



GIAN PROGRAMME ON

Video/Image Content Analytics for Forensic and Surveillance Applications

Foreign Faculty:

Dr. P. Shivakumara
University of Malaya,
Kuala Lumpur, Malaysia

Host Faculty:

Dr. B. H. Shekar
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In the field of computer vision and machine learning, visual surveillance, activity monitoring and forensic investigation are the emerging applications that draw special attention of many researchers. This is due to increase in crimes, such as forged documents, fake currency notes, robbery, hate crimes etc. In order to prevent such crimes, the Closed Circuit Television (CCTV) systems are widely used in malls, banks, traffic intersections to park, stores, or even home. In particular, for forensic investigation, digital cameras and mobile devices are routinely seized as evidence sources. Video and images retrieved from these devices are widely used in crime evidence investigation, which can provide key forensic evidence items. Hence, digital videos have been widely used as key evidence sources in evidence identification, analysis, presentation, and report.

It is clear that the digital forensics investigation over video related resource highly depends on the quality of footage recordings, but poor quality would significantly reduce the coincidence level of the investigation process and thus would not make a strong evidence to be presented in a court. As a result, one can expect several challenges and poses for identifying the crimes through video and images understanding. However, understanding video or image content with image features is hard and not reliable due to adverse factors, such as low contrast, non-uniform illumination effect, clutter background and occlusion. To overcome these problems, text based algorithms have been developed where meaning given by the text recognition methods matches with the content in the video or images. However, for forensic applications, cues given by images may not be sufficient to take a decision due to loss of visibility, limitations of devices, evading evidences etc. In this situation, handwriting analysis play a vital role in identifying cues. Hence, we have seen the usage of handwriting analysis or text analytics present in video source to assist effective video-based digital forensics investigation.

The main aim of forensic video analysis is to identify strong evidence items at different level. In this course, we focus on the video contents to develop efficient video analysis techniques from the view point of forensics. It is proposed to discuss forensic video analysis framework that employs an efficient video/image enhancing algorithm for the low quality of footage analysis. To assist the video-based forensic analysis, a deep-learning-based object detection and tracking algorithm will be discussed that can detect and identify potential suspects and tools from footages. In addition, it is propose to cover techniques which explore text present in a video/image as a cue for digital forensics. Techniques based on handwriting analysis for forensic applications, such as fraud document identification, gender identification and nationality identification will be discussed and demonstrated. The methods for person behavior oriented social media image classification include classification of extraversion, bullying, threatening, depression, psychopath images etc. will be dealt. Finally, the course covers tips for writing tier-1 articles in image processing and pattern recognition that includes how to identify the research problem, how to generate ideas and how to address reviewer comments. Overall, the main goal of this curse is to provide an insight into video/image/text based analysis techniques to assist the forensic investigation.

Objectives

- To explore video-based digital investigation framework that addresses the concerns in low quality of footage, establishment of links between objects and available digital evidences, and detection techniques over video footage;
- To explore deep learning based models that can be used to establish the links between the objects, subjects, and their behaviors in the available footages.
- To discuss new techniques for handwriting analysis for new issues of forensic and surveillance applications
- To explore new techniques for social media image processing with respect to new challenges that society is facing currently.
- To get an idea of developing the inter-disciplinary concepts for solving unsolved issues.

Introduction to Digital Forensics and Visual Surveillance:

Video content based analytics for Digital Forensics and Visual Surveillance
Video Text based analytics for Digital Forensics and Visual Surveillance
Methods for Tampered text detection in video/image

Text based Video/Image/Document analytics for Digital Forensics:

Multi-modal methods for tampered text detection in videos/images
Forged handwriting detection/ Forged Word Detection in video/document images
Multi-Script-Oriented Tampered/Scene Text Detection in Video/Scene Images

Video/Image based analytics for digital forensics:

Histogram based video/image analysis techniques for forensics applications
Forensic analysis of digital images over smart devices and online social networks
Deep learning based models for crime scene evidence analysis

Handwriting Images Analysis for Forensic Applications:

Fraud Document Identification; Forged IMEI number detection
Forged Handwriting Detection; Gender Identification
Nationality Identification; Age Estimation

Social Media Image Analysis for Forensic Applications:

Identification of Normal and Abnormal Social Media Images
Identification of Family and Non-Family Photos
Identification of Multi-Type Family Photos; Future Challenges and Applications

Contents

Who can attend?

