Rajiv Gandhi ProudyogikiVishwavidyalaya Bhopal

M.Tech Computer - Science and Engineering (Data Science)

Third Semester Syllabus

MTCD 301(A) -Image Processing & Computer Vision

UNIT 1 Digital Image Formation and low-level processing: Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc. Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

UNIT 2 Depth estimation and Multi-camera views, Multiple View Geometry Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration.

UNIT 3 Feature Extraction Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space AnalysisImage Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

UNIT 4 Image Segmentation Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection. Pattern Analysis Clustering: K-Means, K-Medoids , Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

UNIT 5 Motion Analysis Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation. Shape from X Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.

Reference Books:

1. Digital Image Processing using MATLAB, By: Rafael C. Gonzalez, Richard Eugene Woods, 2nd Edition, Tata McGraw-Hill Education 2010

2. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011. 3. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.

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Third Semester Syllabus

MTCD 301(B) - Pattern Recognition

UNIT-1 Pattern recognition fundamentals: Basic concepts of pattern recognition, fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model.

UNIT-2 Bayesian decision theory: Minimum-error-rate classification, Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, Discrete features, Missing and noisy features, Bayesian networks (Graphical models) and inferencing.

UNIT-3 Maximum-likelihood and Bayesian parameter estimation: Maximum-Likelihood estimation: Gaussian case, Maximum a Posteriori estimation, Bayesian estimation: Gaussian case, Problems of dimensionality, Dimensionality reduction: Fisher discriminant analysis, PCA ExpectationMaximization method: Missing features

UNIT-4 Sequential Models: State Space, Hidden Markov models, Dynamic Bayesian, Non-parametric techniques for density estimation: Parzen-window method, K-Nearest Neighbour method Linear discriminant functions: Gradient descent procedures, Perceptron criterion function, Minimumsquared-error procedures, Ho-Kashyap procedures, Support vector machines

UNIT-5 Unsupervised learning and clustering: Unsupervised maximum-likelihood estimates, Unsupervised Bayesian learning, Criterion functions for clustering, Algorithms for clustering: Kmeans, Hierarchical and other methods, Cluster validation, Low-dimensional representation and multidimensional scaling (MDS).

Reference Books:

1. Pattern Recognition principles: Julus T. Tou and Rafel C. Gonzalez, Addision –Wesley.

2. Pattern recognition and machine learning, Christopher M. Bishop, Springer 2006.

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Third Semester Syllabus

MTCD 302(A) - Quantum Computing

UNIT I FOUNDATION Overview of traditional computing – Church-Turing thesis – circuit model of computation– reversible computation – quantum physics – quantum physics and computation – Diracnotation and Hilbert Spaces – dual vectors – operators – the spectral theorem –functions of operators – tensor products – Schmidt decomposition theorem.

UNIT II QUBITS AND QUANTUM MODEL OF COMPUTATION State of a quantum system – time evolution of a closed system – composite systems easurement – mixed states and general quantum operations – quantum circuit model – quantum gates – niversal sets of quantum gates – unitary transformations – quantum circuits.

UNIT III QUANTUM ALGORITHMS – Superdense coding – quantum teleportation – pplications of teleportation – probabilistic versus quantum algorithms – phase kick-back – the Deutsch algorithm – the Deutsch- Jozsa algorithm – Simon's algorithm – Quantum phase estimation and quantum Fourier Transform – eigen value estimation.

UNIT IV QUANTUM ALGORITHMS Order-finding problem – eigenvalue estimation approach to order finding – Shor's algorithm for order finding – finding discrete logarithms – hidden subgroups – Grover's quantum search algorithm – amplitude amplification – quantum amplitude estimation – quantum counting – searching without knowing the success probability 101.

UNIT V QUANTUM COMPUTATIONAL COMPLEXITY AND ERROR CORRECTION Computational complexity – black-box model – lower bounds for searching – general black-box lower bounds – polynomial method – block sensitivity – adversary methods – classical error correction – classical three-bit code – fault tolerance – quantum error correction – three- and nine-qubit quantum codes – fault-tolerant quantum computation

TEXT BOOK:

1. P. Kaye, R. Laflamme, and M. Mosca, “An introduction to Quantum Computing”,
Oxford University Press, 1999. click here to read More: http://www.annaunivedu.in/2012/12/cs2062-quantum-computing-syllabus-anna.html#ixzz88kIvfAgh

REFERENCE:

1. V. Sahni, “Quantum Computing”, Tata McGraw-Hill Publishing Company, 2007.
click here to read more: http://www.annaunivedu.in/2012/12/cs2062-quantum-computing-syllabus-anna.html#ixzz88kIzq7iQ

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Third Semester Syllabus

MTCD 302(B) - Social Network Analysis

UNIT-1 Introduction to Social Media and Social Networks, Social Media: New Technologies of Collaboration, Social Network Analysis: Measuring, Mapping, and Modeling Collections of Connections

UNIT-2 Getting Started with NodeXL, Layout, Visual Design, and Labeling, Calculating and Visualizing Network Metrics, Preparing Data and Filtering, Clustering and Grouping.

UNIT-3 Email: The Lifeblood of Modern Communication, Thread Networks: Mapping Message Boards and Email Lists, Twitter: Conversation, Entertainment, and Information, All in One Network, WWW Hyperlink Networks.

UNIT-4 Visualizing and Interpreting Facebook Networks, Photos: Linking People, Photos, and Tags, YouTube: Contrasting Patterns of Content, Interaction, and Prominence, Wiki Networks: Connections of Creativity and Collaboration.

UNIT-5 Social Media Network Analysis Case Studies: Email, YouTube, Facebook, Twitter, Photos, WWW, WhatsApp.

Reference Books:

1. Derek Hansen Ben Shneiderman Marc Smith: Analyzing Social Media Networks with NodeXL, Elsevier, 1th edition. 2010

2. David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World., Cambridge University Press, 2010.

3. Mark Newman, Networks: An Introduction., Oxford University Press, 2010.

4. Avinash Kaushik., Web Analytics 2.0: The Art of Online Accounta-bility, Sybex, 2009.

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M.Tech Computer - Science and Engineering (Data Science)

Third Semester Syllabus

MTCD 302(C) - Green Computing

UNIT-1 Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT 2 Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT 3 Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

UNIT 4 Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT 5 The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TEXT BOOKS:

1. Bhuvan Unhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence‖, CRC Press, June 2014.
2. Woody Leonhard, Katherine Murray, ―Green Home computing for dummies‖, August 2012.

REFERENCES

1. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: steps for the Journey‖, Shroff/IBM rebook, 2011.
2. John Lamb, ―The Greening of IT‖, Pearson Education, 2009.
3. Jason Harris, ―Green Computing and Green IT- Best Practices on regulations & industry‖, Lulu.com, 2008
4. Carl speshocky, ―Empowering Green Initiatives with IT‖, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), ―Green computing: L