

**Textbook**

1. Deep Learning. By Ian Goodfellow, Yoshua Bengio, and Aaron Courville, MIT Press, 2016. Also available at [www.deeplearningbook.org](http://www.deeplearningbook.org)  
Handouts and research articles may also be used by the instructor.

**Objective**

2. Computer Vision has become ubiquitous in our society, with applications in search, image understanding, apps, mapping, medicine, drones, and self-driving cars. Core to many of these applications are visual recognition tasks such as image classification, localization and detection. Recent developments in neural network (aka “deep learning”) approaches have greatly advanced the performance of these state-of-the-art visual recognition systems. This course is a deep dive into details of the deep learning architectures with a focus on learning end-to-end models for these tasks, particularly image classification.

**Pre-Requisite**

3. Linear Algebra, Probability, Machine Learning

**Course Outcome**

4. During the course, students will learn to implement, train and debug their own neural networks and gain a detailed understanding of cutting-edge research in computer vision and its application for robotics. The final assignment will involve training a multi-million parameter convolutional neural network and applying it on a large dataset.

**Course Outline**

4. The course covers the techniques and technology to set up the problem of image recognition, the learning algorithms (e.g. backpropagation), practical engineering tricks for training and fine-tuning the networks.

| Topics   | Allocated Periods |
|--|-------------------|
| <ul style="list-style-type: none"> <li><input type="checkbox"/> Machine Learning Basics</li> <li><input type="checkbox"/> Deep Feedforward Networks</li> <li><input type="checkbox"/> Regularization for Deep Learning</li> <li><input type="checkbox"/> Optimization for Training Deep Models</li> <li><input type="checkbox"/> Convolutional Neural Networks</li> <li><input type="checkbox"/> Sequence Modeling: Recurrent Neural Networks</li> <li><input type="checkbox"/> Applications of Deep Learning</li> </ul> | 45                |