COMP7065 Innovative Laboratory

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Course: https://www.comp.hkbu.edu.hk/v1/file/course/COMP7065.pdf

Week	Topic	Lecture	Lab	Deliverable
1	**Introduction** Course overview Course logistics Data scraping Data preprocessing Data visualization Quantitative analytics	- Give an overview of this course. - Explain the requirements and expectations (assignments & mini-project). - Introduce the basics of data management, data preprocessing, visualization, and quantitative analytics.	Goal: Familiarize with coding tools. Exercise: Collect a small image dataset from the internet, do some data analysis, and fine-tune a neural network model on the dataset. (Need to split the dataset into train & val sets.) Steps: - Choose two (or more) categories, e.g., dog and cat. - Collect an image dataset from the internet using data scraping. (E.g., 20 images per class.) - Preprocess the data: cleaning, augmentation, etc. - Perform data analytics & visualization, e.g., visualize images and their feature distribution in 3D.	Report. * The report should contain a Colab or Jupyter notebook that details the implementation and results. Same for below.
2 3	**Data Mining** Association Rule Mining Similarity Matching	- Introduce the background of data mining: what it is and why it is an important area. - Introduce the concepts of Association Rule Mining (ARM) and Similarity Matching (SM). - Explain how to use data mining methods (i.e. ARM & SM) to build a recommendation system.	Problem: Develop an Amazon product recommendation system. Task 1: Dataset analysis. Task 2: Model design and training. Task 3: Evaluation and visualization. (These tasks should also be done for the remaining projects.)	Report.
4 5	**Regression** Linear Regression Polynomial Regression Support Vector Regression Ridge Regression Lasso Regression	- Introduce the regression problem in machine learning. - Introduce commonly used regression algorithms: linear regression, polynomial regression, support vector regression, etc.	Problem: House price prediction.	Report.
6 7	**Regression** Convolutional neural network Human pose estimation	- Introduce the problem of human pose estimation. - Explain how to solve the problem using deep regression neural networks.	Problem: Human pose estimation in 2D images.	Report.
Students form groups and submit their mini-project proposals. More specific guidelines will be provided later. Once the proposals are approved by the instructor, the students can start to develop their projects.				
8 9 10	**Classification** Object detection Image segmentation	- Introduce the problems of object detection and image segmentation. - Introduce the Mask RCNN framework.	Problem: Fine-tune Mask RCNN for a downstream application.	Report.
11 12	**Deep Generative AI** Discriminative vs. Generative models Generative Adversarial Network (GAN)	- Introduce the background of image generation. - Introduce the classic GAN model.	Problem: Develop a bedroom image generation model.	Report.
13	**Final Demo** Presentation / poster (TBD)	Each group is required to present their mini-project.		Code and report.