DEEP LEARNING

PROF. PRABIR KUMAR BISWAS
Department of Computer Science Engineering
IIT Kharagpur

TYPE OF COURSE: Rerun | Elective | UG/PG

COURSE DURATION: 12 weeks (20 Jul'20 - 09 Oct'20)

EXAM DATE: 17 Oct 2020

PRE-REQUISITES: Knowledge of Linear Algebra, DSP, PDE will be helpful.

INTENDED AUDIENCE: Electronics and Communication Engineering, Computer Science, Electrical Engineering

INDUSTRIES APPLICABLE TO: Google, Adobe, TCS, DRDO etc.

COURSE OUTLINE:
The availability of huge volume of image and video data over the internet has made the problem of data analysis and interpretation a really challenging task. Deep Learning has proved itself to be a possible solution to such computer vision tasks. Not only in computer vision, Deep Learning techniques are also widely applied in Natural Language Processing tasks. In this course we will start with traditional Machine Learning approaches, e.g. Bayesian Classification, Multilayer Perceptron etc. and then on to modern Deep Learning architectures like Convolutional Neural Networks, Autoencoders etc. On completion of the course, students will acquire the knowledge of applying Deep Learning techniques to solve various real life problems.

ABOUT INSTRUCTOR:
Prof. Prabir Kumar Biswas received his B.Tech., M.Tech., and Ph.D. degrees in Electronics and Electrical Communication Engineering from the Indian Institute of Technology Kharagpur in 1985, 1989, and 1991 respectively. He served Bharat Electronics Ltd. (BEL), Ghaziabad as a Deputy Engineer from 1985 to 1987. In 1991, he joined as a faculty in the Department of Electronics and Electrical Communication Engineering at IIT Kharagpur. He also served as the Head of the Computer and Informatics Center at IIT Kharagpur from March 2008 to December 2014. Prof. Biswas visited the University of Kaiserslautern, Germany during March 2002 to February 2003 as Alexander von Humboldt Fellow. His research interests include Image and Video Processing, Pattern Recognition, Machine Learning, Multimedia Systems, Cyber Physical Systems etc.

COURSE PLAN:

Week 1: Introduction to Deep Learning, Bayesian Learning, Decision Surfaces
Week 2: Linear Classifiers, Linear Machines with Hinge Loss
Week 3: Optimization Techniques, Gradient Descent, Batch Optimization
Week 4: Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning
Week 5: Unsupervised Learning with Deep Network, Autoencoders
Week 6: Convolutional Neural Network, Building blocks of CNN, Transfer Learning
Week 7: Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam
Week 8: Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization
Week 9: Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network Fully Connected CNN etc.
Week 10: Classical Supervised Tasks with Deep Learning, Image Denoising, Semantic Segmentation Object Detection etc.
Week 11: LSTM Networks
Week 12: Generative Modeling with DL, Variational Autoencoder, Generative Adversarial Network