

# Hemanth Kandula

MACHINE LEARNING RESEARCHER

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- 5+ years of professional and academic machine learning experience in Healthcare, Bigdata and Robotics
- Led multi-phased research initiatives with a direct impact on patient healthcare.

## Education

### Tufts University

Medford, MA

MASTER OF SCIENCE IN COMPUTER SCIENCE (AI FOCUS)

Aug. 2019 - May. 2021

- **Coursework:** Reinforcement Learning, Natural Language Processing, Machine Learning, Big Data, Programming Languages, Algorithms

### SASTRA University

Thanjavur, India

BACHELOR OF TECHNOLOGY IN ELECTRONICS AND COMMUNICATION ENGINEERING

Jul. 2014 - May. 2018

- **Thesis:** Portable Internet-of-Things enabled rapid semen analysis system
- **Activities and Societies:** Engineering Project Coordinator at **Robotics Club**, Student Volunteer at **National Service Scheme**

## Experience

### Brigham and Women's Hospital, Harvard Medical School

Cambridge, MA

MACHINE LEARNING RESEARCHER

Dec. 2017 - present

Managed projects that solved few of the major unmet needs in human fertility, viral diagnostics with diverse team of clinicians and engineers resulted in 14+ journal and conference articles

- Designed & developed a **state-of-the-art** adversarial unsupervised and self-supervised domain adaption methods and investigated on domain shifted medical datasets. Accepted for **publication at Nature BME Journal**
- Created various highly curated benchmark **medical datasets of 500,000+ images** for domain adaption
- Developed deep learning framework for In Vitro fertilization (IVF) which **outperformed embryologists**
- Developed and deployed smartphone-based low-cost point-of-care Ovulation prediction device using deep learning into android application which **predicts Ovulation at-home with 99% accuracy**.
- Proposed generalization method using unsupervised adversarial learning for smartphone-based **viral(SARS-COV-2) diagnosis**
- Developed web/mobile apps (Vue.js, Flask, Android) for medical image datasets acquisition and annotation, and for deployed ML algorithms which was used by **clinicians from 9+ hospitals** and health clinics in US.
- Built point-of-care **low-cost diagnostics (<\$1)** devices interfaces with embedded internet of things (IoT) systems
- Lead & managed team of research interns in applying computer vision and deep learning in medical imaging projects

### SASTRA University

Thanjavur, India

STUDENT RESEARCHER

Apr 2016 - Nov 2017

At Electric Vehicle Engineering and Robotics (EVER) Lab, I worked on projects in mobile and aerial robotics

- **Decreased costs by 40%** by deploying algorithm with semantic segmentation (SegNet) for indoor autonomous navigation in ROS instead of high-cost Lidar sensors on CoroBot (mobile robot)
- Designed and implemented end-to-end autonomous control for drone GPS navigation system for agricultural crop spraying

### 300dpi

Thanjavur, India

APP DEVELOPER

Aug. 2016 - Oct. 2017

- Developed android applications for college cultural festivals for participants and organizers of Sastra University which were **used by 10,000+ students** from various colleges in India.

## Relevant Skills

### Programming/Scripting

Python, JAVA, SQL, C/C++, MATLAB, Bash, Linux

### Tools/Frameworks:

PyTorch, Keras, TensorFlow, NumPy, Pandas, SKLearn, CUDA, Spark, Git, Spark, Docker, AWS, GCP

### Mobile/Web Frameworks

Android, Vue.js, Node.js, Flask, REST API, Firebase, MongoDB

## Selected Achievements

|      |  |                  |
|------|--|------------------|
| 2019 | <b>Full tuition scholarship</b> , from Brigham and Women's Hospital, Harvard Medical School                | Cambridge, MA    |
| 2018 | <b>Grand Prize Award</b> , MakeMIT-2018, Massachusetts Institute of Technology                             | Cambridge, MA    |
| 2019 | <b>Winners</b> , Sharkhack 2019, Simmons University  | Boston, MA       |
| 2017 | <b>Winner of Gauntlet challenge</b> , in DAKSH'17, SASTRA University                                       | Thanjavur, India |
| 2017 | <b>Winner of Eleckart challenge</b> , in SHAASTRA'17(tech festival), Indian Institute of Technology-Madras | Chennai, India   |

