

# MANDIKAL MURALI VIKRAM

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## EDUCATION

### National Institute of Technology Karnataka, Surathkal

Bachelor of Technology in Information Technology

GPA: 9.75/10, Department Rank: 1/104

Granted Huawei Scholarship for highest GPA

Surathkal, India  
Aug 2015 - May 2019

### Senior Secondary School

Class 12, CBSE AISSCE Secured 96.2 percentage and 99.45 percentile

Bangalore, India  
March 2015

### Secondary School

Class 10, CBSE AISSE Scored a perfect 10/10 CGPA

Bangalore, India  
March 2013

## PUBLICATIONS

**Mandikal Vikram**, Steffen Wolf, “A GAN framework for Instance Segmentation using the Mutex Watershed Algorithm”, Smooth Games Optimization & Machine Learning Workshop, Neural Information Processing Systems conference (NIPS) 2018, Accepted for Spotlight presentation

**Mandikal Vikram**, Aditya Anantharaman, Suhas B S and Sowmya Kamath, “An Approach for Multi-modal Medical Image Retrieval using Latent Dirichlet Allocation”, CoDS-COMAD 2019 (Oral Presentation) · A short version accepted at the AI for Social Good Workshop, Neural Information Processing Systems conference (NIPS) 2018

**Mandikal Vikram**, Aditya Anantharaman, Suhas B S, Ashwin TS and Ram Mohana Reddy, “Kinect Based Suspicious Posture Recognition for Real-Time Home Security Applications”, IEEE India Council International Conference (INDICON 2018)

## RESEARCH EXPERIENCE

### Microsoft Research

Research Intern, Intelligent Devices Expedition group

Advisors: Dr. Harsha Simhadri and Dr. Prateek Jain

Bangalore, India  
August 2018 to Present

- Working on developing resource efficient machine learning algorithms which can be deployed on edge devices, specifically for keyword detection in speech and gesture recognition.
- Developed a novel meta learning algorithm which enables RNNs to make rolling predictions.
- This reduces the amortized computational complexity by an order of 100 and also improves the performance when compared to an RNN trained with a regular training routine.

### Heidelberg Collaboratory of Image Processing, University of Heidelberg

Summer Research Intern, Funded by DAAD WISE Fellowship

Advisor: Prof. Fred Hamprecht

Heidelberg, Germany  
May 2018 to July 2018

- Designed a GAN framework for instance segmentation using the Mutex Watershed algorithm.
- Highlights include multitasking the generator and discriminator, and adding a novel smooth auxiliary loss to stabilize the GAN training and improving the segmentation performance.
- Further improved the segmentation by training the generator on unlabelled natural images using the discriminator. This work has been accepted at the SGO&ML NIPS Workshop 2018.

### Video Analytics Lab, Indian Institute of Science

Summer Research Intern

Advisor : Dr. Venkatesh Babu

Bangalore, India  
May 2017 to July 2017

- Developed code for Spiking Neural Networks in Theano framework - this is the first time an SNN is implemented in any tensor-based framework.
- Spiking neural networks are biologically plausible neural networks which learn through a temporally dependent learning method known as Spike Time Dependent Plasticity (STDP) - an alternate to gradient descent.
- The highlight of this work includes inherent robustness towards adversarial attacks such as FGSM which exploit gradient descent. [\[Github\]](#)

## Indian Institute of Technology, Gandhinagar

Summer Research Intern

Advisor: Dr. Shanmuganthan Raman

Gandhinagar, India

May 2016 to July 2016

- Worked on optimizing the implementation of some of the state-of-the-art techniques such as Binary k-means algorithm and WTA-Hashing.
- Developed an algorithm for unsupervised multiple object detection and classification - by pruning edge boxes using Binary k-means clustering.

## ACADEMIC ACHIEVEMENTS

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- Awarded the DAAD WISE fellowship.
- Awarded NTSE (National Talent Search Exam) by NCERT.
- Qualified Regional Mathematics Olympiad (RMO) - one of the thirty students in the state (Karnataka) to do so and was also invited for a week-long camp at the Indian Statistical Institute. This is one of the most challenging math contest in the country. RMO is a proof-based mathematics exam, equivalent to the AMC12 and AIME in the US.

## SELECTED PROJECTS

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### Traffic Sign Detection using YOLO Architecture *Tensorflow, Python*

[\[Github\]](#)

Advisor: Prof. Ananthanarayana VS

- Fine-tuned the YOLO network to localize and classify traffic signs using the Belgium Traffic Sign Dataset. The motivation to use the YOLO architecture was its speed.
- Modified the loss function to differentially penalize large and small objects which significantly improves the performance in traffic sign detection when compared to the standard YOLO loss function, thus exploiting the fact that traffic signs are generally smaller objects.

### Multi-modal Medical Image Retrieval *Tensorflow, Python*

[\[Github\]](#)

Advisor: Dr. Sowmya Kamath

- Proposed a LDA based approach for visual feature extraction in medical images.
- Explored novel early and late fusion approaches to combine visual and textual modalities.
- The proposed late fusion approach beat the state-of-the-art on the ImageCLEF 2009 dataset.
- This work has been accepted for publication and oral presentation at the CoDS COMAD 2019.

### Parallel k-means Clustering *OpenMP, MPI, CUDA, C++*

[\[Github\]](#)

- Used k-means clustering for Image Colour Quantization and Image Compression.
- k-means clustering was implemented in parallel on 3 platforms - OpenMP, CUDA and MPI and there performance was compared.
- Obtained a speed of order  $10^3$  in CUDA due to data parallelism and a image compression factor of 2.2, with a minimal loss in image quality.

### Android Malware Detection *Tensorflow, Python*

[\[Github\]](#)

- Classification of android apps done based on pseudo-dynamic analysis of system API Call sequences. Used an autoencoder for feature compression along with CNN and RNN based models.

### Fund management software for purchase department, NITK *PHP, SQL, HTML*

[\[Github\]](#)

- Designed and developed a web application for the accountants at purchase department, NITK.
- The application is designed to handle the complex formalities and procedures involved while managing the funds allocated for various projects.
- It is currently in production and I am providing support and maintaining it.

## OTHER PROJECTS

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- Ensemble gender classifier using face images - motivation was the minimization of the memory and computational cost of deep CNNs.
- Developed a course management portal using flask as a part of software engineering course.
- Implemented Go-Back-N ARQ using raw sockets.
- Digital Mammography challenge - built a CNN to classify breast tumors.

## PROGRAMMING SKILLS

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Deep Learning Frameworks:	TensorFlow, PyTorch, Theano
Languages and Scripts:	C++, C, Python, Java, HTML, CSS, Javascript, MySQL, Bash
Tools:	Android Studio, OpenGL, Flask, Git