National Taiwan University
Institute of Industrial Engineering
Laboratory of Analytics on Knowledge Engineering

Data Analytics

IE5054 111-2 Syllabus
Monday 9h10-12h10 @ Xinsheng Lecture Building R402

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Introduction

Data analytics is becoming the fashion in all domains. Related buzzwords, such as data mining, big data, artificial intelligence, machine learning and deep learning, are floating around in all kinds of media. Through this course, we will study both the fundamental definitions of all buzzwords as well as common techniques, such as multivariate statistical inference and unsupervised and supervised learning algorithms. R or Python will be used throughout this course in order to analyze, compare, and link the different techniques to the practical world.

DA course is now designed in a blended learning format, which includes: asynchronous video learning; face-to-face discussion; homework exercises; and the final project collaboration.

(For those who would like to enroll in this course, you are strongly encouraged to attend the first lecture and see if the course eventually fits your interest. The registration code will be distributed after you sign up for the first lecture.)

Objective

Students from this course shall learn to:

1. understand the data characteristics and the fitness of different algorithms;
2. pretreat and clean the data;
3. extract and select significant features;
4. explain the analytical results;
5. use R/Python for quick data analytics.

Keyword

multivariate analysis, statistical inference, data mining, machine learning, artificial intelligence

Pre-requisite

probability, statistics, linear algebra, and programming skills

Assigned Reading

All the materials and videos will be available on COOL for you when enrolling in the course.

Reference Book

- Strang, G. (2006). *Linear Algebra and Its Applications*
- Montgomery, D. C., & Runger, G. C. (2014). *Applied Statistics and Probability for Engineers*
- Rencher, A. C., & Christensen, W. F. (2012). *Methods of Multivariate Analysis*
- Johnson, R., & Wichern D. (2014). *Applied Multivariate Statistical Analysis*
- Izenman A. J., 1st edition, *Modern Multivariate Statistical Techniques*
- James, G., Witten, D., Hastie, T., & Tibshirani, R. (2017). *An Introduction to Statistical Learning*
- Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning*

Evaluation

Homework (25%), Mid-term Exam (35%), Team Project (37%), Participation (3%)

Planning

Date	Topics
02/20	Review & Preview
02/27	Bank Holiday (228 Peace Memorial Day) × Regression Analysis
03/06	Regression Analysis
03/13	Multivariate Statistical Inference
03/20	Dimension Reduction Techniques
03/27	Partial Least Squares Regression
04/03	Bank Holiday (Spring Break) × Big Data Infrastructure
04/10	Mid-term Exam
04/17	Supervised Learning Algorithms × Team Building
04/24	Supervised Learning Algorithms
05/01	Unsupervised Learning Algorithms
05/08	Unsupervised Learning Algorithms
05/15	Machine Learning Techniques
05/22	Deep Neural Nets
05/29	Deep Neural Nets
06/05	Challenge Presentation Day (Peer Review*)
06/12	Report Due