

## Education

### Stony Brook University

*Ph.D. (Major: Mechanical, Minor: Computer Science), GPA 3.88*

Stony Brook, NY

*Aug. 2015 – Present*

- **Relevant Coursework** : Artificial Intelligence, Computer Vision, Machine Learning, Analysis of Algorithms, Advanced Control Systems, Robotics, Advanced Dynamics, Computational Geometry, Geometric Modeling, Product Design Optimization
- Developing Machine Learning Based Mechanical Design, under the guidance of Dr. Purwar; funded by \$450K [NSF grant](#).

## Experience

### Autodesk Research

*Robotics Research Intern*

San Francisco, CA

*May 2019 – Aug 2019*

- CAD Informed Adaptive Robotic Assembly; Developed an Assembly Motion Planner Algorithm; Python plugin for Fusion 360
- Integrated a concave-concave mesh collision library (C++) with In-house Robotic Environment; Impacted three research projects
- Initiated a deep learning project on Representation Learning of Assembly Motion Plans; Developed a representation schema for Motion Plans; Trained a VAE on a synthetic dataset; Applications in Grasp Authoring, Qualitative Assessment of Motion Plans

### Stony Brook University

*Research Assistant*

Stony Brook, NY

*May 2016 – Present*

- Interactive ML Agent for Assisted Mechanism Design; Human Machine Collaboration; ML for conceptual machine design.
- Developing Generative Models (Conditional GAN and VAE) for computational creativity and managing uncertainty.
- Working on deep RL model for Mechanical Design; Developed an OpenAI-gym Environment for Mechanism Design Task.
- VAE for representation learning of Mechanism Motion Point Clouds in 2D and 3D; Trained classifiers for Type-Synthesis
- Developing a Machine Learning Driven Web-Based App for Synthesis of Mechanical Linkages; Deployed on AWS; url: <http://deshpandeshrinath.github.io/motiongen-react/>; [TensorflowJS, React, AWS, Redux]
- Lead Author of an award winning publication for solving practical synthesis problems (doi: 10.1115/1.4037801)

## Skills

- **Languages** : Proficient in Python, Javascript, C++, MATLAB, Competent with Mathematica, HTML5, CSS
- **Tools & Technologies** : Tensorflow, OpenCV, Simulink, ROS, Vim, Scikit-learn, OpenGL, Canvas, Three.js, React, Redux

## Relevant Projects

### Deep Reinforcement Learning for Continuous Control Tasks

*Tensorflow, OpenAI-Gym <https://github.com/deshpandeshrinath/deepDGP>*

CSE 537 AI, Prof. N Balasubramanian

*Jan 2018 – May 2018*

- Implemented Deep DPG algorithm to learn continuous control policies; Compatible with all OpenAI-Gym environments.
- Implemented Hindsight Experience Replay for learning goal-oriented tasks with sparse binary rewards.

### Visual Odometry with Deep Learning

*Python, Tensorflow, OpenCV <https://github.com/sladebot/deepvo>*

CSE527 Computer Vision, Prof. Roy Shilkrot

*Oct 2017 – Dec 2017*

- Built deep Recurrent Convolutional Neural Network for pose estimation of a car; CNN was derived from pretrained FlowNet2.0
- Trained and tested on KITTI visual odometry dataset (grayscale); Supported by [Human Interaction Lab](#), Stony Brook.

### Computing Central Trajectory

*CGAL, OpenGL, Boost, C++*

CSE555 Computational Geometry, Prof. Joseph Mitchell

*March 2017 – May 2017*

- Developed an algorithm to find valid representative trajectory among n time stamped trajectories; works in d dimensional space.
- Algorithm builds a weighted DAG on input; designed heuristics for assigning weights. Output is dijkstra's shortest path on DAG.

### Optimal Control of a Drifting Car

*MATLAB, GPOPS-II*

MEC560 Advanced Control Systems, Prof. Vivek Yadav

*Oct 2016 – Dec 2016*

- Designed Ext. Kalman Filter for Observer; Modeled governing dynamics; Used empirical tire friction model for drift simulations.
- Computed shortest path using Dynamic Programming. Obtained Optimal Control via Direct Collocation; Implemented in MATLAB using optimal control solver [GPOPS II](#).

### Motion Planning of Baxter Arm

*MATLAB*

MEC529 Robotics, Prof. N. Chakraborty

*March 2016 – May 2016*

- Computed smooth B-Spline motion for pushing. Computed Jacobian matrix; Applied approximate Inverse Position Kinematics

## Selected Publications

- Deshpande S, Purwar A. **Computational Creativity via Assisted Variational Synthesis of Mechanisms using Deep Generative Models**, ASME Journal of Mechanical Design 2019; doi :10.1115/1.4044396
- Deshpande S, Purwar A. **A Machine Learning Approach to Kinematic Synthesis of Defect-Free Planar Four-Bar Linkages**, Feb 2019, ASME J. Computing and Information Science in Engineering, doi 10.1115/1.4042325
- Deshpande S, Purwar A. **A Task-Driven Approach to Optimal Synthesis of Planar Four-Bar Linkages for Extended Burmester Problem**, ASME. J. Mechanisms Robotics. 2017;9(6):061005-061005-9. doi:10.1115/1.4037801

## Awards

- Research Intern Culture Catalyst Award, Autodesk, Aug 2019
- Award of Research Achievement, Sigma XI Scientific Research Society, May 2019
- A.T. Yang Award in Theoretical Kinematics, Aug 2017