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Shrinath Deshpande

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Education

Stony Brook University — Stony Brook, NY
Ph.D. (Major: Mechanical, Minor: Computer Science), GPA 3.86 — *Aug. 2015 – Present*

- **Relevent Coursework :** Artificial Intelligence, Computer Vision, Machine Learning, Analysis of Algorithms, Advanced Control Systems, Robotics, Advanced Dynamics, Computational Geometry, Geometric Modelling, Product Design Optimization
- Developing a framework for data-driven mechanism design, under the guidance of Dr. Purwar; funded by $450K NSF grant.

Experience

Stony Brook University — Stony Brook, NY
Research Assistant, Teaching Assistant — *May 2016 – Present, Aug 2015 – May 2016*

Machine Learning

- Working on Deep RL for Intelligent Mechanism Design; Implemented DDPG, HER for goal oriented continuous control tasks.
- Used autoencoder nets for dimensionality reduction; Achieved 45:1 data compression for mechanism trajectory database.
- Autoencoders trained in greedy layer-wise fashion; Tensorflow, GCP based implementation; Accepted for publication.

Optimization

- Developed Lagrange Optimization routine for four-bar linkage synthesis; Reduces constrained optimization into polynomial system. Solved the system by gröebner basis method; implemented using GIAC npm package on node.js server.
- Led to 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 — *Jan 2018 – April 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 — *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.

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 techiques used by race drivers.

Motion Planning of Baxter Arm — MEC529 Robotics, Prof. N. Chakraborty
MATLAB — *March 2016 – May 2016*

- Computed smooth B-Spline motion for pushing. Computed Jacobian matrix; Applied approximate Inverse Position Kinematics
- Obtained joint angles and rates for the task. Performed simulations to validate the results.

Selected Publications

- Deshpande S, Purwar A. A Machine Learning Approach to Kinematic Synthesis of Defect-Free Planar Four-Bar Linkages. (Accepted for ASME IDETC, 2018.)
- 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. (2016, August). MotionGen: An iOS and Android App for Planar Four-Bar Motion Generation, ASME 2016 IDETC.

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