

Rakesh Gupta

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Summary

Senior technology leader with 25 years of experience in software. Built software products and prototypes in AI, Machine Learning, Deep Learning, Reinforcement Learning, Spoken Dialog, Natural Language, and Robotics. Comfortable leading teams, contributing individually, and working with customers, startups and collaborators.

Experience

SAIC USA Inc., San Jose, CA

Director of Autonomous Driving

May 2016 - present

Strategic role in Autonomous Driving - advising on strategy, technically evaluating startups for SAIC Capital, setting startup and university collaborations in the US. Tactical role in building the US autonomous driving team from scratch to 20+. Leading the US team on urban driving and shared mobility projects with elements of Deep Learning, Reinforcement Learning, Perception, Mapping, Localization, Motion Planning, Control, Testing and Validation for deployment.

Honda Research Institute USA, Inc., Mountain View, CA

Principal Computer Scientist

July 2007 - April 2016

Provided leadership in Machine Learning/AI, collaborating with Honda worldwide. Projects included:

Autonomous Driving: Team lead for urban autonomous driving software, with focus on path planning, reactive behavior with sensor data and high resolution maps. Project on decision making at intersections using Monte Carlo Search Trees.

Spoken Dialog: Team lead for free form dialog system for setting destination in a car. We developed Dynamic Probabilistic Ontology Trees (POT), a new probabilistic model to track dialog state. Modeled belief over user goal and interaction history across multiple turns using Bayesian Network. Incorporated destination landmark evidence via a kernel density estimator. Our prototype was demonstrated via an android app and soon thereafter transferred to the product group.

Destination prediction with GPS data: Team lead for GPS data collection and destination prediction. We used data for probabilistic route prediction using Inverse Reinforcement learning. Predicted personal travel time for electric vehicle to address range anxiety.

Hybrid fuel efficiency: Team lead for using route prediction to compute optimal battery and engine power mix for fuel efficiency. We simulated system dynamics and battery charge to yield an average of 1.2% savings without any change in user behavior.

Robot Belief Tracking: Led a team of six to design and implement autonomous path planning and assistive features in a Personal Mobility Vehicle (PMV). We added hardware modifications and motor to a four wheeled vehicle for auto steering. Developed a Region based hierarchical model for object delivery. Detected people and objects using depth and vision sensors. Modeled beliefs about entity locations using Dynamic Bayesian Network, incorporating evidence via particle filtering. Developed variation of SARSA Reinforcement learning to learn optimal policy for object delivery.

Honda Research Institute USA, Inc., Mountain View, CA

Senior Computer Scientist

Jan 2000 - June 2007

Natural Language Processing (NLP)/Web Knowledge Discovery: Integrated knowledge from Wikipedia, Yahoo Question/Answers, Open Directory Project and OpenMind to improve topic recognition on the web. Achieved a large error reduction over previous state of art on Google Answers and Switchboard datasets. Extracted summaries from Twitter, Yelp and newsfeeds.

Created OpenMind Indoor Common Sense project to collect text data from volunteers. Data used in-house and at Intel Research, MIT Media Lab, and Technische Universität München.

Simultaneous Localization and Mapping (SLAM): Developed a single camera algorithm incorporating feature descriptors from multiple views. Built a 3D map of the environment using Extended Kalman Filtering. Demonstrated localization on a mobile robot in a large room with path having significant viewpoint changes. Created globally consistent 3D maps from depth fields using active unstructured light space-time stereo system. Used Iterative Closest Point for local alignment, with a novel outlier rejection strategy to create a 3D map of a room.

Schlumberger, Austin Product Center, Austin, TX

Senior Software Engineer

Oct. 1995 - Dec 1999

Designed and wrote software in the Graphics and Modeling group. Worked on 3D Common Modeler project for creation and visualization of geometric models for geological structures. Created models by extracting fault and horizon surfaces from field data. Triangulated these surfaces and intersected them topologically to compute volume properties. Coded volume visualization of attribute data.

Managed an offshore team of 12 developers working on software components.

Massachusetts Institute of Technology, Cambridge, MA

Research Assistant

Jan 1993 - Aug 1995

Officer of the Deck Virtual Environment Training: Designed and implemented software for Navy project on Officer of the Deck training. Developed a C++ object oriented framework and submarine dynamics model with BBN Inc. Blackboard asynchronous architecture for communication with multiple modalities such as Speech, Head Mounted Display and Beachtron sound spatialization. Wrote user level device driver and lab's C software system embedded in Tcl-Tk.

Education

Massachusetts Institute of Technology, Cambridge, MA

Ph.D., M.S., Mechanical Engineering

Sep 1995

GPA 5.0/5.0

PhD research focused on experiments with human subjects comparing their performance in real and Multimodal Virtual Environments. Developed a real-time, interactive, dynamic simulation model incorporating visual, haptics with force feedback, and auditory modes.

Indian Institute of Technology, New Delhi, India

Bachelor of Technology, Mechanical Engineering

June 1990

GPA 9.6/10.0

Selected Publications

Adam Vogel, Deepak Ramachandran, Rakesh Gupta, Antoine Raux, Improving Hybrid Vehicle Fuel Efficiency Using Inverse Reinforcement Learning, AAAI, Toronto, Canada, 2012.

Rakesh Gupta, Lev Ratinov. Text Categorization with Knowledge Transfer from Heterogeneous Data Sources, AAAI, Chicago, 2008.

Rakesh Gupta and Mykel Kochenderfer. Common Sense Data Acquisition for Indoor Mobile Robots, AAAI, San Jose, 2004.

Memberships/Scholarships/Resident Status

Member IEEE, ACM, AAAI, ACL

National Talent Scholarship, India, 1984-90

US Citizen