Department of Electronic and Telecommunication Engineering

FAc

Memo

To: ~~Dean~~ UGs, Faculty of Engineering

From: Dr. N. W. N. Dayananda, Head of the Department

Date: 17 Sept. 2018

Re: Removal of Pre-Requisite for EN4553

EN2550 Fundamentals of machine vision and Image Processing has been a pre-requisite for EN4553 Pattern Analysis and machine Intelligence. However, the changes in the application areas of pattern analysis and machine intelligence makes it illogical to have EN2550 as a pre-requisite.

In view of this, it is requested to remove EN2550 as a pre-requisite for EN4553.

Approval of the Senate is sought.

Effective from 2014 Intake onwards.

Head
Dept. of Electronic and
Telecommunication Engineering
University of Moratuwa
Sri Lanka

Undergraduate Studies Division

17 SEP 2018

Faculty of Engineering
University of Moratuwa

Module Code	EN2550	Module Title	Fundamentals of Image Processing and Machine Vision			
Credits	2.5	Hours/Week	Lectures	2	Pre/Co – requisites	-
GPA/NGPA	GPA		Lab/Assignment	3/2		

Learning Outcomes	
At the end of the module the student will be able to:	
1.	Apply image processing algorithms for image enhancement
2.	Apply machine vision algorithms for detection and recognition
3.	Design machine vision solutions for common industry problems
Outline Syllabus	
1.	**Describe the digital representation of images (2 h):** representation of a grayscale digital image as a 2-D array of numbers, representation to color images, concepts of resolution and DPI, interpolation algorithms for image scaling.
2.	**Image processing (6 h):** point and neighborhood operations for image enhancement, 2-D Fourier techniques frequency-domain algorithms to replicate spatial domain operations, morphological operations.
3.	**Machine vision (8 h):** cameras and fundamental multiple view geometry, basic segmentation algorithms, simple classifiers, detection and recognition.
4.	**Industry applications of image processing (4 h):** photo processing for printing, medical image processing.
5.	**Industry application of machine vision (4 h):** camera as a measurement device, vision for automation.
6.	**Case studies of image processing and vision in practice (4 h)**

Module Code	EN4573	Module Title	Pattern Recognition and Machine Intelligence			
Credits	3.0	Hours/Week	Lectures	2	Pre/Co – requisites	
GPA/NGPA	GPA		Lab/Assignments	3		

Learning Outcomes	
At the end of the module the student will be able to:	
1.	Investigate the capabilities of classifiers and learning algorithms.
2.	Recommend the best classifier to tackle real life pattern recognition problems.
3.	Apply pattern recognition techniques in solving industry and research problems.

Outline Syllabus	
1.	**Introduction (4 h):** Basic concepts of pattern recognition, applications of pattern recognition in biomedical engineering, data mining, , signal processing, computer security, natural language processing, and computer vision, probability distributions (binary variable, multinomial variable, Gaussians, the exponential family, non-parametric methods).
2.	**Decision Trees (4 h):** Discrete attribute decision trees, continuous attribute decision trees, learning algorithms (ID3, C4.5, CART, Random Forest), cut point selection.
3.	**Linear models for regression and classification (6 h):** Linear basis function model, the bias-variance decomposition, Bayesian linear regression, the evidence approximation. discriminant functions, probabilistic generative models, probabilistic discriminative models, the Laplace approximation, Bayesian logistic regression
4.	**Kernel methods and sparse kernel machines (4 h):** Dual representations, constructing kernels, radial basis function networks, Gaussian process, maximum margin classifiers, relevance vector machines.
5.	**Graphical methods (2 h):** Bayesian networks, Markov random fields, inference in graphical methods.
6.	**Mixture models and EM (2 h):** k-means clustering, mixture of Gaussians.
7.	**Sampling methods (2 h):** basic sampling algorithms, Markov chain Monte Carlo, Gibbs sampling.
8.	**Continuous latent variables (2 h):** Principal component analysis, probabilistic PCA
9.	**Sequential data (2 h):** Markov models, hidden Markov models, linear dynamical systems.