

Karkala Shashank Hegde

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PROGRAMMING SKILLS

• Languages:

Python (Tensorflow, PyBullet, Mujoco, Gym, PyTorch, Pandas, Numpy, Flask, Scikit-learn, Scipy, ROSpy),
MATLAB (Statistics and Machine Learning, Deep Learning, Signal Processing Toolboxes),
C++ (OpenAL, OpenCV)

EDUCATION

- **University of Southern California - PhD** Los Angeles, USA
Electrical and Computer Engineering GPA: 3.94/4 2021 – Present
AI Researcher at the Robotic Embedded Systems Laboratory, advised by Dr. Gaurav Sukhatme.
- **University of Southern California - Master of Science** Los Angeles, USA
Electrical and Computer Engineering GPA: 3.94/4 2019 – 2021
- **National Institute of Technology Karnataka - Bachelor of Technology** Surathkal, India
Electrical and Electronics Engineering GPA: 8.17/10 Thesis GPA: 9.5/10 2013 – 2017

RESEARCH EXPERIENCE

- **Robotic Embedded Systems Laboratory**[\[link\]](#), USC Los Angeles, USA
Research assistant Sept 2020 - present
 - Develop sample efficient learning methods for quadruped hurdling tasks on SLURM clusters. Use Sample factory for distributed learning with reduced policy lag.
 - Experiment with audio based communication between agents for multi agent reinforcement learning.
 - Create high performing small Neural Networks on AWS for robotic control, to fulfill device and time constraints.
- **Stochastic Systems & Learning Laboratory**[\[link\]](#), USC Los Angeles, USA
Research assistant May 2020 - May 2021
 - Build scale-able Reinforcement Learning policies using function approximators with lesser trainable parameters.
 - Study and Apply state of the art Imitation Learning techniques to self driving vehicles and experiment on Hyper realistic simulations such as CARLA.
- **Dynamic Robotics and Control Laboratory**[\[link\]](#), USC Los Angeles, USA
Research assistant November 2019 - October 2020
 - Simulate and control a quadruped mini cheetah robot on Pybullet and Gazebo, by using stochastic control with policy gradient based agents. Test the RL controller on the actual robot after integration with ROS.
 - Experiment on different action spaces such as impedance control, torque control, force control, and use hybrid learning methods with model predictive control to help faster learning. Use RLLib for distributed learning.
- **St. Aloysius College, Mangalore University** Mangalore, India
Research intern at Laboratory of Applied Biology, Koppers Biotech Unit May 2014 - June 2015
 - Predicting growth trend of algae after studying the effect of light on enhanced algal bio-fuel production. These predictions were done using Linear regression on the collected time series data.

SELECT PUBLICATIONS

- **S. Hegde**, GS. Sukhatme (2022) *Efficiently Learning Small Policies for Locomotion and Manipulation* (Submitted to ICRA23) [\[site\]](#)
- G. Salhotra, **S. Hegde**, SS. Batra, P. Englert, GS. Sukhatme (2022) *Guided Learning of Robust Hurdling Policies with Curricular Trajectory Optimization*, Southern California Robotics Symposium [\[site\]](#)
- **S. Hegde**, A. Kanervisto and A. Petrenko (2021) *Agents that Listen: High-Throughput Reinforcement Learning with Multiple Sensory Systems*, IEEE Conference on Games. [\[site\]](#)
- Hiteshi Sharma, R. Jain. and **S. Hegde** (2021) *Randomized Policy Learning for Continuous State and Action MDPs* (arxiv) [\[pdf\]](#)
- **S. Hegde**, V. Kumar, and A. Singh. (2018). *Risk aware portfolio construction using deep deterministic policy gradients*. IEEE Symposium Series on Computational Intelligence (SSCI) Bangalore, Nov. 2018. [\[pdf\]](#)

