Hari **Santhanam**

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Education

University of Pennsylvania *Philadelphia, PA*

M.S.E. in Robotics, GPA: 4.00 *Sep 2020 - May 2022*
Specialization in Computer Vision

Princeton University *Princeton, NJ*

B.S.E. with Honors in Electrical Engineering, GPA: 3.64, Departmental GPA: 3.85 *Sep 2016 - Jun 2020*
Certificates in Statistics and Machine Learning, Robotics and Intelligent Systems

Coursework

Advanced Topics in Machine Perception, Computer Vision & Computational Photography, Deep Learning, Machine Learning, Linear Algebra & Optimization, Linear Systems Theory, Digital Signal Processing, Building Real Systems, Probability & Stochastic Systems, Algorithms & Data Structures

Skills

Programming: Python, Java, C, C++, Matlab, R, Verilog
Frameworks: PyTorch, Tensorflow, OpenCV, Numpy, Keras

Work Experience

Agility Robotics *Tangent, OR*

Object Detection and Tracking Perception Engineer *Sep 2022 - present*

- Creating and deploying data augmentation techniques to enhance the object detection and tracking system on human-centric robot Digit.

Amazon Robotics *Boston, MA*

Advanced Robotics R&D Intern *Jun 2021 - Aug 2021*

- Improved Mask R-CNN segmentation performance in new sensor setting by performing domain adaptation with generated synthetic data.
- Placed foreground objects into new sensor setting's background based on derived distribution and used a GAN to create realistic blending.

Princeton Project X *Princeton, NJ*

Research Intern *Jun 2019 - Aug 2019*

- Combined ConvLSTM with PReMVOS, a semi-supervised segmentation network that tracks an object based on video's first frame.
- Adapted network to track an object in video based on template image, rather than video's first frame, and achieved promising J&F mean scores.

Lightening Energy *Dover, NJ*

Electrical Engineering Intern *Jun 2018 - Aug 2018*

- Developed and designed a prototype for a battery pack configuration that electrically powers an industrial device.
- Programmed a battery management system (BMS) and power supply to work in cohesion with the pack for factory settings.

Princeton Plasma Physics Laboratory *Princeton, NJ*

Research Intern *Jun 2017 - Aug 2017*

- Detected oscillations using Langmuir probes by altering the magnetic field strength and probe voltage within a cylindrical plasma tube.
- Discovered ion acoustic waves caused detected oscillations using MatLab and co-wrote a paper featured on the official PPPL website.

Research Experience

Line Labelling and Contour Detection using SOLOv2 *Philadelphia, PA*

MSE Thesis Advisor: Professor Jianbo Shi *Sep 2021 - Aug 2022*

- Developed first convexity line labelled dataset using novel automated algorithm, consisting of contour extracting, labeling, and grouping.
- Studied performance of SOA segmentation algorithms with additional ablations, and demonstrated improvement in a 3D reconstruction task.

Explainability of AI Algorithms in Pediatric Sepsis Detection *Philadelphia, PA*

Research Advisor: Professor Lyle Ungar *Jan 2021 - May 2021*

- Worked with doctors to develop random forest, logistic regression, and XGBoost models to predict sepsis within 4 hours of ER admission.
- Identified feature groups that are most important drivers of prediction using Shapley values, and uniquely normalized age-dependent features.

Video Synthesis: Binary Masks to Frames via DeepInversion *Princeton, NJ*

Undergraduate Senior Thesis Advisor: Professor Niraj Jha *Sep 2019 - May 2020*

- Inverted a pre-trained Mask R-CNN architecture to reverse engineer input training video sequences from just output binary masks.
- Optimized noise as input tensor and added weighted batch normalization loss and pixel variance loss to existing Mask R-CNN architecture.

Use of Compressed CNNs to Diagnose Diseases Using Small Datasets *Princeton, NJ*

Independent Work Advisor: Professor Niraj Jha *Jan 2019 - May 2019*

- Trained compressed ResNet-50 models, pre-trained on ImageNet, to classify diseases found in small NIH Chest-Xray and OCT datasets.
- Compared performance with dense models trained on the same Chest-Xray and OCT datasets and achieved average discrepancy of only 0.5%.

Publication

Hari Santhanam*, Nehal Doiphode*, Jianbo Shi
Automated Line Labelling: Dataset for Contour Detection and 3D Reconstruction
Winter Conference on Applications of Computer Vision (WACV), 2023

Honors & Awards

2020	**Cum Laude Honors**, Princeton University	*Princeton, NJ*
2019	**Project X Summer Funding Award**, Princeton University	*Princeton, NJ*
2018	**Princeton Environmental Institute Fellowship Recipient**, Lightening Energy	*Dover, NJ*
2017	**Princeton Plasma Science and Technology Internship Recipient**, Princeton Plasma Physics Laboratory	*Princeton, NJ*

Leadership & Teaching

UPenn Graduate Teaching *Philadelphia, PA*

Teaching Assistant for Computer Vision and Computational Photography *Sep 2021 - Dec 2021*

- Held weekly office hours and group coding sessions for learning and implementing traditional computer vision algorithms.

Princeton McGraw Center for Teaching and Learning *Princeton, NJ*

Head Undergraduate Tutor for Multivariate Calculus and Physics Mechanics *Jan 2018 - May 2020*

- Led a team of tutors in core engineering classes, and communicated directly with professors for effective tutoring.

Extracurriculars

Princeton Wind Ensemble *Princeton, NJ*

Clarinetist *Sep 2017 - May 2018*

- Attended biweekly rehearsals and performed at Richardson Auditorium with the Oxford Wind Ensemble.

Princeton Club Travel Tennis *Princeton, NJ*

Member *Sep 2017 - Jan 2018*

- Played on the travel club team that competes against other club teams in the Ivy League.