Welcome to 42028: Deep Learning and Convolutional Neural Network

Teaching Team

- **Subject Co-ordinator & Lecturer:**

  Dr. Nabin Sharma

  Email: Nabin.Sharma@uts.edu.au

- **Tutorial Staff**:
  - Dr. Muhammad Saqib
  - Mr. Ankit Kapoor

Objectives

- Introduction to Machine Learning fundamentals.
- Understand the difference between traditional machine learning and Deep Learning.
- Able to Build, Train, and Test a Convolutional Neural Network (CNN) from scratch.
- Learn to use libraries and framework for implementing Deep CNN architectures.
- Collaboratively Analyze, design, implement and test solutions to real-world computer vision related problems.

Assessment Items

- Assessment Task 1: Assignment-1 (Individual)
  - **Weight:** 30%
  - **Task:**
    1. Implement a simple kNN classifier for digit classification
    2. Implement a Linear classifier using SVM for digit classification
    3. Implement a Linear classifier using Neural Network for digit classification
    4. Compare the three implementations in terms of classification accuracy and top choices.
  - **Due Date: 11.59pm Friday 10 April 2020.**
  - **Deliverables:** Short Report and code, via Canvas.

Assessment Items

- Assessment Task 2: Assignment-2 (Individual)
  - **Weight:** 40%
  - **Task:**
    1. Customize AlexNet/GoogleNet/ResNet and reduce/increase the layers. Train and test on images
    2. Implement a custom CNN architecture for object detection and localization.
    3. Train and test the custom architecture on a given dataset for detection of multiple Objects, using Faster RCNN or Yolo object detection methods.

    (Training, validation and testing datasets will be provided.)
  - **Due Date:** **11.59pm Friday 29 May 2020**.
  - **Deliverables:** Short Report and code, via Canvas.

Assessment Items

- Assessment Task 3: Final Project (Group)
  - **Weight:** 30%
  - **Task:** Any one of the following problems, or any combination:
    1. Design/Implement an image classification algorithm.
    2. Design/develop an object detection system for detecting specific objects in a video and localizing them.
    3. Develop a clear problem statement that is within the capabilities of CNNs and design and capture a dataset of significant size that addresses this problem.
    4. Compare a series of algorithms against each other to determine optimum performance, and then suggest new approaches that improve performance.
    5. Develop a user interface that allows the operational use of an algorithm to achieve a real-world
- **Final Due Date:** **11.59pm Friday 5 June 2020,**
  Demo schedule to be informed later
- **Deliverables:** Multiple deliverables, via Canvas.

Assessment Items

Assessment Task 3: Final Project (Group)

Deliverable details:

1. Report: Group details, Project title and abstract : Week 3, Friday: Weightage 10%
2. Report: Dataset details, GUI design plan, Implementation/development plan: Week 6, Friday : Weightage 10%
3. Report: Initial experimental results: Week 8, Friday: Weightage 10%
4. GUI design/report: Week 10, Friday: Weightage 10%
5. Complete project (GUI, experimental results etc.): Week 12, Weightage 50%
6. Presentation and Demo: Weightage 10%

Labs/Tutorials

- **Duration**: 3Hrs
  - 2Hrs (Tutor guided)
  - 1Hr (For project related activities), students to work in groups.
- Implementation of Algorithms using Python
- IPython/Jupyter notebooks to be used
- Google Colab will be used

Labs/Tutorials

- Deep Learning frameworks: TensorFlow, Keras, etc
- Datasets will be provided

Important Tasks:

- Project Groups to be formed by Week-3 Friday.
- Trello will be used for your project management.