Machine Learning in Economics and Finance 1 (MLEF1)

1. Instructor

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2. Course Learning Outcomes

Upon graduation, students should be able to

1. Use Python and scikit-learn to process, calculate statistics of, and visualize tabular data
2. Use Python and scikit-learn to implement basic techniques in supervised learning and unsupervised learning for problems in economics and finance
3. Use Python and scikit-learn to implement classifiers and regressors using neural networks for problems in economics and finance
4. Understand the mathematical foundations of basic techniques in supervised learning and unsupervised learning

3. Format

- Six 3-hour sessions
- each session consists of the theory part (30 minutes - 1 hour), Python modelling, examples, and a mini-project with applications from Economics and Finance
- For Python coding, students can use local IDEs (such as Pycharm), Google's colab (https://colab.research.google.com/), or Quantopian (https://www.quantopian.com/)

4. Syllabus

4.1. Lecture 1 - Python for Data Science

4.1.1. Basic Python Programming

4.1.2. Using numpy, pandas, and matplotlib

4.1.3. Example - Using Python to calculate Internal Rate of Return (IRR) and Net Present Value (NPV)

4.1.4. Example - Using Python to compute the statistics of and visualize macroeconomic data from World Bank

4.2. Lecture 2 - Linear Regression & Logistic Regression

4.2.1. Linear Regression

4.2.2. Using scikit-learn for Linear Regression

4.2.3. Logistic Regression

4.2.4. Using scikit-learn for Logistic Regression

4.2.5. Bias and Variance

4.2.6. Examples - CAPM, Fama-French 3-factor model, Fama-French 5-factor model

4.2.7. Example - Predicting Growth / Value stocks using Logistic Regression

4.3. Lecture 3 - K means clustering

4.3.1. Distance Measures

4.3.2. Algorithm

4.3.3. Using scikit-learn for K means clustering

4.3.4. Example - Clustering volatilities of indices and stocks' returns

4.3.5. Example - Clustering years using interest rates and inflation in the UK

4.4. Lecture 4 - K nearest neighbors

4.4.1. KNN classification

4.4.2. KNN regression

4.4.3. Using scikit-learn for KNN

4.4.4. Example - A trading strategy using KNN

4.5. Lecture 5 - Decision Trees

4.5.1. Decision Trees Classification & Regression

4.5.2. Using scikit-learn for Decision Trees

4.5.3. Example - Using Decision Trees in Credit Scoring

4.5.4. A brief overview of Random Forest and Gradient Boosting

4.6. Lecture 6 - Neural Networks

4.6.1. Neural Networks

4.6.2. Forward Propagation and Backpropagation

4.6.3. Using scikit-learn for Neural Networks

4.6.4. Example - Using Neural Networks to predict stock prices

4.6.5. Model Evaluation

5. Schedule

No	Lecture	Date	Time
1	Python for Data Science	Saturday, 11 July 2020	2PM - 5PM
2	Linear Regression & Logistic Regression	Saturday, 18 July 2020	2PM - 5PM
3	K means clustering	Saturday, 25 July 2020	2PM - 5PM
4	K nearest neighbors	Saturday, 1 August 2020	2PM - 5PM
5	Decision Trees	Saturday, 8 August 2020	2PM - 5PM
6	Neural Networks	Saturday, 15 August 2020	2PM - 5PM