

# T M FERUZ ALI

Ph.D. Research Scholar

Email : ferozalitmiitb@gmail.com

Mobile : +91-8169992829



## SUMMARY

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- Completing Ph.D. candidate at Indian Institute of Technology Bombay (Dept. of Electrical Engg.).
- Master degree (CPI: 9.5/10) from Indian Institute of Technology Bombay (Dept. of Electrical Engg.) .
- 6 years research experience in machine learning, computer vision and deep learning.
- Research publications in top-tier international conferences on computer vision and machine learning.
- Strong mathematical, analytical and programming skills.
- Proficient in attention to detail, critical thinking and in-depth analysis.
- Passionate about idea generation and solving challenging open ended problems.
- Developed novel methods in metric learning and re-ranking for person retrieval in video surveillance and attained state-of-the-art performance.
- 2 years industrial R&D experience in video analytics.
- 3 years research experience in signal processing and image processing.
- 4 years Teaching Assistant-ship experience at IIT Bombay.
- Multiple awards at national level.
- Recognition for hostel administration, and certification in fire and risk management.

## EDUCATION

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- **Indian Institute of Technology Bombay (Dept. of Electrical Engg.)** Mumbai, India  
*Ph.D. Candidate* (2015 - 2021)  
*Thesis title: Metric Learning and Re-ranking for Person Re-identification in Video Surveillance*  
*Advisor: Prof. Subhasis Chaudhuri*
- **Indian Institute of Technology Bombay (Dept. of Electrical Engg.)** Mumbai, India  
*Master of Technology (Communication and Signal Processing; CPI: 9.5/10 (GPA: 3.80))* (2009 - 2012)  
*Thesis title: Maneuvering, Multi-Target Tracking using Particle Filters*  
*Advisor: Prof. Rajbabu Velmurugan*
- **University of Calicut** Calicut, India  
*Bachelor of Technology (Electronics and Communication Engg.; Honors Degree; Marks: 76.93%)* (2005 - 2009)

## RESEARCH, INDUSTRIAL AND TEACHING EXPERIENCE

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- **Indian Institute of Technology Bombay** Mumbai, India  
*PhD Candidate (Dept. of Electrical Engg.)* (2015 - 2021)
  - **Computer Vision:** Worked on person re-identification(re-ID), pedestrian image processing, robust image feature representation and image co-segmentation.
  - **Machine Learning:** Worked on small sample size problem, supervised, semi-supervised and unsupervised metric learning methods, feature extraction, kernel non-linear methods, multiple kernel learning, re-ranking, incremental learning, computationally and spatially efficient metric learning, discriminant methods, novelty detection, object verification, and theoretical and computational analysis of distance metric learning methods.
  - **Deep Learning:** Worked on classification, regression, feature extraction, metric learning, object detection, feed forward neural networks, convolutional neural network (CNN), Resnet, auto-encoders and generational adversarial networks (Gans)

- **Person Re-identification(re-ID):** Developed novel methods for person retrieval in video surveillance. They include maximum margin metric learning over discriminative nullspace for addressing small sample size problem in person re-ID, semi-supervised maximum margin metric learning for exploiting freely available unlabelled data in re-ID systems, kernelized cross-view quadratic discriminant analysis for person re-ID, multiple kernel metric learning for person re-ID, kernel cross-view asymmetric metric learning for unsupervised person re-ID, re-ranking for person re-ID using dual cross view reciprocal constraints and online metric learning, computationally and spatially efficient metric learning for person re-ID. Attained state-of-the-art performance in metric learning and re-ranking.
- **Image Co-segmentation:** Worked on a novel method for unsupervised and robust segmentation of common object among multiple images using iterative discriminant feature learning and label propagation.
- **Music Genre Classification:** Worked on feature extraction for music representation and application of machine learning algorithms like SVM, logistic regression and neural networks for music genre classification.
- **Mentoring Master and Bachelor Projects:** Mentored seven research projects including three master student projects and four bachelor student projects.

## Indian Institute of Technology Bombay

Mumbai, India

*Teaching Assistant (Dept. of Electrical Engg.)*

(2015 - 2019)

- **Courses:** Computer Vision, Digital Signal Processing, Signals and Systems.
- **Responsibilities:** Conducting tutorials, question paper preparation, project/assignment evaluation, course administration and grading.

## Cisco Systems Inc.

Bangalore, India

*Software Engineer*

(2012 - 2014)

- **Video Analytics for Surveillance Cameras:** Research on analytics for compressed video domain (video codecs), event detection and video meta-data generation.
- **Video Codecs:** Extensive analysis of video codecs including H.264, MPEG1 and MPEG2, video decompression using FFMPEG, motion vectors extraction and video processing.
- **Video Streaming from Surveillance Cameras:** Implementation of video streaming from IP surveillance cameras to media server using ONVIF standards.

## Indian Institute of Technology Bombay

Mumbai, India

*Project Research Assistant (Dept. of Electrical Engg.)*

(2009 - 2012)

- **Document Image Processing:** Developed a novel technique using morphological processing and curve fitting techniques to remove scanning error, warping/skewness and disorientation of texts in scanned books.
- **Face Recognition:** Implemented face detection, facial image processing, representation and classification techniques based on eigenfaces using OpenCV.
- **Underwater Target Tracking :** Proposed a novel algorithm based on particle filters for tracking multiple underwater targets having complex maneuvers and non-linear system dynamics. Implemented multiple target tracking and estimation techniques using particle filter, Kalman filter, extended Kalman filter and data association filter.
- **Computer Graphics using Wavelets:** Implemented multi resolution curve editing based on spline wavelets for flexible editing and smoothing of curves using its control points.
- **Hands Free Audio Telephony:** Implemented an audio signal processing technique based on adaptive beam-forming using microphone arrays for extracting voice from a particular direction for hands free audio telephony in cars.

