Amey Chaware

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Education

Duke University   *Durham NC*

MASTER OF SCIENCE IN ELECTRICAL AND COMPUTER ENGINEERING, GPA: 3.95/4   *May 2020*
- ECE Merit Scholarship

College of Engineering, Pune   *Pune, India*

BACHELOR OF TECHNOLOGY IN ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING, GPA: 8.07/10 (3.7/4)   *May 2017*

Research Interests

Computer Vision, Computational Imaging, Machine Learning

Research Experience

Computational Optics Lab   *Duke University*

RESEARCH ASSISTANT   *September 2018 - PRESENT*

Learned Sensing: Jointly optimized microscope hardware
- Created CNNs to optimize illumination in microscopes for classification and segmentation
- Performed data preprocessing for machine learning and also analyzed the output data to get results
- Co-authored two papers based on this concept

Adaptively learned illumination for microscopes
- Examined a recurrent, reward-based system for dynamically optimizing the illumination of the microscope on a per sample basis
- Created an 'early-exit' mechanism to trade-off acquisition cost vs decision confidence
- Demonstrated that acquiring more images can improve the accuracy of classification

Overlapped Imaging for efficient classification
- Developed a system which overlays multiple fields-of-view onto a single sensor and detects malaria parasite from the resulting image
- Showed that it is possible to obtain high accuracy classification of the parasite from up to 7 overlapped images, which may offer a potential 7x speedup in diagnosis

Camera Culture   *MIT Media Lab*

VISITING RESEARCHER   *July 2019 - August 2019*
- Investigated the use of variational inference and generative models to solve computational imaging inverse problems
- Applied these techniques to help in imaging objects through scattering media

Publications

- **Amey Chaware***, Colin L. Cooke*, Kanghyun Kim, Roarke Horstmeyer. "Towards an Intelligent Microscope: adaptively learned illumination for optimal sample classification". ArXiv Preprint arXiv:1910.10209
- Alex Muthumbi*, **Amey Chaware***, Kanghyun Kim, Kevin C. Zhou, Pavan Chandra Konda, Richard Chen, Benjamin Judkewitz, Andreas Erdmann, Barbara Kappes, and Roarke Horstmeyer, "Learned sensing: jointly optimized microscope hardware for accurate image classification," Biomed. Opt. Express 10, 6351-6369 (2019)
- Colin L. Cooke, Fanjie Kong, **Amey Chaware**, Kanghyun Kim, Pavan C. Konda, and Roarke Horstmeyer, "Physics-Enhanced Machine Learning for Microscope Image Segmentation," In preparation., 2019

* indicates equally contributing author

Professional Experience

Embryyo Technologies   *Pune, India*

R&D ENGINEER   *July 2017 - April 2018*
- Researched literature, designed and performed experiments to arrive at an early stage proof of concept of a Microfluidic Cell Separator for early detection of blood sepsis
- Performed experimentation on low-cost alternate materials for microfluidic channels
- Created electrical models of various target cells based on literature to simulate the Clausius-Mossotti factor
- Developed image processing algorithms for on-chip haematocrit estimation

Projects

Image Denoising using Generative Models

DUKE UNIVERSITY *September 2019 - December 2019*

- Extracted noise patches from images and then using a GAN to estimate the noise distribution
- Created additional noisy realisations of the images by using GAN noise estimates, and then denoised them using Noise2Noise network

Adversarial Debiasing of Species Distribution Models

DUKE UNIVERSITY *March 2019 - May 2019*

- Trained a adversarial neural network model to debias species distribution models with respect to human presence
- Used Social Media data as a predictor for human presence and 64 ecological factors to predict true species distribution

DeepLesion

+DataScience Initiative at Duke University *January 2019 - April 2019*

- Built a machine learning model to classify eight different types of lesions from volumetric CT scan data
- Employed various strategies to mitigate class imbalance and used multiplexed DICOM window thresholding to assist in classification

Stacked Steel Sheet Counter

PROJECT FOR TATA STEEL LIMITED *April 2017 - June 2017*

- Developed a portable proof-of-concept device as a solution to the challenge of counting thin steel sheets
- Used image processing in Python OpenCV with a Raspberry Pi CPU for implementing relevant algorithms

Venipuncture Assistance System

UNDERGRADUATE THESIS PROJECT *August 2016 - May 2017*

- Created a system based on near-infrared (NIR) imaging to simplify the procedure of venipuncture
- Modified cameras to be sensitive to NIR light and evaluated various LED arrays to obtain the best contrast in the acquired images
- Identified veins from the resulting images using OpenCV and displayed the patterns back to the operator in an augmented reality fashion, also used vein patterns as biometric identifiers in a basic security system

Teaching

BME 590: Machine Learning and Imaging

Duke University

TEACHING ASSISTANT *Fall 2019 and Spring 2020 semesters*

- Helping a mixed class of 30 graduate and 10 undergraduate students to learn basics of machine learning through this project-based course
- Designed homework assignments and conducted weekly recitation sections as well as Tensorflow tutorials
- Created and maintained the course website

DukeREP Program

Duke University

MENTOR *June 2019 - August 2019*

- Co-mentored a local high school student through a project to convert a normal microscope to a computational one by adding off-the shelf electronic components

Skills

Languages Python, C/C++, MATLAB

Frameworks Tensorflow, PyTorch, pandas, scikit-learn, OpenCV, R-Pi, Arduino

Other Activities

- Member and the current Treasurer of JYOTI, the Indian graduate student association at Duke
- Was a part of the Robotics club in college, and stood runners-up in Robocon-2016 with the team
- Member of the Graphic Design Team for annual technical festival in college, MindSpark, headed the team for the 2016 edition