

# GLOBAL INITIATIVE FOR ACADEMIC NETWORKS



## Malaviya National Institute of Technology Jaipur

### Advanced Pattern Recognition Techniques

26<sup>th</sup> – 30<sup>th</sup> March 2018

#### Overview

Pattern recognition is the scientific discipline in the field of computer science whose goal is the classification of objects into a number of categories or classes. These objects can be signal waveforms (one-dimensional signals), images (two- or three-dimensional signals), abstract data or any type of measurements that need to be classified. The objects are referred using the generic term *patterns*. Pattern recognition is characterized as an information reduction from  $n$ -dimensional space ( $n \gg 1$ ), to 1-dimensional class membership space, information mapping or information labelling process. In abstract sense, the pattern recognition may be represented as a mapping of patterns from measurement space or world observation to class membership space.

Pattern recognition techniques are an important component of machine intelligence systems and are used for data preprocessing, feature extraction, as well as decision making or classification. Pattern recognition techniques overlap with areas such as: signal processing, artificial intelligence, neural modelling, optimization/estimation theory, and others. Pattern recognition applications include: image analysis, machine and computer vision, optical character recognition, computer-aided diagnosis, speech recognition and understanding, biometric-based identification (face, iris, fingerprint, speaker and gait recognition, etc.), seismic and radar signal analysis.

#### Objective

The main objective of the proposed course "Advanced Pattern Recognition Techniques" is to make the advanced concepts of pattern recognition clear to computer and electrical engineers, as well as postgraduate and PhD students in the fields of computer science and mathematics. The course is envisaged as self-contained,

and to address participants with different knowledge backgrounds. Some prerequisite knowledge, such as elementary linear algebra and probability theory basics is required.

The course is residential, spanning 5 days, and consists of lectures and hands-on experiences relating to diverse topics on pattern recognition and classification. It is intended that the course will complement and extend the materials in existing technical courses that many students will encounter in their first year of postgraduate training. It will also provide an opportunity to broaden awareness of knowledge and techniques in Pattern Recognition, Machine learning, Computer Vision, and Image Computing, and to develop appropriate research skills.

<b>Dates</b>	<b>Course Duration : 26<sup>th</sup> – 30<sup>th</sup> March 2018</b> <b>Last date of Registration: March 26<sup>th</sup> 2018</b>
<b>Who should attend</b>	Faculty, professionals and research scholars working in research areas like security, authentication and in promoting multimodal and advanced biometric authentication. Engineers and researchers from government organizations and R&D SMEs

<b>Registration Fees</b>	<p>MNIT Course Registration Fee (exclusive of GIAN Portal Registration Fee)</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Rs. 5000.00 per delegate for participants from academic Institutes.</li> <li><input type="checkbox"/> Rs. 2000.00 for Research students and SC/ST candidates.</li> <li><input type="checkbox"/> Rs. 10000.00 for Industry participants</li> <li><input type="checkbox"/> The registration fees for the foreign nationals is USD \$250.</li> </ul> <p>The above fee includes all instructional materials, computer use for tutorials and lab, free Internet facility and Lunch and Tea. The participants will be provided with single bedded accommodation on payment basis.</p>
<b>Registration Details</b>	<ol style="list-style-type: none"> <li>1. Fees may be paid via Demand Draft in favour of “REGISTRAR (SPONSORED RESEARCH) MNIT Jaipur” payable at Jaipur.</li> <li>2. Or fees can be paid through online (NEFT) Account No. : 676801700388 In name of “REGISTRAR (SPONSORED RESEARCH) MNIT Jaipur” Bank : ICICI Bank, Branch: MNIT Jaipur IFSC Code: ICIC0006768.</li> </ol>

3. Participants are requested to send a Demand Draft with a print out of the filled Registration form, by Courier/ Speed Post/ Registered Post before 23<sup>rd</sup> March 2018 to:

Dr. Neeta Nain

Department of Computer Science and Engineering

JLN Marg, MNIT Jaipur-302017

Rajasthan India

Please label the envelop, 'GIAN: Advanced Pattern Recognition Techniques'.

