Samsung Innovation Campus: Artificial intelligence

Course Objectives

- Understand the foundational math behind data science and machine learning: linear algebra, probability and statistics.
- Be able to do data preprocessing with the Python libraries (NumPy and Pandas) for the execution of optimal machine learning models and data visualization.
- Explore supervised and unsupervised learning and be able to apply the most suitable machine learning algorithm.
- Learn to process textual data to derive high quality information from text and apply new insights to real-world business (NLP)
- Build and train deep neural networks, use the deep learning libraries such as TensorFlow and Keras to gain proficiency, as well as handle various deep learning techniques.

Course Breakdown

- ✓ Lecture + Capstone Project
- ✓ Lecture covers most subject areas in general concepts of each technology.
- ✓ Focuses on building fundamental capabilities of AI modeling on a concrete foundation of mathematics, including linear algebra, probability and statistics.
- ✓ Introduces A to Z in Machine Learning tools, from NumPy to Keras, and techniques including CNN and practice with hands-on exercises.
- ✓ Offers real-world problem-solving experience as a capstone project, handling open-source data with participants' own AI

Lecture Guide

Course Content
Week 1: Introduction to Artificial Intelligence
Unit 1: The Concept of Artificial Intelligence
Unit 2: Applications of Artificial Intelligence
Unit 3: Techniques in Artificial Intelligence
Unit 4: Artificial Intelligence: Trends and Markets
Unit 5: Course Roadmap
Week 2: Math for Data Science
Unit 1: Introduction
Unit 2: Basic Math for Data Science
Unit 3: Understanding Data Science: Vector
Unit 4: Understanding Data Science: Matrix
Unit 5: Understanding Deep Learning: Derivatives
Quiz
Week 3: Exploratory Data Analysis: NumPy Arrays for Optimized Numerical Computation and Pandas
Unit 1: NumPy Array Data Structure for Optimal Computational Performance
Unit 2: Optimal Data Exploration Through Pandas
Unit 3: Pandas Data Preprocessing for Optimal Model Execution
Unit 4: Data Visualization for Various Data Scales
Quiz
Week 4: Probability and Statistics
Unit 1: Understanding of Probability

Unit 2: Understanding of Statistics I
Unit 3: Understanding of Statistics II
Unit 4: Statistical Hypothesis and Testing
Quiz
Week 5: Machine Learning 1 – Supervised Learning
Unit 1: Machine Learning Based Data Analysis
Unit 2: Application of Supervised Learning Model for Numerical Prediction
Unit 3: Application of Supervised Learning Model for Classification
Unit 4: Decision Tree
Unit 5: Naïve Bayes Algorithm
Unit 6: KNN Algorithm
Unit 7: SVM Algorithm
Unit 8: Ensemble Algorithm
Quiz
Week 6: Machine Learning 2 – Unsupervised Learning
Unit 1: Unsupervised Machine Learning Algorithm
Unit 2: Hierarchical Clustering
Unit 3: Non-Hierarchical Clustering
Unit 4: Linear Factor Model for Dimensionality Reduction
Quiz
Week 7: Natural Language Processing and Language Models for Text Mining
Unit 1: Text Mining
Unit 2: Text Preprocessing
Unit 3: Language Model
Unit 4: Natural Language Processing with Keras
Quiz
Week 8: Neural Network and Deep Learning
Unit 1: Basics of Neural Network
Unit 2: Basics of TensorFlow
Unit 3: Deep Learning Methods using TensorFlow and Keras
Quiz
Week 9: Various Deep Learning Topics
Unit 1: CNN Model
Unit 2: RNN for Sequential Data Modeling
Unit 3: Generative Adversarial Neural Network to Create Non-Existent Images

Capstone Project Guide

Course Content
Week 10: Starting an AI Project
Project Preparation
Design Thinking
Week 11: AI Capstone Project Tutorial
Using a Ready-made CNN Model
AI Application Cases
During the capstone project, student's project activities take more time than lectures itself. Please expect up to 80 hours to complete the whole project.
Team Building Topic Planning Team Building
Capstone Project Action Plan

Action Planning
WBS Planning
Preliminary Presentation
Presentation
Presentation
Prototyping & Testing (1st iteration) Data Wrangling
Modeling
Testing
Prototype Presentation Presentation Presentation
Prototyping & Testing (2nd iteration)
Data Wrangling
Modeling
Testing
Prototyping & Testing (2nd iteration)
Data Wrangling
Modeling Testing
Final Presentation
Final Report Creation
Presentation Final Presentation

Course Assessment:

The scoring assessments of the students will follow the below criteria:

Criteria	Weight
Quiz - Quiz will be placed at the end of each week - Approximately 5 ~ 20 questions per quiz	40 %
Capstone Project - Project is measured based on the quality of final product, presentation and teamwork	60 %
Participation - Participation is measured by the instructor throughout the course	+α
Total	100%

Certification:

The students will be eligible for a certification when both qualifications below are met.

Qualification	Cut-off Rate
1. Attendance higher than	90 %

2. Total grade for assessment higher than	50 %
▶ Certified when both qualifications are met	-