

Spring 2023

## **DS 677: Deep Learning**

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### **Recommended Citation**

Li, Daming, "DS 677: Deep Learning" (2023). *Computer Science Syllabi*. 394.  
<https://digitalcommons.njit.edu/cs-syllabi/394>

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# Course Syllabus

## DS 677: Deep Learning

### Spring 2023

Instructor: Daming(David) Li, email: dli@njit.edu

#### Course Description and format:

This course will prepare students for hands-on experience in deep learning with Python and the advanced frameworks including Scikit-Learn, Keras and TensorFlow. This course will combine theory and practice together, and guide students step by step to analyze, design, implement and present real-world deep learning project. This class will also promote the good practice and the common used tools in industry to prepare students well for career development in data science. The format of the course will include lectures by the instructor, lab exercises, class discussion, directed reading, and student presentations/projects. The exact format will depend on the size of enrollment and student background and will adjust according to the progress.

#### Goal:

- Hands-on experience in deep learning with Python
- Advanced Deep Learning frameworks
- Learn to analyze, design, implement and present real-world deep learning project
- Gain the edge for your career

#### Prerequisites:

- Advanced data analytics with Python programming skills
- Good foundation on machine learning
- Basic understanding about deep learning
- College level math courses
  - Linear algebra
  - Probability
  - Statistics
  - Calculus
  - Numerical analysis
  - etc

#### Textbooks (helpful but not required):

- Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 2nd Edition
- Learning Deep Learning: Theory and Practice of Neural Networks, Computer Vision, Natural Language Processing, and Transformers Using TensorFlow 1st Edition.

**Collaboration and Honor Code:** Students may discuss problems together but must write up their own solutions. When writing up the solutions, students should write the names of people, if any, with whom they discussed the assignment. Note in particular that copying homework or programming assignments, in full or in part is forbidden. Students found cheating or plagiarizing will be immediately referred to the Dean of Students and the NJIT Committee on Professional Conduct and subject to Disciplinary Probation, a permanent marking on the record, possible dismissal, and an “F” grade in the course. All submitted assignments will be checked for similarities, and plagiarism and guilty students identified.

## **Grade Breakdown**

- Homework (10%)
- Quiz (20%)
- Term Projects (20%)
- Midterm (20%)
- Final (30%)

## **Homework (10 %)**

- Homework assignments
- Try to do it independently, discussions allowed, but cheating/copying is strictly prohibited.
- Homework Grading Policy
- Completeness and correctness are more important than performance.
- Late homework policy
- 25% penalization per late day; Not accepted more than 3 days late

## **Lab exercise**

- We may have a lab session at the end of each class.
- Focus on course materials and sample code
- We will solve some simple problems
- Post your answers by replying on canvas
- Some answers may be selected for discussion by the end of lab session.
- Some problems may become part of homework

## **Two Term Projects (20%)**

- Submit code and report to summarize what you have done and results you obtained.
- Prepare for presentation and demo.
- 1~3 students a group. It can be same as lab group.
- More details to be announced soon
- Cheating/Copying is strictly prohibited. I will report to Dean and you will get F in this course.

## **Quiz (20%)**

- Focus on course materials.
- 4 Quizzes
- Dates are posted on canvas
- Prepare your computer for hands-on coding

## **Two Exams (50%)**

- One midterm and one Final (20%+30%)
- In-class;
- Open book;
- Final is cumulative
- Only in Python/Tensorflow/Keras. We don't use pytorch in this class.

## **Some tips:**

- Set up your dev environment for exams. It will require to write code.
- Prior to quiz/exam, restudy the materials and Jupyter sample code

- If I discover cheating, I will report the incident to the Dean of Student's office Re: Academic Integrity. (TAs report the incident to the course instructor)

**Tentative course topics (Subject to changes according to progress)**

- The Fundamentals of Machine Learning
- Introduction to Neural Network with TensorFlow & Keras Basics
- Training Deep Neural Networks
- Custom Models and Training with TensorFlow
- Loading and Preprocessing Data with TensorFlow
- Convolutional Neural Networks
- Recurrent Neural Networks & Long Short-term Memory(LSTM)
- Midterm Exam
- NLP with RNNs and Attention
- Representation Learning Using Autoencoders
- Generative Learning Networks (GANs)
- Reinforcement Learning
- Training and Deploying TensorFlow Models at Scale
- Other Topics about Deep Learning, Final Review and Q&A
- Final Exam