



INFO 7375 ST in Artificial Intelligence Engineering and Applications

Course Information

Course Title: Special Topics in Artificial Intelligence Engineering and Applications

Course Number: INFO 7375-01-ST

Term and Year: Spring 2022

Credit Hour: 4

Course Format: On-Ground

Instructor Information

Full Name: Subrata Das

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Course Prerequisites

Graduate level INFO 6205 Minimum Grade of C-

Course Description

Covers recent advances in neural nets and deep learning techniques with applications to large-scale engineering problems.

Standard Learning Outcomes

Learning outcomes common to all College of Engineering Graduate programs:

- 1. An ability to identify, formulate, and solve complex engineering problems.*
- 2. An ability to explain and apply engineering design principles, as appropriate to the program's educational objectives.*
- 3. An ability to produce solutions that meet specified end-user needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.*

The Information Systems Program accepts students of different engineering backgrounds with minimum programming skills and produces first class Information Systems engineers that operate at the intersection of real-world complexity, software development, and IT management. Graduating students will be able to construct end-to-end advanced software applications that meet business needs.

Specific Learning Outcomes for the Information Systems program:

- 1. Create a strong technical foundation through diverse, high-level courses*
- 2. Built crucial interpersonal skills needed to succeed in any industry*
- 3. Foster a deep level of applied learning through project based case studies*

Course Outcomes and Assessment Standards

Prepare students with cutting-edge tools and technologies to face the new wave of data science challenges from the academia and industry. In this class, students will learn the most fundamental and cutting-edge tools,

techniques and applications of AI, machine and deep learning, and NLP to get ready for the challenging job market. Prof. Subrata Das has over 20 years of experience in both academia and industry applying computational techniques. The class will be very hands-on with lots of practical exercises and assignments and two projects from Kaggle competitions. Some background of mathematics and statistics and machine learning will be required.

Course Schedule:

Week	Topic	Content	Assignment
1	Introduction	history of symbolic Artificial Intelligence (AI), evolution of machine learning (ML), introduction to vectors and tensors, overview of ML algorithms, neural learning, emergence of deep learning (DL)	Python and TensorFlow Programming
2	Neural Networks (NN)	model and training, forward propagation, cost function optimization, error backpropagation, training by gradient descent, bias/variance and under/overfitting, regularization	Assignment 1
3-4	Convolutional Neural Networks (CNN)	convolution and pooling operations, activation functions, five important CNN models (LeNet, AlexNet, VGGNet, GoogLeNet/Inception, ResNet), backpropagation algorithm for CNN	Assignment 2
5-6	CNN Implementation	frameworks (Tensorflow, Keras, Theano, Pytorch), model coding, visualization of layers, transfer learning, enterprise services (IBM Watson, Google Cloud, AWS, Microsoft Cognitive Toolkit)	Assignment 3
7-8	mid-term quiz and project, applications (image classification, object detection)		
9	Sequential Modeling	Recursive Neural Networks (RNN), vanishing gradient, Long Short Term Memory (LSTM),	Assignment 4
10	More Deep Models	Restricted Boltzmann Machines (RBM), training RBMs, Deep Belief Networks (DBN), Stacked Auto Encoders, Generative Adversarial Networks (GAN), Deep Reinforcement Learning, Open AI Gym	Assignment 5
11-12	Natural Language Processing (NLP)	parsing, named entity extraction, coreference resolution, word embedding, document classification, NLTK, RNN/LSTM and BERT	Assignment 6
13-14	final quiz and project, applications (image captioning, chatbot)		

End-of-Course Evaluation Surveys

Your feedback regarding your educational experience in this class is very important to the College of Professional Studies. Your comments will make a difference in the future planning and presentation of our curriculum.

At the end of this course, please take the time to complete the evaluation survey at <https://neu.evaluationkit.com>. Your survey responses are **completely anonymous and confidential**. For courses 6 weeks in length or shorter, surveys will be open one week prior to the end of the courses; for courses greater than 6 weeks in length, surveys will be open for two weeks. An email will be sent to your HuskyMail account notifying you when surveys are available.

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to <http://www.northeastern.edu/osccr/academic-integrity-policy/> to access the full academic integrity policy.

Student Accommodations

Northeastern University and the Disability Resource Center (DRC) are committed to providing disability services that enable students who qualify under Section 504 of the Rehabilitation Act and the Americans with Disabilities Act Amendments Act (ADAAA) to participate fully in the activities of the university. To receive accommodations through the DRC, students must provide appropriate documentation that demonstrates a current substantially limiting disability.

For more information, visit <http://www.northeastern.edu/drc/getting-started-with-the-drc/>.

Library Services

The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals.

For more information and for Education specific resources, visit <http://subjectguides.lib.neu.edu/edresearch>.

24/7 Blackboard Technical Help

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Within Blackboard, open a support case via the red support button on the right side of the screen, click Create Case

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Visit the [Information Technology Services \(ITS\) Support Portal](#)

Email: help@northeastern.edu

ITS Customer Service Desk: 617-373-4357

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work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration and an awareness of global perspectives on social justice.

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