

September 17, 2019

# Tarun Dutt

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## Contact Information

26/C, Electronic City  
IIIT Bangalore  
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## Education

Integrated Masters in Computer Science, Specialization in Data Science  
International Institute of Information Technology, Bangalore  
Cumulative Grade: 3.39/4.00

Expected Spring 2019

National Public School, Rajajinagar, Bangalore  
12th Standard Board Examination : 94.6%)

2014

## Research Experience

### Deep Artifact Detection in Microscopic Urinalysis

*Research Assistant, Sigtuple*

August 2018 – Present

Worked towards my thesis to develop and implement robust deep learning models to support the detection of unknown/unseen objects during prediction. Models were tested on a microscopic urine sample image dataset, where multiple artifacts present in the images were identified and rejected at test time, while also correctly classifying clinically significant objects. Techniques from the open set recognition and out-of-distribution detection literature were explored, in addition to our own clustering experiments in feature space.

### Limb Tracking in D. Melanogaster

*Researcher, National Center for Biological Sciences - TIFR*

May 2018 – Present

Conducting data-driven tracking and analysis of limb movements in Drosophila Melanogaster using image processing, clustering and time series techniques. Currently developing heuristic algorithms to look at limb movement synchronizations, and combining spatial and temporal information to understand how inter-limb coordination during walking develops.

### Analysis of coupled neuron models

*Complex Systems and Soft Matter Physics Lab, IIIT Bangalore*

January 2018 - December 2018

Built and simulated a coupled system of differential equations representing the behaviour between two types of neurons. Conducted detailed analysis on the stability and spike train patterns of the system.

### Optimizing Train Schedules on a Large Railway Network

*Computational Sciences Lab, IIIT Bangalore*

May 2017 – August 2018

Formulated and prototyped a Mixed Integer Linear Programming (MILP) model to schedule new trains on one of the largest railway networks, while satisfying minimum headway, overtaking and crossover constraints.

### Augmenting and Visualizing CT Scan Data for Surgical/Diagnostic Assistance

*E-Health Research Center, IIIT Bangalore*

August 2017 - December 2017

Visualised CT scan data of the brain using volumetric rendering with ray casting. Augmented the 3D model on video input featuring a patient, to assist during clinical procedures/diagnosis.

### Decompiling Images into Presentational Markup

*Research Intern, GE Global Research*

May 2017 – July 2017

Developed a general purpose deep learning system to decompile images of mathematical expressions into LaTeX source code. The model employs a convolutional network for text and layout recognition in tandem with an attention-based neural machine translation system.

<b>Peer Reviewed Conference Proceedings</b>	<b>T. Dutt</b> , A. Shreekumar, G. N. Srinivasa Prasanna, T. R. Dastidar. Deep Artifact Detection in Microscopic Urinalysis. <i>in prep.</i>
	R. Pratap, <b>T. Dutt</b> , A. Deshmukh, P. Nair. A Faster Sampling Algorithm for Spherical k-means. <i>Proceedings of The 10th Asian Conference on Machine Learning, PMLR 95:343-358, 2018</i>
	R. Sanat, <b>T. Dutt</b> , Anushka Chandrababu, A. Abhilasha, G. N. Srinivasa Prasanna: Optimizing Schedule of Trains in Context of a Large Railway Network. <i>IEEE Intelligent Transport Systems Conference (ITSC 2018): 1214-1220</i>
<b>Selected Course Projects</b>	<b>Obama Lip Sync</b> Generated natural looking 2D speech animation that synchronizes with audio and is then composited onto a target video clip. The network used an LSTM to learn the mapping from raw audio features to mouth shapes. Pix2pix was used to synthesize mouth texture conditioned on the mouth shape
	<b>Augmented Reality for Patients with Aphasia</b> Worked on creating an immersive, therapeutic tool to help patients with Aphasia recover in their home environment using object recognition and augmented reality to prompt verbal responses
<b>Skill Set</b>	<p><b>Programming, Libraries:</b> Comfortable in Python, C++, C, Keras, Tensorflow</p> <p><b>Relevant Mathematical Background:</b> Advanced coursework on statistical inference, linear algebra and dynamical systems.</p> <p><b>Computational Background:</b> Advanced coursework on methods in convex optimization, statistical computing, neural networks and machine learning.</p>
<b>Competitive Workshops</b>	<ul style="list-style-type: none"> <li>• Computational Approaches to Memory and Plasticity Summer School 2018, National Center for Biological Sciences, TIFR</li> <li>• INFORMS Annual Meeting 2018, Pheonix, USA</li> </ul>
<b>Teaching Assistantship</b>	<ul style="list-style-type: none"> <li>• Mathematics for Machine Learning <span style="float: right;">Fall 2018</span></li> <li>• Learning and Cognitive Systems: An Optimization Perspective <span style="float: right;">Spring 2019</span></li> </ul>
<b>Honours and Awards</b>	Honourable Mention for performance in the ACM ICPC programming contest Asia Chennai First Round in 2015 and 2016.