- Faculty from Universities and Technical Institutions (Registration fee: Rs. 2000)
- Administrative Personnel from Government Sectors (Registration fee: Rs. 3000)
- Students at all levels (BTech/BE/ME/MTech/MCA/MSc/PhD) – Computer Science/Electronics (Registration fee: Rs. 1000)
- Researchers from Industry (Registration fee: Rs. 5000)

PRIOR EXPERIENCE IN IMAGE PROCESSING AND PATTERN RECOGNITION IS DESIRABLE.

Foreign Faculty

Dr. P. Shivakumara is currently working as a Senior Lecturer at University of Malaya (UM), Kuala Lumpur, Malaysia. He has received B.Sc., M.Sc., M.Sc Technology by research and Ph.D degrees in Computer Science from the University of Mysore, Mysore, Karnataka, India. He worked as a Research Fellow at National University of Singapore, Singapore during 2005-07 and 2008-13. He worked as Research Consultant at Nanyang Technological University, Singapore. He has published more than 210 research papers in national, international conferences and journals. He has been serving as Associate Editor for Pattern Recognition, Expert Systems with Applications, IEEE Transactions on Multimedia, International Journal on Document Analysis and Recognition, CAAI-Transactions on Intelligence in Technology, ACM Transactions on Asian and Low-Resource Language Information Processing, Springer-Nature of Computer Science (SNCS), Malaysian Journal of Computer Science (MJCS). He got Top Reviewer Recognition award from Pattern Recognition Letter Journal. He has been serving as a Program Committee Member (PCM) for the several International Conferences. His area of research include video text understanding, document analysis and image processing.



Host Faculty

Dr. B H Shekar is currently working as a Professor in the Department of Computer Science, Mangalore University, Mangalore. He is specialized in Pattern Recognition, Image Processing, Machine Learning and Artificial Intelligence. Published nearly 185 articles in International and National level Journals and Conferences. Worked as a reviewer to the Elsevier/Springer/IEEE Transactions. He successfully guided thirteen candidates towards doctoral degree and currently ten students are working towards their doctoral degree covering video analytics, multimedia, multi-modal biometrics, human action recognition and medical image analytics. He was awarded Commonwealth Academic Fellowship during 2014 to carry out his Post-doctoral work at University of Surrey, UK. The Sandwich model fellowship is awarded by German Academic Exchange Service during 2002 to carry out part of his PhD research work in University of Nuremburg, Germany. He has successfully completed international collaborative research project works with Moscow State University, Moscow, Russia and University of Tokyo, Japan. He also conducted GIAN programmes on 'Digital Payments: Technology for Cashless Society' and 'Visual Object Recognition' funded by MHRD, Govt. of India.



How to Register?

Step 1 : GIAN Web (Portal) Registration (Individuals who have already registered to GIAN earlier do not need to repeat)
Interested persons need to create profile on GIAN official website (<https://gian.iitkgp.ac.in/GREGN/index>)
Register for new user sign up and create login user id **OR** otherwise login with email id and password (if already registered).
First time users need to register and pay a one-time fee of 500/-. (Please do not confuse GIAN web registration with course registration.)

Step 2 : Course Registration (through GIAN Portal)

Click on the "Course Registration"

Select the course title "Video/Image Content Analytics for Forensic and Surveillance Applications" from the list.

Click on "Save" option first, and then Click on "Confirm Course(s)".

Once you enroll for the course, an Enrolment/Application number will be generated, and the course coordinators will be notified.

Step 3 : Course Fee Payment (Only selected candidates)

Only Selected Candidates will be intimated through e-mail by the Course Coordinators. They have to remit the necessary course fee through Mangalore University Online Payment Gateway:

PAYMENT MODE:

1. Online Payment through State Bank Collect or NEFT as said below:

• **OPTION 1: ONLINE PAYMENT PORTAL (State Bank Collect)**

- Visit the link: <https://www.onlinesbi.sbi/sbicollect/> (Karnataka/Educational Institutions / Mangalore University)
- Select Payment Category as: Other Receipts 007 --> Miscellaneous 22: { Enter the Amount }
- Remarks Entry: {VIDEO/IMAGE FORENSICS GIAN COURSE}
- Also provide your details in the next subsequent Rows: Name, Mobile Number etc.

• **OPTION 2: NEFT PAYMENT**

- Registration Fee can also be paid through NEFT to the following account. Please note the transaction number and enter the same in the Registration Form. Bank : State Bank of India
- Branch : Mangalagangothri Branch
- SB A/C Name: Finance Officer
- SB A/C No: 10094966480
- IFSC Code: SBIN0008034

• **OPTION 3: PAYMENT Through DD**

- DD for registration fee in favor of The Finance Officer, Mangalore University, payable through any Nationalized Bank at Mangalore.

The participants will be provided an accommodation on payment basis and it is first come first serve.

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and Clarifications