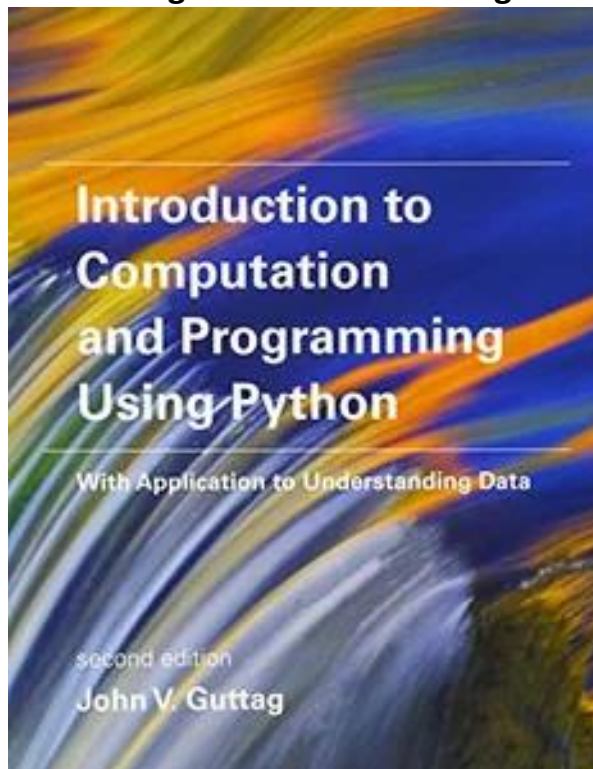


一、課程內容

1. 講義上課(隨機點名十次 計分 20%)
2. 繳交習題(八至十題 附有範例，審核內容，計分 60%)
3. 期末專題(較大型作業 計分 20%)
4. 沒有考試

二、參考書籍

1. Computational Thinking and Problem Solving



Guttag, John. "Introduction to Computation and Programming Using Python: With Application to Understanding Data." 2nd ed. MIT Press, 2016.

2. 自編講義(Moodle 可事先下載)

三、教材內容

1. Python 程式語言簡介
 - i. Python Data Structure
 - ii. Python Classes
2. 探索最佳化問題(Introduction to Optimization Problems)

- i. Knapsack Problems
 - ii. Greedy algorithm for solving problems
3. 最佳化問題初解(Optimization Problems Solutions)
 - i. NP-complete Problems
 - ii. Dynamic Programming
4. 圖形理論模式(Graph- Models)
 - i. Classic Graph-Theoretic Problems
 - ii. Graph Searching Algorithm
5. 隨機思考(Stochastic Thinking)
 - i. Uncertainty World and Stochastic Modeling
 - ii. Stochastic Programs
6. 隨機漫步(Random Walks)
 - i. Random Walks
 - ii. The Drunkard's Walk
 - iii. Biased Random Walks
7. 蒙地卡羅模擬(Monte Carlo Simulation)
 - i. Pascal's Problem
 - ii. Probability Problems and solutions
8. 信賴區間(Confidence Intervals)
 - i. Data analysis
 - ii. Confidence Intervals
 - iii. Central Limit Theorem
9. 取樣及標準差(Sampling and Standard Error)
 - i. Data Sampling
 - ii. Standard Error of the Mean
10. 認識實驗資料(Understanding Experimental Data)
 - i. Behavior of Experiments
 - ii. Know Experiment Data
11. 認識實驗資料二(Understanding Experimental Data (cont.))
12. Fitting Exponentially Distributed Data (Python)

13. 機器學習簡介(Introduction to Machine Learning)

- i. Feature Vectors
- ii. Distance Metrics

14. 資料分群簡介(Introduction to Clustering)

- i. Class Cluster
- ii. K-means Clustering
- iii. Other Clustering Methods

15. 資料分類簡介 (Introduction to Classification)

- i. Knowing Classifiers
- ii. Classification Example
- iii. K-nearest Neighbors
- iv. Regression-based Classifiers

16. 資料分類及統計誤差(Classification and Statistical Sins)

- i. Tests Are Imperfect
- ii. Sampling Bias
- iii. Statistically Significant Differences Can Be Insignificant

17. 期末專題製作