**Statistical Learning & Deep Learning**

Office Hours and Contact Hours

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**Microsoft Teams**

Description

Deep Learning, a subset of Machine Learning, is a representation learning method which extracts features automatically without implicit programming from a source data by using multiple layers of neural networks. Deep Learning has been transforming the Artificial Intelligence research by enabling rapid advancements in computer vision, natural language processing, and many other fields of science. From self-driving cars to Alpha-Go, the reach of Deep Learning algorithms have begun to change the very fabric of human understanding. In this course, students will gain a thorough introduction to cutting-edge research in Deep Learning using applications in Computer Vision. Through lectures, assignments and a final project, students will learn the necessary skills to design, implement, and understand their own neural network models.

Syllabus content

* Statitcis and Probebility Theory
* Basics of Neural Networks
* Optimization Algorithms
* Hyperparameter Tuning and Regularization
* Foundations of Convolutional Neural Networks
* Deep Convolutional Neural Networks
* Training and Inference of Convolutional Neural Networks
* Transfer Learning and Modern CNN models
* Object Detection and Bounding Boxes
* Transpose Convolutions for Auto Encoders
* Recurent Neural Network and LSTM
* Self-Supervised Representation Learning
* Generative Adversarial Networks
* Variational AutoEncoder

Please note that this is an advanced graduate independent study and we assume basic knowledge of data analytics.

You should understand:

* + Proficiency in Python
  + College Calculus, Linear Algebra
  + Basic Probability and Statistics

Milestones and Deliverables

* Students will use these models to define complex modern architectures in TensorFlow and tf.Keras frameworks or Pytorch. In the course project, student will implement a deep neural network model the respected project.
* Deliverables for this independent study will be composed of one final project and whitepaper resulting from the project.

Graded Assignments

The grades for this course will be based on a standard 70% = C, 80% = B, 90%=A grading scheme. The final grades will be based on the following assignments:

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| --- | --- |
| Reading independent study materials and capture notes | 25% |
| Neural Network Model Design for the project | 25% |
| Model Implementation | 25% |
| Paper | 25% |

Common Syllabus Information

<http://provost.utsa.edu/syllabus.asp>