University of Essex
MSc Artificial Intelligence
Module: ML_PCOM7E July 2025 B

Collected Unit Notes

For convenience, unit notes from this module are collected here.

Please note that my personal reflections on the learning process for the module subject matter, for the sake of brevity, are collected and presented in the Unit 12 reflective essay.

Unit 1: Introduction to Machine Learning

The objectives of this unit were to review the history and current state of the art of machine learning as a field, as well as to examine the interaction between machine learning and related fields such as big data analytics in the context of Industry 4.0 / 5.0.

To that end, I contributed my thoughts to a collaborative discussion about an example of unexpected outcomes of human-computer interaction, with a focus on the "resilience" aspect of designing modern business process software.

Unit 2: Exploratory Data Analysis

The objective of this unit was to gain an introductory grasp of Exploratory Data Analysis (EDA), with a focus on identifying unusual, abnormal, or outlier points in a set of data points for the purpose of normalizing training data for machine learning applications.

Unit 3: Correlation and Regression

The objectives of this unit were to review the core elements of statistical correlation and regression, including computational methods and their application to real world data.

Aside from seminar preparatory exercises, I also summarized peer responses from Unit 1's collaborative discussion about an example of unexpected outcomes of human-computer interaction in the context of Industry 4.0 / 5.0.

Unit 4: Linear Regression With Scikit-Learn

The objectives of this unit were to develop familiarity using Scikit-Learn to model

single variable and multivariate linear relationships, as well as the with the standards for evaluating model effectiveness.

Unit 5: Clustering

The objectives of this unit were to review the statistical concept of clustering, with a focus on K-means and agglomerative clustering, as well as evaluative standards for the same.

Unit 6: Clustering with Python

The objectives of this unit were to develop familiarity using Python to implement K-means clustering algorithms on large data sets.

I also completed the first major module project: a group project to develop and evaluate a predictive model for Airbnb rental prices in the greater New York City area.

My project role was to write the final report. I wrote all of the project report; code and visualizations were provided by other group members.

Unit 7: Introduction to Artificial Neural Networks

The objective of this unit was to gain a baseline understanding of perceptrons and artificial neural networks (ANNs), including the algorithmic structure ANNs are derived from and the different types of functions used to compose ANNs and their implementation code.

Unit 8: Introduction to Artificial Neural Networks

The objectives of this unit were to review the concepts of error-handling and backpropagation in artificial neural networks (ANNs), as well as to review the application of ANNs to real world scenarios.

I also started a collaborative discussion in the student forum on the subject of written material produced by ANNs, and the legal risks associated with developing generative writing ANNs from copyrighted training material.

Unit 9: Introduction to Convolutional Neural Networks

The objective of this unit was to review more advanced neural network models, such as convolutional neural networks (CNNs), dueling neural networks, and transformer models such as BERT and GPT.

Unit 10: Natural Language Processing

The objective of this unit was to continue developing familiarity with transformer-based architectures such as BERT and GPT, as well as to review advances in natural language processing techniques and architectures.

I also summarized a collaborative discussion on the subject of written material produced by ANNs, and the legal risks associated with developing generative writing ANNs from copyrighted training material.

Unit 11: Model Selection and Evaluation

The objective of this unit was to deep dive into the workflow for machine learning models, evaluation, and production deployment standards. Machine learning operations (MLOps) was also introduced as a concept for further exploration.

I also completed the second major project of this module, an individual presentation on coding and evaluating the accuracy of a convolutional neural network designed to categorize images from a set of stock thumbnails by image subject type ("car," "truck," etc.).

Unit 12: Industry 4.0 and Machine Learning

The objective of this unit was to focus on the emergence of Industry 5.0 as a paradigm, with an introduction to future areas of research in machine learning, such as self-supervised learning and neural architecture searches.
I also prepared an individual reflective essay on my module learning experiences, as viewed through the lens of the Gibbs' Reflective Cycle.