Rohit Sonker

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Education

Indian Institute of Technology (IIT) Kanpur, India July. 2014 – June 2019

- Master of Technology (Dual Degree) in Mechanical Engineering — CGPA 9.3/10
- Bachelor of Technology in Mechanical Engineering — CGPA 7.9/10

GRE: V 163/170, Q 164/170 — TOEFL iBT: 116/120

Publications and Presentations

- **R. Sonker** and A. Dutta, "Adding Terrain Height to Improve Model Learning for Path Tracking on Uneven Terrain by a Four Wheel Robot," in IEEE Robotics and Automation Letters, vol. 6, no. 1, pp. 239-246, Jan. 2021, doi: 10.1109/LRA.2020.3039730. (Link)
- **Rohit Sonker**, Ayush Mishra, Palvika Bansal, Anup Pattnaik "Techniques for Medical Concept Identification from Multi-Modal Images", in CEUR Workshop Proceedings, Vol-2696, 2020. (Link)
- **(Oral Presentation)** *Techniques for Medical Concept Identification from Multi-Modal Images* CLEF 2020 Conference, Thessalokini, Greece
- **(Poster)** *Learning Based Control for Mobile Robots on Uneven Terrain*, Research Scholar Day, IIT Kanpur 2018

Research Experience

Online Control by Learning Inverse Dynamics via Kalman Networks July 2021 - Present

Researcher, Karlsruhe Institute of Technology, Advisors - Vaisakh Shaj and Prof. Gerhard Neumann *Germany*

- Investigated learning of forward and inverse dynamics models using recurrent Kalman networks which combine Kalman filtering with deep learning to accommodate missing and noisy sensor observations
- Implemented inverse model learning with feedforward control for trajectory tracking by Franka Panda manipulator
- Working on extending controller to learn inverse dynamics for robot with pneumatic artificial muscles

Model based Learning for Path Tracking on Uneven Terrain July 2018 - June 2019

Master's Thesis, Indian Institute of Technology Kanpur, Advisor - Prof. Ashish Dutta *Kanpur, India*

- Used dynamics model learning with model predictive control and cross entropy optimization for planning
- Novel contribution of incorporating terrain height to improve performance and increase generalisation of model
- Analysed effects of multiple parameters such as task horizon, action sampling, controller frequency
- Results showed a significant improvement over standard baseline controllers, work published in IEEE RAL

Incorporating Advice in Reinforcement Learning May 2018 – July 2018

Summer Intern, University of Texas at Dallas, Advisor - Prof. Sriraam Natarajan *Dallas, TX, USA*

- Conducted research on adding advice under human-in-loop learning paradigms for various RL algorithms
- Combined advice preferences given by multiple sub-optimal experts by Expectation Maximisation to shape policy
- Method helped remove targeted noise in learning and motivated early learning for useful behaviours

Moving Target Enclosure by Group of Turtlebots May 2016 – July 2016

Undergraduate Researcher, Indian Institute of Technology, Advisor - Prof. Laxmidhar Behera *Kanpur, India*

- Used cyclic pursuit strategy for cooperative control of multiple agents to enclose and follow moving target
- Tested algorithm in ROS on a group of turtlebots which successfully converged into formation around target

Professional Experience

Data Scientist July 2019 – Present

Pricewaterhouse Coopers US Advisory *Mumbai, India*

***PwC Certified AI Modeler**, completed projects and developed Proof of Concepts using ML techniques*

Medical Concept Detection from Multi-Modal Images (ImageClef2020)

- Used Multi-label Image Classification techniques to predict a set of concepts from different radiographic images
- Utilized various techniques such as transfer learning, clustering, association rule mining, K-NN image retrieval
- Implemented a novel band classification architecture using multiple step neural networks
- Secured 2nd Position globally at ImageClef2020 Hackathon, presented & published work at CEUR Clef Conference

Database Entity Matching with NLP

- Developed a database entity matching NLP algorithm with similarity search TF-IDF, word2vec and Sentence Encoder embeddings
- Converted proof of concept to full client engagement utilized across various workstreams
- Deployed model as end to end AWS hosted pipeline for mapping entities in discrete datasets

