# CSE676 Deep Learning

Course Syllabus

## 1 Introduction

Deep Learning algorithms learn multi-level representations of data, with each level explaining the data in a hierarchical manner. Such algorithms have been effective at uncovering underlying structure in data, e.g., features to discriminate between classes. They have been successful in many artificial intelligence problems including image classification, speech recognition and natural language processing. The course, which will be taught through lectures and projects, will cover the underlying theory, the range of applications to which it has been applied, and learning from very large data sets. The course will cover connectionist architectures commonly associated with deep learning, e.g., **basic neural networks**, **convolutional neural networks**, and **recurrent neural networks**.

### 1.1 Materials & Textbooks (Optional)

- ***Pattern Classification***, *David G. Stork, Peter E. Hart, and Richard O. Duda*
- ***Pattern Recognition and Machine Learning***, *Christopher Bishop*
- ***Attention Is All You Need*** *Ashish Vaswani, Noam Shazeer, Niki Parmar, Jakob Uszkoreit, Llion Jones, Aidan N. Gomez, Lukasz Kaiser, and Illia Polosukhin*
- ***Deep Learning***, *Goodfellow Ian, Yoshua Bengio, and Aaron Courville*

## 2 Course Outline[1]

- **Week 1 and Week 2**
  - Math and Linear Regression
- **Week 3 and Week 4**
  - Review on Linear Regression, Softmax Regression and MLP
- **Week 5 and Week 6**
  - CNN and *Efficient-Net Paper* Reading
- **Week 7** (One Class)
  - Midterm (Coverage on Week 1,2,3,4)
- **Week 8 and Week 9**
  - Recurrent Neural Networks and *Paper Read on Transformer*
- **Week 10, Week 11, Week 12 and Week 13**

[1] Subject to change based on class progress and feedback.

  - Continual Learning and Others (Optimizations, Federated Learning, Meta-Learning, etc)

- **Week 14 and Week 15**
  - Project Presentation

# 3 Course Logistics

## 3.1 Office Hours

**Course Instructor**: *Dr Kaiyi Ji* [000] and *Jue Guo* [B]

- **Research Area**: Optimization for machine learning, Multi-task learning, Continual Learning, federated learning.
- Interested in participating in our research? Reach to us by email.

**Course Hours**: (08/28/2023 - 12/11/2023)

- Session [000]
- Time: Tuesday and Thursday 11:00AM - 12:20PM
- Joint Course Piazza

**Office Hours**:

- My office hours: 4:00pm - 6:00pm on Friday
- TA: Jiayu Qin (email:jiayuqin@buffalo.edu)
- TA office hours: Wednesday and Friday 12:00pm - 1:00pm
- Office Hour Zoom Link

## 3.2 What makes up your grade?[2]

We will have

- **Attendance**: 5 percent (Random Pop Quiz)
- **Programming Assignment**: 20 percent (One)
- **Midterm**[3]: 20 percent
  - **Require** Lock-down Browser
  - Multiple Choices [Only 1 correct answer]
  - Numerical Questions [Only 1 correct answer]
- **Final**: 25 percent (Dec 14th)
  - **Require** Lock-down Browser
  - Multiple Choices [Only 1 correct answer]
  - Numerical Questions [Only 1 correct answer]
- **Project**[4]: 30 percent
  - Group Project (# of people determined by the final enrollment)
    - Learn to work as a team
  - List of project and detail given after the first week of Course.
  - Present the project in the course. [20-30 minutes]

[2]The logistic is subject to change based on the overall pace and the performance of the class.
[3]A week-ahead notice for mid-term, based on the pace of the course.
[4]No extension on the project, which you should work on from the first week of class.

### 3.3 Grading Rubric

| **Percentage score (S)** | **Letter Grade** |
|---|---|
| $93 \leq S \leq 100$ | A |
| $88 \leq S < 93$ | A - |
| $83 \leq S < 88$ | B + |
| $78 \leq S < 83$ | B |
| $73 \leq S < 78$ | B- |
| $68 \leq S < 73$ | C + |
| $63 \leq S < 68$ | C |
| $56 \leq S < 63$ | D |
| $0 \leq S < 56$ | F |

## 4 Academic Integrity

(**Short**) Do not cheat! You will be caught and punished. Our department is serious about graduating ethical and upstanding computer scientists. The policy has recently been updated and will be enforced. For more information: Academic Integrity