediction Application with LSTM (Energy Consumption, Temperature, etc.)

Prerequisites

A basic knowledge of python programming and machine learning.