Model Monitoring Framework - MLOps

- Developed a model monitoring framework to AWS hosted model endpoint to analyze performance over time
- Automated metrics for monitoring such data drift and model drift using various statistical measures such as KS, MMD and Fischer tests

COVID-19 Projection Model

- Developed a time varying SIRD simulation model for COVID19 projections for over 50+ countries running multiple simulation scenarios
- Model accuracy was improved by 15% as compared to standard IHME projections
- Extended model to develop a vaccinated compartment with ARIMA projections to model infectivity and vaccination rate
- Project cpability led to additional client engagements over worth over $700K lasting over an year

Teaching Assistant July 2018 - April 2019

ME762: Intro to Robotics & ME763: Robot Manipulators *IIT Kanpur, India*

- Graded course assignments, ensured smooth conduction of the course and invigilated examinations and clarified student doubts during dedicated office hours
- Held regular doubt clearing sessions to address problems of students in assignments and coursework

Selected Course Projects

Object Detection harness for Visually Impaired | *Engineering Design* Jan 2019 – April 2019

- Created a wearable harness to with object detection and proximity sensing capabilities to assist visually impaired
- Developed a prototype using mobile phone camera, laptop, depth sensors and Arduino micro-controller to give out voice description of surrounding objects to the user

Modelling Tax Compliance Behaviour | *Multiagent Systems* Jan 2017 – April 2017

- Developed an agent-based evolutionary model to analyze tax compliance trends in a population of 10k individuals
- Introduced factors such as 'Neighborhood(network) Effect' and 'Perceived Audit Rate' to make simulation realistic
- Results correctly predicted tax compliance rates and gave insights on improvement of tax collection

Redundancy Resolution For 3DOF Manipulator | *Neural Networks* Jan 2018 – April 2018

- Developed an Single Network Adaptive Critic (SNAC) for redudancy resolution of a 3DOF manipulator
- Tested control algorithm for reaching and trajectory following tasks

Stock Market Prediction | *Machine Learning* July 2017 – Nov 2017

- Aimed to forecast future values of the NASDAQ composite index using various market indicators
- Used feature engineering to incorporate statistical features such as momentum, moving averages, strength index
- Created a weighted voting ensemble model of ARIMA time series model, Kernel SVM and Neural Network to predict future values

Technical Skills

Languages: Python, C/C++, MATLAB, R
Deep Learning: PyTorch, Keras
Other Softwares: Robot Simulation (ROS, Mujoco, Pybullet) and Design (Solidworks, Inventor)

Co-Curricular Activities

Core Team, Institute Counselling Service April 2018 – April 2019

Indian Institute of Technology Kanpur *Kanpur, India*

- Working in a team of 8 members coordinating with institute counsellors, faculty members and over 200 volunteers to provide academic, financial and emotional support to students
- Led a team of 60 Orientation Team Member and 50 Buddies to effectively conduct an 8-day orientation program for over 1000 new students to ensure their smooth transition to the campus life
- Managed a tutoring program with over 50+ mentors spread across different subjects and hostels
- Planned the student selection process for Student's Benevolence Fund Scholarship, collaborating with Faculty to conduct interviews

Learning and Development Team July 2019 - June 2020

Firm Development Activities - PwC US Advisory *Mumbai, India*

- Identified key areas to upskill professionals and developed a year long plan for internal trainings after discussions with the leadership team - program led training of over 100+ folks across multiple offices
- Created and single-handedly managed a dedicated training structure for AI techniques by collaborating across competencies within PwC

Relevant Courses

Computer Science and Math

Fundamentals of Computing
Data Structures and Algorithms
Multi-Agent Systems: Games, Algorithms & Evolution
Machine Learning
Neural Networks

Calculus
Linear Algebra & ODEs
Partial Differential Equations
Complex Analysis
Quantitative Methods for Decision Making

Robotics and Control

Introduction to Robotics
Robot Motion Planning
Robot Manipulators: Dynamics & Control
Mechatronics

Control Systems
Vibration Control
Compliant Mechanisms

Specialization In Reinforcement Learning (Offered by University of Alberta on Coursera)*

Fundamentals of Reinforcement Learning
Sample-based Learning Methods

Prediction and Control with Function Approximation
A Complete Reinforcement Learning System (Capstone)

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