

Hae Jin (Hayley) Song

haejinso@usc.edu | 213-503-8281

<https://cocoa.github.io/blog>

Education

<i>University of Southern California</i>	Los Angeles, CA
• Candidate for Doctor of Philosophy in Computer Science	Fall 2018
<i>Massachusetts Institute of Technology (MIT)</i>	Cambridge, MA
• Master of Science in Electrical Engineering and Computer Science	Spring 2018
• Bachelor of Science in Electrical Engineering and Computer Science (w/ Minor in Mathematics)	Spring 2016

Current Research

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- Image understanding and relational learning in large geospatial data (eg. Multispectral satellite data)
 - Interpretability and transferability of deep neural networks based on information and coding theory
 - Mathematical analysis on the learning dynamics of deep neural networks
 - Main [publications](#)
 - Encoding geospatial semantics from satellite images using variational autoencoder
 - Road and building detection on multispectral satellite images with DNN and spatial reasoning
 - [MINT-Viz](#): Interactive visualization tool for spatiotemporal data and deep neural network models

Internship Experience

<i>Mobile Pattern Detection using Machine Learning</i>	
Intern at Apple Inc.	Feb. 2018-Sep. 2018
• Designed acoustic experiments for data collection on iPhones	
• Built predictive models for iPhones using Random Forest and Neural Networks	
<i>Robot localization and object detection</i>	
Intern at Keecker	Summer, 2016
• Improved the accuracy of robot's 3D position via camera calibration using Aruco and OpenCV in C++	
• Built a recognizer for the Keecker logo that is robust in various illuminations and scales	
• Implemented an Android application that commands the robot to rotate in search of the Keecker's logo and moves towards the logo upon its detection	
<i>Machine Learning and Web Development</i>	Saclay, France
Intern at INRIA, France	Summer, 2015
• Optimized the parameters of three classifiers (KNN, Linear SVM and Random Forest) and ranked their performances on gestural datasets	
• Implemented a recommendation system to find the most useful set of gestures using the optimized classifiers	
• Built a web application for Human Computer Interaction researchers to upload their datasets and interact with the results from the recommendation system	

Research Experience

<i>Non-rigid alignment of mammogram images for breast cancer detection</i>	Cambridge, MA
Masters student with Regina Barzilay in CSAIL, MIT	2017
• Deformable image alignment using Optical Flow and Demons algorithm to localize and track tumors	
• Improved learning algorithms for the displacement field estimation with annotated data	
<i>Computer Vision and 3D reconstruction</i>	
Masters student with Regina Barzilay and Julian Straub in CSAIL, MIT	2016-2017
• Built a multi-camera system for 3D reconstruction of human arms for early diagnosis of lymphedema using multiple depth sensors (Intel Realsense)	
• 3D point cloud alignment using functional maps and minute volume changes detection	
• Visual magnification of volume changes in 3D	
<i>Free-Flow: Unintrusive Reading Device for a Printed Text</i>	Cambridge, MA
SuperUROP Researcher with Dr. Suvrit Sra in LIDS, MIT	2015-2016

- Developed a software for a hand-held, pen-style device that allows a quick search of words in printed texts
- Used Optical Character Recognition, filtering and image processing for word extraction and recognition

Data Science and Big Data

Cambridge, MA

Undergraduate Researcher in Anyscale Learning For All in CSAIL, MIT

Summer, 2014

- Constructed predictive models based on large data from medical and physical fields using data reduction, regression, classification and Gaussian Models on the cloud
- Parsed and organized raw data using Python and MATLAB, and then conducted statistical data analysis

McGovern Institute for Brain Research at MIT

Cambridge, MA

Undergraduate Researcher in Graybiel Lab

- Organized a large amount of neural data and improved the database using MATLAB
- Developed algorithms to test rats' decision-making and calculate reaction times
- Automated the outlier filtering and image alignment process using ImageJ and MATLAB
- Calculated the distances in 3D between an injection site and different parts of the brain

Camera Culture Group at MIT Media Lab

Cambridge, MA

Undergraduate Researcher

Spring, 2012

- Designed and developed glass-free 3D image layers and prototypes for exhibition using a laser cutter
- Reduced by half the amount of required materials by optimizing the alignment of the layers

Papers & Presentations

Please visit: [my website](#)

- Road and building detection from multispectral satellite images using semantic segmentation and spatial reasoning
- Generating Gaussian, Pictures, and Stories with Generative Adversarial Networks (Fall 2016)
- Automatic Cell Detection using HOG features and SVM (Fall 2016)
- Unintrusive Reading Device for a Printed Text (MIT EECS SuperUROP Poster Sessions, 2016)
- 3D air gesture recognition using Dynamic Time Warping and KNN (MIT EECS Poster Sessions, 2016)

Relevant Projects

- IOS application for 3D gesture recognition on air using Dynamic Time Warping and KNN
- Optimization of the blog traffic using a distributed memory caching system (Memcached)
- Analysis of Tweets and essays using Twitter API, sentiment analyzer and statistical inference techniques
- Modeling of Hidden Markov Model of a robot using message-passing algorithms
- Implementation of sampling techniques (Metropolis-Hasting, Gibbs) and Monte Carlo simulations

Scholarship

- MIT EECS - Foxconn Undergraduate Research and Innovation Scholar through MIT Research and Innovation Scholars Program

Leadership

MIT Yearbook and Photography Club (Technique) 2012-2013

Publicity Editor

- Applied graphic design skills such as Photoshop and In Design to publicize Technique's weekly meeting, book sales and Senior Portraits

MIT Experimental Study Group 2012-2013

Associate Advisor

- Organized academic and social events and connected the Associate Director with students

MIT Korean Class 2012-2013

- Prepared curriculum and led lectures and recitations for the beginner and intermediate Korean classes at MIT as a volunteer

Teaching

TA for Introduction to Artificial Intelligence (USC, CSCI 360) Spring 2020

TA for Advanced Natural Language Processing (MIT, 6.864) – Graduate level Fall 2017

[Skills](#)

Languages: Korean (Native), English (Fluent), French (Intermediate)

Programming: C++, Python, MATLAB, Android Programming, Web development