## OTHER PROJECTS

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- **Fast CDMA communication system:** Implementation of fast Frequency Hopped Spread Spectrum (FHSS) CDMA communication system using CORDIC algorithm.
- **Fpga Implementation of Channel Modulation:** System implementation of channel modulation techniques using FPGA and its interfacing with ADC, DAC and switch controls.
- **Music Player using SD Card:** Music playback system implementation for streaming from SD card using serial communication, audio streaming, micro controllers and embedded circuits.
- **UPS Power Booster:** Developed a novel system to utilize the power from the UPS battery and the line supply during low voltages to boost and stabilize voltage.

## PROGRAMMING SKILLS

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MATLAB, Python, Pytorch, C/C++, Linux, Latex.

## AWARDS AND ACHIEVEMENTS

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- **Selection in ICVGIP-2018 Vision India Session:** Selected among best papers (authored primarily by Indian researchers in the last two years) presented at top-tier international vision conferences and journals.
- **Visvesvaraya Fellowship:** Awarded from the Dept. of Science and Technology, Govt. of India, for the entire duration of PhD. (Awarded to the top ~20% students from the department)
- **Graduate Thesis Award:** For the best B.Tech thesis in the department.
- **Honors Degree:** From University of Calicut for outstanding academic performance in B.Tech.
- **NIIT All India Programming Contest:** 2nd in national level competition for programming in C.
- **National Science Exhibition:** 1st in the Jawaharlal Nehru National Science Exhibition (for innovative idea).
- **All India Maths Olympiad:** 32-nd rank in All India Junior Maths Olympiad.
- **Award for Hostel Administration:** For outstanding contributions in hostel administrative council.
- **Certification on Fire and Safety :** Certification from Fire and Safety department of Cisco Systems Inc. for handling hazards, building fire and risk management.
- **National Adventure Federation Certification:** Successful completion of para-gliding and para-sailing program by National Adventure Federation.

## PUBLICATIONS/PRE-PRINTS

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- Maximum Margin Metric Learning Over Discriminative Nullspace for Person Re-identification, **T M Feroz Ali** and Subhasis Chaudhuri, *European Conference on Computer Vision (ECCV-2018)*, Munich, Germany.
- A Semi-Supervised Maximum Margin Metric Learning Approach for Small Scale Person Re-identification, **T M Feroz Ali** and Subhasis Chaudhuri, *IEEE International Conference on Computer Vision Workshop (ICCVw-2019)*, Seoul, Korea.
- Onboard Hyperspectral Image Compression Using Compressed Sensing and Deep Learning, S Kumar, S Chaudhuri, B Banerjee, **T M Feroz Ali** *European Conference on Computer Vision Workshop (ECCVw-2018)*, Munich, Germany.
- Multiple Kernel Fisher Discriminant Metric Learning for Person Re-identification, **T M Feroz Ali**, Kalpesh K Patel, Rajbabu Velmurugan, Subhasis Chaudhuri, *Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP-2018)*, Hyderabad.
- Cross-View Kernel Similarity Metric Learning Using Pairwise Constraints for Person Re-identification, **T M Feroz Ali**, Subhasis Chaudhuri, *Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP 20-21)*, Jodhpur.
- Multiple Kernel Metric Learning and Dual Cross-view Reciprocal Re-ranking for Person Re-identification, **T M Feroz Ali**, Kalpesh K Patel, Rajbabu Velmurugan, Subhasis Chaudhuri, Under review for *Journal of Visual Communication and Image Representation*
- Kernel Maximum Margin Metric Learning for Person Re-identification and Novelty Detecion, **T M Feroz Ali**, Subhasis Chaudhuri, Under submission for *IEEE Transactions on Image Processing*
- Theoretical Analysis of Null Foley-Sammon Transform and its Implications, **T M Feroz Ali**, Subhasis Chaudhuri, Under submission for *IEEE Transactions on Pattern Analysis and Machine Intelligence*
- Co-segmentation using a Classification Framework, Avik Hati, **T M Feroz Ali**, Rajbabu Velmurugan, Subhasis Chaudhuri, Book chapter in *Image Cosegmentation, Springer* (under preparation).

## TALKS

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- **ICVGIP-2018::** Invited Talk on "Maximum Margin Metric Learning Over Discriminative Nullspace for Person Re-identification" in Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP-2018) Vision India Session, conducted by IIIT Hyderabad.
- **IIT-HKBU Workshop::** Talk on 'Metric Learning for Person Re-identification' in IIT-HKBU Workshop on *Data and Imaging Sciences* held on February 2019 at Hong Kong Baptist University, Hong Kong.

## REVIEWER SERVICE

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- Reviewer for *The Visual Computer: International Journal of Computer Graphics*, Springer.
- Reviewer for *National Conference on Communication NCC-2015 and NCC-2021*.

## REFERENCES

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- Prof. Subhasis Chaudhuri  
Director, IIT Bombay &  
Professor in Dept. of Electrical Engineering,  
Indian Institute of Technology Bombay,  
Email : sc@ee.iitb.ac.in
- Prof. Rajbabu Velmurugan  
Dept. of Electrical Engineering,  
Indian Institute of Technology Bombay,  
Email : rajbabu@ee.iitb.ac.in