INDUSTRY EXPERIENCE

- **SalesDNA** Los Angeles, USA
Data Scientist May 2021 - August 2021
 - Built data pipelines for collection, cleaning and modelling. Use real time Markov modelling for a sales process.
 - Built model free reinforcement learning algorithms to build AI strategies on this sales simulation.
- **Fidelity Investments** Bangalore, India
Software Engineer at Asset Management technology July 2017 - July 2019
 - Develop applications based on Supervised Machine Learning for trade order selection and efficient execution.
 - Research on Reinforcement Learning and its application on portfolio construction in equity trading. A Gym simulation was built using real trading data. Google Tensorflow was used during the course of this work.
 - Worked with the Equity Trading team to develop and support the java and python based trading engine. Gained experience in java spring-boot, python flask, SQL, splunk, AWS and many other software developer tools.

ACADEMIC PROJECTS

- **Autonomous Vehicle Navigation:** As a part of the Autonomous Vehicle lab, I worked on navigation, path planning and simulation of an autonomous car to take part in IGVC 2021. I used Gazebo to build an accurate simulation of the track, and implement path finding algorithms such as A star.
- **Competitive and Co-operative Multi Agent Reinforcement Learning**^[pdf]: As a part of my directed research with the Hardware Accelerated Learning group^[link], I'm experimented with various multi agent reinforcement learning algorithms. The goal of this project is to understand the state of the art RL algorithms that work well in both competitive and cooperative environments.
- **Torque Transfer**^[code]: Use reinforcement learning and transfer learning to create robust AI agents. The AI agent should generalize to a variety of open world self driving simulations. After training an AI for a self driving car simulation using Imitation learning and reinforcement learning, the learnt policy was used as a pre trained network for an AI agent in another self driving simulation. The pretrained model showed faster learning in the new simulation.
- **Emotion Transfer on speech using spectrogram images**^[code]: Use a conditional Generative Adversarial Neural Network to generate images on spectrograms of speech signals. By using cycle GANs we use style transfer on spectrograms of speech signals to embed emotion in them. The generated spectrogram is reconstructed back to speech using the Griffin-Lim algorithm.
- **Fashion compatibility prediction**^[code]: Use a Siamese Convolutional Neural Network to classify if two fashion objects are compatible with each other. Then using the pair-wise similarity scores predicted to see if an outfit is compatible. To do this Google Tensorflow 2.0 was used and the models were trained on AWS p3.2xlarge instances (Tesla V100 GPUs)
- **Spoken Language classifier**^[code]: Implement a Gated Recurrent Unit based Neural Network to classify the extracted MFCC features from speech audio. A streaming model classifies the language being spoken in real time. Using this streaming model, we could analyse the probability of miss-classification at every instant of speech.
- **Prosthetic Voice (Thesis)**^[pdf]: Undergraduate Thesis: sEMG signal controlled speech production aid for speech challenged individuals using Machine Learning. The signals were collected, filtered, pre-processed and then fed to a classifier that would predict the hand action performed. The action would then be translated to speech.
- **Emotion Detection**^[pdf]: I was part of a three member team that built a Machine Learning driven emotion detector using variations in speech signals. Using MFCC feature extraction and PCA on other features, we built a classifier.

ACHIEVEMENTS

- **USC Annenberg Fellow:** Awarded a 1 year Fellowship for my PhD.
- **Masters Student Honors Program**^[link]: Certificate for outstanding academic and research achievements.
- **The Data Open**^[pdf]: Was a finalist in the SoCal round of the Data Open Hackathon organized by Citadel.
- **Soda bottle classification contest**^[link]: Winner of image classification contest by Deep Cognition.
- **High School:** Best Outgoing student in school, ranked in top 1% of All India Engineering exam.

SERVICE

- **Teaching Assistant:** EE541 - A Computational Introduction to Deep Learning; EE641 - Deep Learning Systems
- **Invited Speaker Sears Deep Learning Center Program**^[link]: Delivered a company wide talk on SOTA applied Deep Reinforcement Learning.
- **Deep Reinforcement Learning Workshop:** Regularly conducted DRL workshops at Fidelity Investments.