



Course Objective and Outcome Form

Department of Electrical and Computer Engineering

School of Engineering and Physical Sciences

North South University, Bashundhara, Dhaka-1229, Bangladesh

1. **Course Number and Title:** CSE553/EEE660 – Computer Vision
CSE468 - Computer Vision
2. **Number of Credits:** 3
3. **Prerequisites:** None
4. **Contact Hours:** 12 weeks, 3 hrs/week
5. **Faculty:** Dr. Nabeel Mohammed (NbM)
6. **Email:** nabeel.mohammed@northsouth.edu
7. **Course Description:** The recent advances in Computer Vision are mostly fuelled by successful application of Machine Learning, specifically Deep Learning, techniques. This course aims to strike a balance between presenting the new advances and the more traditional approaches. These features are presented in the context of image matching, classification, CBIR and other applications. The significant part of the course concentrates exclusively on Deep Learning techniques, with a major emphasis on Convolutional Neural Networks and its use in large scale image classification, object detection, instance segmentation, metric learning etc. Transformer-based architectures will also be covered once students gain a grasp of the CNN-based models
8. **Syllabus:**
 - Traditional Features
 - a. Colour Histogram
 - b. Application of Gabor Filter banks
 - c. Histogram of Oriented Gradients
 - d. SIFT
 - e. LBP
 - Application of Features
 - f. Classification
 - g. Human Detection
 - h. Pose Estimation
 - i. Image Matching
 - j. CBIR
 - Deep Learning
 - k. Supervised Learning
 - l. Convolutional Neural Networks

- m. Regularizers
 - i. Dropout
 - ii. L1/L2 etc.
 - n. Design of Loss functions
 - o. Autoencoders
 - p. Siamese Networks
 - q. Generative Adversarial Neural Networks
 - r. Transformer based models
- Applications of Deep Learning
- s. Classification revisited
 - t. Object Detection
 - i. Faster R-CNN
 - ii. YOLO
 - u. Instance Segmentation
 - v. Face Identification/Recognition
 - w. Transfer Learning applications

9. Assessment Weight:

- a. Project - 40%
- b. Assignment - 20%
- c. Midterm - 20%
- d. Final - 20% (Extra questions for MS Students)

10. Grading Policy: We will follow NSU Grading policy

11. Reading Material

- a. Deep Learning Book: <https://www.deeplearningbook.org/>
- b. <http://neuralnetworksanddeeplearning.com/chap1.html>
- c. AlexNet Paper: <https://papers.nips.cc/paper/2012/file/c399862d3b9d6b76c8436e924a68c45b-Paper.pdf>
- d. ArcFace Paper: <https://arxiv.org/abs/1801.07698>
- e. R-CNN Paper: <https://arxiv.org/abs/1311.2524>
- f.