M. TECH - COMPUTER VISION AND IMAGE PROCESSING

Department of Computer Science and Engineering

In recent times, there has been a dramatic increase of image and video data in every conceivable field due to the proliferation of digital capture devices and also due to the internet increasingly becoming a multimedia phenomenon. Consequently, the field of Computer Vision and Image Processing has emerged as a promising field of study and research due to its wide spread applications in managing the huge influx of image and video data.

Computer Vision started with building machines that can visualize data like human and give inputs for robots; and now has wider objectives to serve applications such as search engines, computational photography, medical imaging, vision for computer graphics and many more. Areas like document and medical image analysis are also developing rapidly. The field of robotics has abundant potential to serve in medical surgery, defense, home security and the community at large. With the advancements in supportive technologies such as digital cameras and video equipments, Computer Vision and Image Processing will become increasingly more capable and affordable as well.

The issues and scope for research in this area of specialization are so vast that it is vital to offer a specialized programme in this area. With this as the goal, the University is offering a two year M.Tech programme in Computer Vision and Image Processing. The objective is to create professionals and researchers with the necessary expertise to handle the various real-world problems where image processing techniques might provide robust solutions.

The programme includes core courses in Digital Image Processing, Signal Processing, Video Processing, and Computer Vision with the necessary background covered in mathematical courses. The programme has an intensive course work for three semesters with suitable elective courses followed by a dissertation where the students would conduct research in this field of study. The department has a well established research facility, “Amrita – Cognizant Innovation lab” which would help the students to build applications on real-time image and video data.

Students have abundant opportunities to pursue internships in major companies and R&D labs like ISRO, NPOL etc. Bright career opportunities are available to students in top companies and research labs.
# CURRICULUM

## First Semester

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Credits: **19**

* Non Credit Course

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Total Credits: **65**
## List of Courses

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### Subject Core

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### Project Work

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TEXT BOOKS / REFERENCES:

CV601 Multidimensional Data Structures and Algorithms 3-0-1-4


TEXT BOOKS/ REFERENCES:

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TEXT BOOKS / REFERENCES:

TEXT BOOKS / REFERENCES:

TEXT BOOKS / REFERENCES:

CV602 IMAGE ANALYSIS 3-0-1-4

TEXT BOOKS / REFERENCES:

**CV604 PATTERN RECOGNITION AND MACHINE LEARNING  3-0-1-4**


**TEXT BOOKS / REFERENCES:**

**CV606 COMPUTER VISION  3-0-1-4**


**TEXT BOOKS / REFERENCES:**

TEXT BOOKS / REFERENCES:

EN 600 TECHNICAL WRITING P/F

TEXTBOOKS/REFERENCES:
CV701  HIGH-LEVEL COMPUTER VISION  3-0-0-3

Shape from X – Shape from Stereo, Shape from Shading, Shape from Silhouette, Shape from Texture and Shape from Focus. Shape Representation: Statistical Shape Models, Active Shape Models, Combined Appearance Models, Active Appearance Models, View-based Appearance Models, Tracking with View-based Appearance Models. Object Recognition: Shape Correspondence and Shape Matching, PCA, Shape Priors for Recognition, Finding Templates and Recognition, Recognition by Relations between Templates, Robotic vision, Computer Vision on the GPU. Tracking & Video Analysis: Tracking and Motion Understanding - Kalman filters, condensation, particle, Bayesian filters, Hidden Markov models, Change detection and Model-based tracking.

TEXT BOOKS / REFERENCES:

CV702  MACHINE VISION  3-0-0-3


TEXT BOOKS / REFERENCES:

CV703 MEDICAL IMAGE ANALYSIS
3-0-0-3


TEXT BOOKS / REFERENCES:

CV704 CONTENT BASED IMAGE AND VIDEO RETRIEVAL
3-0-0-3


TEXT BOOKS / REFERENCES:


CV705 DOCUMENT IMAGE ANALYSIS 3-0-0-3


TEXT BOOKS / REFERENCES:


CV706 COMPUTATIONAL INTELLIGENCE FOR IMAGE PROCESSING  3-0-0-3


TEXT BOOKS / REFERENCES:


CV707 VIDEO ANALYTICS  3-0-0-3

Case Study: Face Detection and Recognition, Natural Scene Videos, Crowd Analysis, Video Surveillance, Traffic Monitoring, Intelligent Transport System.

TEXT BOOKS / REFERENCES:


CV708   MULTIMEDIA SECURITY   3-0-0-3


TEXT BOOKS / REFERENCES:


CV709   VISUAL PATTERN ANALYSIS AND MODELING   3-0-0-3

TEXT BOOKS / REFERENCES:


CV710    MULTICORE ARCHITECTURE               3-0-0-3


TEXT BOOKS / REFERENCES:


CV711    VIRTUAL REALITY AND APPLICATIONS                      3-0-0-3


TEXT BOOKS / REFERENCES:


**CV712 PRINCIPLES OF MULTIMEDIA DATABASES 3-0-0-3**


**TEXT BOOKS / REFERENCES:**


**CV713 CLUSTER ANALYSIS 3-0-0-3**

Genetic Algorithm - Swarm intelligence based clustering, Kernel based clustering - Clustering high dimensional data - Dimensionality reduction - Subspace clustering - Coclustering - Information theoretic clustering - Clustering with divergence - Handling outliers - Assessment of clusters.

**TEXT BOOKS / REFERENCES:**

**CV714 GPU ARCHITECTURE AND PROGRAMMING 3-0-0-3**


**TEXT BOOKS / REFERENCES:**