
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 an ML-based framework for Mechanical Design, under the guidance of Dr. Purwar; funded by \$450K [NSF grant](#).

Experience

Stony Brook University

Research Assistant, Teaching Assistant

Stony Brook, NY

May 2016 – Present, Aug 2015 – May 2016

Machine Learning

- Developing Generative Models (VAE's and Auto-regressive RNN's) for computational creativity and conceptual machine design.
- Working on deep RL model for Mechanical Design; Developed an OpenAI-gym Environment for Mechanism Design Task.
- Variational autoencoders for representation learning of Linkage Trajectories; Trained classifiers for Mechanism Type-Synthesis

Optimization

- Developed Lagrange Optimization routine for four-bar linkage synthesis; Reduces constrained optimization into a polynomial system. Solved the system by gröebner basis method; implemented using GIAC npm package on node.js server.
- Lead Author of an award winning publication for solving practical synthesis problems (doi: 10.1115/1.4037801)

MotionGen: Web, iOS and Android App for Linkage Synthesis

- Developed smart-synthesis, motion interpolation functionalities for the cross platform app based on MVC architecture; url: <http://cadcam.eng.sunysb.edu/>. Used Apache Cordova framework for iOS and Android implementations.
- Implemented multi-core computations for synthesis using *Cluster* node package.

Teaching Assistant - MEC101 (Mechanical Design Innovation), MEC 262 Engineering Dynamics

- Involved in creating assignment, exams and conducting recitation sessions for 200+ students in each course.
- Developed modular robotic kits for MEC101 students; Conducted Hands-On tutorials on Arduino programming.

Skills

- **Languages** : Proficient in Python, Javascript, MATLAB, Mathematica. Competent with C++, HTML, CSS
- **Tools & Technologies** : Tensorflow, OpenCV, Simulink, ROS, Vim, Scikit-learn, Unix/Linux, GCP, STL, Apache Cordova

Relevant Projects

Deep Reinforcement Learning for Continuous Control Tasks

CSE 537 AI, Prof. N Balasubramanian

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

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

CSE527 Computer Vision, Prof. Roy Shilkrot

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

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

CSE555 Computational Geometry, Prof. Joseph Mitchell

CGAL, OpenGL, Boost, C++

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

MEC560 Advanced Control Systems, Prof. Vivek Yadav

MATLAB, GPOPS-II

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](#).
- Used high gain PID controller to follow optimal control. Results match with empirical drifting techniques used by race drivers.

Selected Publications

- Deshpande S, Purwar A. **A Machine Learning Approach to Kinematic Synthesis of Defect-Free Planar Four-Bar Linkages**, ASME IDETC Aug 2018. (Accepted for ASME J. Computing and Information Science in Engineering)
- 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
- Purwar, A., Deshpande, S., Ge, Q. J. **MotionGen: An iOS and Android App for Planar Four-Bar Motion Generation**, ASME IDETC 2016 August.

Awards

A.T. Yang Award in Theoretical Kinematics

Aug 2017

- Awarded \$1000 for the Best Paper at ASME Mechanisms and Robotics Conference, Cleveland, OH, August, 2017