Mandikal Murali Vikram

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Education

National Institute of Technology Karnataka (NITK), Surathkal
Bachelor of Technology in Information Technology
GPA: 9.75/10, *Department Rank:* 1/104 — Surathkal, India
Awarded Huawei Scholarship for highest GPA — Aug 2015 - May 2019

Senior Secondary School — Bangalore, India
Class 12, CBSE AISSCE *Secured* 96.2 *percentage and* 99.45 *percentile* — March 2015

Secondary School — Bangalore, India
Class 10, CBSE AISSE *Scored a perfect* 10/10 *CGPA* — March 2013

Publications

1. **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
2. **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
3. **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. * equal contribution

Research Experience

Microsoft Research
Research Intern, Intelligent Devices Expedition group — Bangalore, India
Advisors: Dr. Harsha Simhadri and Dr. Prateek Jain — 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 an compared to an RNN trained with a regular training routine.
- Currently developing techniques to enable bi-directional RNNs to make rolling predictions and towards publishing this work.

Heidelberg Collaboratory of Image Processing, University of Heidelberg
Research Intern, Funded by DAAD WISE Fellowship — Heidelberg, Germany
Advisor: Prof. Fred Hamprecht — May 2018 to July 2018

- Designed a GAN framework for instance segmentation using the Mutex Watershed algorithm.
- Developed a novel smooth auxiliary loss which stabilized the GAN training and improved the segmentation performance.
- Further improved the results by training the generator on unlabelled natural images using the discriminator (transfer learning). This work has been accepted at the **SGO&ML NIPS Workshop 2018**.

Video Analytics Lab, Indian Institute of Science
Research Intern — Bangalore, India
Advisor : Dr.Venkatesh Babu — May 2017 to July 2017

- Developed code for Spiking Neural Networks in Theano framework - this is one of the first implementation of SNN 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 Gandhinagar, India
Advisor: Dr. Shanmuganthan Raman May 2016 to July 2016

- Worked on optimizing the implementation of 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 and Awards

- Awarded the DAAD WISE fellowship.
- Awarded Huawei scholarship for two consecutive years for highest GPA.
- Awarded National Talent Search Scholarship by NCERT. A national-level scholarship program in India to identify and recognize students with high intellect and academic talent.
- Qualified Regional Mathematics Olympiad (RMO) - among the thirty students who qualified in the state (Karnataka). RMO is a proof-based mathematics exam, equivalent to the AMC12 and AIME in the US.

Significant Projects at NITK

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**.

Suspicious Posture Recognition for Home Security Applications *Python, Android* [Github]
Advisor: Prof. Ram Mohana Reddy

- An IR camera is used since it is independent of lighting conditions.
- The low dimensionality of the skeletal features enabled the classifier to be deployed on the edge device itself, thus cutting on the latency involved in running the classifier on the server.
- An Android app was built to notify the users when a suspicious activity occurs.
- This work has been accepted for publication at the **IEEE INDICON 2018**.

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 deferentially penalize large and small objects; this significantly improved 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.

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 their performance was compared.
- Obtained a speed up of order 10^3 in CUDA due to efficient data parallelism.

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]

- The application is designed to handle the formalities and procedures involved in managing the funds allocated for various projects.
- It is currently being used by the accountants at purchase department at NITK.

Programming Skills

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