You may email a scanned copy of the DD and the signed registration form by the deadline to Dr. Neeta Nain at [nnain.cse@mnit.ac.in](mailto:nnain.cse@mnit.ac.in)

## FACULTY

[Slobodan Ribaric, Ph.D.](#), is a Full Professor at the Department of Electronics, Microelectronics, Computer and Intelligent Systems, Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia. S. Ribaric is a head of the Laboratory of Pattern Recognition and Biometric Security Systems (RUBOISS). He received the B.S. degree in electronics, the M.S. degree in automatics, and the PhD degree in electrical engineering from the Faculty of Electrical Engineering, Ljubljana, Slovenia, in 1974, 1976, and 1982, respectively.



His research interests include Pattern Recognition, Artificial Intelligence, Biometrics, Computer Architecture and Robot Vision. He has published more than one hundred and fifty papers on these topics. Some articles have been published in the leading scientific journals such as IEEE Transactions on Ind. Electronics, IEEE Transactions on Pattern Analysis and Machine Intelligence, Microprocessing and Microprogramming, Int. Journal of Pattern Recognition, Artificial Intelligence and Pattern Recognition. Ribaric author of five books: Microprocessor Architecture (1986, four editions), The Fifth Computer Generation Architecture (1986.), Advanced Microprocessor Architectures (1990, two editions), CISC and RISC Computer Architecture (1996), Computer Structures, Architecture and Organization of Computer Systems (2011). The book CISC and RISC Computer Architecture was named as the best scientific books in the field of information science of year 1996 (J. J. Strossmayer award). S. Ribaric is co-author of the book An Introduction to Pattern Recognition (1988).

In 2013, he received the Gold medal "Josip Lončar" awarded by the Faculty of Electrical Engineering and Computing, University of Zagreb for his outstanding contribution to the Faculty. Prof. Ribaric is the chair of the IC1206 COST Action "De-identification for privacy protection in multimedia content". Professor Ribaric has held a series of invited lectures at universities and institutes in Denmark, China, Germany, India, Italy and Slovenia. He is a member of Editorial Board of CIT Journal, and he was a member of Editorial Board of IET Biometrics Journal in period 2013-2015. Ribaric is a member of the IEEE and MIPRO.

# COURSE DETAILS:

**Tentative Duration:** 5 days, March 2018:

- 20 hrs. Lectures
- 3 hrs. Tutorials
- 6 hrs. laboratories

<b>Modules:</b>		
<b>Day 1</b> <b>(26<sup>th</sup> March 18)</b>	<b>Lecture 1:</b> Duration: 1 hour Faculty: SR	<ul style="list-style-type: none"><li>• Task of Pattern Recognition: Features, Feature Vectors, Classifiers.</li><li>• Supervised and unsupervised pattern recognition.</li><li>• An example of pattern recognition system.</li></ul>
	<b>Lecture 2:</b> Duration: 3 hours Faculty: SR	<ul style="list-style-type: none"><li>• Linear classifier: Linear decision function. Gradient descent algorithm.</li><li>• Variants of Perceptron algorithm, generalized perceptron algorithm, Ho-Kashyap method.</li></ul>
<b>Day 2</b> <b>(27<sup>th</sup> March 18)</b>	<b>Lecture 3:</b> Duration: 4 hour Faculty: SR	<ul style="list-style-type: none"><li>• Non-linear classifiers. Generalized linear decision function.</li><li>• Dichotomy polynomial classifiers. Radial basis function (RBF) networks, Decision tree.</li></ul>
<b>Day 3</b> <b>(28<sup>th</sup> March 18)</b>	<b>Tutorial 1:</b> Duration: 3 hours Faculty: SR	<ul style="list-style-type: none"><li>• Support Vector Machines (SVMs). Lagrangian duality/Wolfe dual representation form.</li><li>• SVMs - nonlinear case. Kernel based methods.</li></ul>