## Selected Research Projects

### MD-nets: Medical Domain Adaption Networks

*Accepted in Nature BME*

RESEARCH ASSISTANT - HARVARD MEDICAL SCHOOL, SHAFIEE LAB

*May. 2019 – Nov. 2020*

- Designed & developed a novel adversarial unsupervised and a self-supervised domain adaption method shown state-of-the-art results on benchmarks.
- Investigated the use of adversarial learning on shifted distribution and medical image qualities which enabled using **low-cost diagnostics devices (<\$1)**

### SPyDERMAN

*Published in ACS Nano*

RESEARCH ASSISTANT - HARVARD MEDICAL SCHOOL, SHAFIEE LAB

*Nov. 2019 – Aug. 2020*

- Smartphone-based pathogen detection (SARS-CoV-2, Zika, HIV, HBV HCV) multiplier using adversarial networks
- Created a data library by generating synthetic images with StyleGAN for all viral datasets
- Proposed generalization method using unsupervised adversarial learning with target pathogen and data library

### Artificial Intelligence for In-Vitro fertilization (IVF)

*Published in various journals*

RESEARCH ASSISTANT - HARVARD MEDICAL SCHOOL, SHAFIEE LAB

*Sep. 2018 – Dec. 2019*

- Developed deep learning models(Keras, TensorFlow) for automated human embryo assessment for an In Vitro fertilization (IVF)
- Deployed ensemble of deep learning models for low-cost portable (<\$100) and smartphone-based embryo imaging devices (<\$1)

### Domain Adaptation in UAV Navigation & Obstacle Avoidance using Deep RL

*Available on GitHub*

RESEARCH PROJECT; ADVISOR: PROF. JIVKO SINAPOV

*Sep. 2020 – Dec. 2020*

- Implemented a adversarial domain adaption method to retain knowledge different environments in indoor settings.
- Showed significant performance improvements over Reinforcement Learning tasks learned from scratch and direct transfer learning

### Cross-Lingual Sentiment Analysis via Conditional Language Adversarial Adaptation

*Accepted in NAACL Workshop*

RESEARCH PROJECT; ADVISOR: PROF. BONAN MIN

*Jan. 2020 – Aug. 2020*

- Developed conditional Language Adversarial Network (CLAN) which is designed to learn language invariant features that are also discriminative for sentiment classification.
- Showed that CLAN outperforms all previous methods for both in-domain and cross-domain CLSA tasks.

### OVA: Point-of-Care Ovulation Testing

*Published in Lab-on-a-chip*

RESEARCH ASSISTANT - HARVARD MEDICAL SCHOOL, SHAFIEE LAB

*Dec. 2017 – Jun. 2017*

- A smartphone-based low-cost point-of-care diagnostics device to accurately predict ovulation at-home
- Developed with convolutions neural networks(CNN) and deployed into android application.

## Personal Projects

### Smart Cane for Visually Impaired

[Link](#)

MAKEMIT 2018 HACKATHON

*Jan. 2018*

- Build with the software stack of TensorFlow object detection API, SegNet (semantic segmentation) for detection objects and surfaces on a Nvidia Jetson TX2 and integrated with haptic and audio feedback to a cane
- Further improved with Kinect sensor for 3D environment mapping and ultrasonic sensor for irregularities in the ground

### Shafieelab.bwh.harvard.edu

[Link](#)

SHAFIEE LABORATORY WEBSITE

*Jan 2019 – Apr 2019*

- Developed and maintained the web app with Vue.js front end framework

## Extracurricular Activity

### Robotics Club, SASTRA University

*Thanjavur, India*

PROJECT COORDINATOR

*Aug. 2015 – Oct. 2017*

- Organized Robotics Workshops to encourage budding Engineers to learn and explore the field of Robotics.
- Managed 60+ people and led 6 computer vision and robotics projects
- Worked and concluded projects include: Gesture Controlled Quadcopter, PID Controller Based Line Follower Robot, Autonomous Mobile Robot, and recognition-based Robot Writing Using Character Segmentation Algorithm

### National Service Scheme

*Thanjavur, India*

STUDENT VOLUNTEER

*Jan. 2016 – Oct. 2017*

- The National Service Scheme (NSS) is a Central Sector Scheme of the Government of India, Ministry of Youth Affairs & Sports. It provides an opportunity to the students of India to take part in various government led community service activities & programs.
- Participated in children's educational activities in local villages of Thanjavur area.