	<p><b>Lecture 4:</b> Duration: 4 hours Faculty: SR</p>	<ul style="list-style-type: none"> <li>• Feature selection. Preprocessing.</li> <li>• Karhunen – Loeve transform (Principal Component Analysis - PCA).</li> <li>• Fisher’s linear discriminant Analysis (LDA). Multiple discriminant Analysis.</li> <li>• Independent Component Analysis (ICA). Most discriminant features MDF (PCA+ LDA).</li> <li>• Learning and testing sample sets-methods of evaluation.</li> </ul>
<p><b>Day 4</b> <b>(29<sup>th</sup> March 18)</b></p>	<p><b>Laboratory 1:</b> Duration: 2 hours Faculty: NN</p>	<ul style="list-style-type: none"> <li>• Face detection using SVM classification.</li> </ul>
	<p><b>Laboratory 2:</b> Duration: 2 hours Faculty: NN</p>	<ul style="list-style-type: none"> <li>• Dimensionality reduction using PCA and LDA for face recognition.</li> </ul>
	<p><b>Lecture 5:</b> Duration: 4 hours Faculty: SR</p>	<ul style="list-style-type: none"> <li>• Artificial neural networks (ANNs).</li> <li>• Three-multi-layer perceptron.</li> <li>• Error-back propagation learning algorithm.</li> </ul>
<p><b>Day 5</b> <b>(30<sup>th</sup> March 18)</b></p>	<p><b>Lecture 6:</b> Duration: 4 hours Faculty: NN</p>	<ul style="list-style-type: none"> <li>• Deep learning. Convolutional neural network.</li> </ul>
	<p><b>Laboratory 3:</b> Duration: 2 hours Faculty: NN</p>	<ul style="list-style-type: none"> <li>• Character recognition using Feed Forward Back Propagation Neural Networks.</li> </ul>
		<ul style="list-style-type: none"> <li>• <b>Exam:</b> 2 hours <b>Faculty:</b> Neeta Nain (NN) and Slobodan Ribaric (SR).</li> <li>• <b>Discussion:</b> 1 hour</li> </ul>

## COURSE CO-ORDINATOR:



**Neeta Nain**, PhD, presently working as Assistant Professor, Department of Computer Science and Engineering, Malaviya National Institute of Technology Jaipur, has a teaching experience of over 21 years. Her research area is Computer Graphics, Image processing, Pattern Recognition, Machine Learning and Biometrics.

She has published more than fifty papers on these topics for various International Journals and conferences like ACM Transactions on Asian Language Information Processing, IETE Journal of Research, Springer Multimedia Tools and Applications etc.

**Yogesh Kumar Meena** received his PhD in Computer Science & Engineering from MNIT, Jaipur, India. He is Assistant Professor at the Department of Computer Science & Engineering Malaviya National Institute of Technology, Jaipur, India. His research interests include issues related to Data Mining, Natural Language Processing, Pattern Recognition and Knowledge Management. He is author of a great deal of research studies published at national and international journals, conference proceedings as well as book chapters.



## REGISTRATION DETAILS

GIAN Portal registration (Rs 500 fee is mandatory for all participants).

Create login and password at <http://www.gian.iitkgp.ac.in/GREGN/index>.

Login and complete the Registration Form and select Course(s).

Confirm application and pay Rs. 500/-(nonrefundable) through online payment gateway.

Download "Pdf file" of the application form and email it to [nnain.cse@mnit.ac.in](mailto:nnain.cse@mnit.ac.in)



**Malaviya National Institute of Technology Jaipur  
Department of Computer Science and Engineering**



## **Advanced Pattern Recognition Techniques**

**26 – 30 March 2018**

Under

**Global Initiative of Academic Networks (GIAN)**

**Ministry of Human Resource Development**

**Govt. of India**

### **REGISTRATION FORM**

**Name (In Block Letters):** \_\_\_\_\_

**Designation:** \_\_\_\_\_

**Qualification:** \_\_\_\_\_

**Institution:** \_\_\_\_\_

**Address:** \_\_\_\_\_

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**Email address:** \_\_\_\_\_

**Mobile No:** \_\_\_\_\_

**Category: General/SC/ST/OBC**

**Accommodation Required: Yes/No**

**(Accommodation is paid and expenses need to be borne by the participant)**

**Registered for GIAN Portal: Yes/No**

**I am enclosing a scanned copy of Demand Draft No. \_\_\_\_\_**

**dated \_\_\_\_\_ drawn on \_\_\_\_\_ amounting**

**to Rs \_\_\_\_\_/-only in favour of “REGISTRAR (SPONSORED**

**RESEARCH) MNIT Jaipur”.**

**Or**

**I am enclosing a receipt of NEFT Transaction \_\_\_\_\_ dated \_\_\_\_\_**

**amounting to \_\_\_\_\_ only.**

**Date:** \_\_\_\_\_

**Signature**