Sarthak Ahuja

CONTACT INFORMATION	A407, Robotics Institute, Carnegie Mellon University 5000 Forbes Ave, Pittsburgh, PA 15213	sarthakahuja.org sarthaka@cs.cmu.edu

EDUCATION

Robotics Institute, Carnegie Mellon University, Pittsburgh
Master of Science, Robotics, *GPA 4.22/4.33*   Aug. 2018 - May 2020
Courses: Computer Vision, Machine Learning, Visual Learning and Representation,
Planning for Robotics, Deep Reinforcement Learning

Indraprastha Institute of Information Technology, Delhi
Bachelor of Technology (Honors), Computer Science, *GPA 9.1/10.0*   Aug. 2012 - July 2016

EXPERIENCE

Graduate Research Assistant, Robotics Institute   Oct. 2019 onwards
Master's thesis research advised by Prof. Henny Admoni and Prof. Aaron Steinfeld. My work is focused on improving a robot's self-assessment capabilities - particularly reasoning about the effects of a robot's actions on the operating environment; learning vision-based physics intuition models that guide robots to conduct safe exploration. **(ongoing)**

Research Software Engineer, IBM Research India   July 2016 to July 2018
Member of the Collaborative AI team. Lead developer and researcher for IBM Watson Recruitment, a real-time data analytics platform that shortlists the most qualified candidates for a given job. Research focused in the domains of natural language processing (dynamic taxonomy generation and semantic similarity computation) and multi-agent systems (human behavior modeling in repeated social dilemmas).

Research Associate, PreCog Research Group, IIIT-Delhi   May 2016 to July 2016
Advised by Prof. Ponnurangam Kumaraguru. Developer on Project-O, Precog's social media analytics platform. Research focused in the domain of social systems and computer vision - particularly on patch-based visual summarization of social media events using discriminative learning.

Research Intern, Infosys Center for AI, IIIT-Delhi   Dec. 2014 to May 2016
Core member of IIIT-Delhi's Autonomous Car Team - Swarath. Led a team of two, to design and develop the car's perception system; explored and deployed multiple SLAM algorithms for visual positioning and navigation using wearable and vehicle dashboard monocular cameras.

SELECTED PEER-REVIEWED PUBLICATIONS

- **Ahuja, S.**, Admoni, H., Steinfeld, A.; Learning Vision-Based Physics Intuition Models for Non-Disruptive Object Extraction from Clutter, International Conference on Intelligent Robots and Systems (IROS) 2020 **(under review)**
- Vallam, R., **Ahuja, S.**, Chaudhuri, R., Sajja, S., Pimplikar, R., Mukherjee, K., Parija, G.; Interactive POMDPs for Social Decision Making with Dynamic Focus on Agents, Proceedings of the International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS) 2019 (pp. 674-682)
- Mondal, J., **Ahuja, S.**, Singh, S., Mukherjee, K., Parija, G.; Benchmarking of a Novel POS Tagging Based Semantic Similarity Approach for Job Description Similarity Computation, Proceedings of the European Semantic Web Conference (ESWC) 2018 (pp. 430-444). Springer
- **Ahuja, S.**, Mondal, J., Singh, S., George, D.; Similarity Computation Exploiting the Semantic and Syntactic Inherent Structure among Job Titles, Proceedings of the International Conference on Service-Oriented Computing (ICSOC) 2017 (pp. 3-18). Springer
- Goel, S., **Ahuja, S.**, Subramanyam, A., Kumaraguru, P.; #VisualHashtags: Visual Summarization of Social Media Events Using Mid-Level Visual Elements, Proceedings of the ACM International Conference on Multimedia (ACMMM) 2017, (pp. 1434-1442)

PATENTS

- **Ahuja, S.**, Singh, S., Parija, G., Chaudhuri, R., Kuchhal, M., Kataria, M.; SIdeal: System and Method for Attribute Weight Induction in a Multiple Recruiter Setting Exploiting Public Goods Games Framework, U.S. Patent Application No. 15/842,066
- George, D., Mondal, J., Singh, S., **Ahuja, S.**, Medicke, J., Klabzuba, A.; System and Method to Produce Generalized Representation of Job Description Documents and Calculate Similarity Using the Representation in Recruitment Domain, U.S. Patent Application No. 15/854,837
- **Ahuja, S.**, Mukherjee, K., Mondal, J., Singh, S.; App-lause - Automatic Audience Generation and Simulation for Immersive Rehearsals **(patent pending)**

POSTER PRESENTATIONS

- **Ahuja, S.**, Admoni, H., Steinfeld, A.; Learning Physics Intuition Models for Non-Disruptive Object Extraction from Clutter, Northeast Robotics Colloquium 2019, University of Pennsylvania

Selected Projects	**Informed Multi-Representation Multi-Heuristic A***

Selected Projects

Informed Multi-Representation Multi-Heuristic A*
- Implemented an informed version of MRMHA* that uses past plans to control future state expansions; Used Conditional-VAEs to learn a sampling distribution (Ichter et al. ICRA 2018) over state expansions on subsets of the state-space to better schedule expansions from their corresponding queues.

Effects of Anticipatory Robot Motion on Human Decision-Making
- Conducted a user study with 99 participants who interact with a robot arm in a 3-way collaborative selection task. Designed and developed the collaborative and adversarial behaviors for robot arm to anticipate user intent, as measured by the users eye gaze.

Visual Learning for Jenga Tower Stability Prediction
- Developed a CNN based physics intuition model (Groth et al. ICCV 2018) for assessing Jenga towers using only RGB images. By conditioning the visual images on specific blocks during training in simulation, our model was able learn the effects of removing a particular block on the stability of a tower.

Assistive Sketching and Animation Using Shape-Aware Moving Least Squares Deformations
- Developed an end-to-end sketching platform which assists an artist to draw complex non-convex 2D characters and dynamically animate them using a Kinect; Implemented drawing tools using bezier curves, distance-transform based skeletonization, and shape-aware deformations (Sharma et al. SA 2015).

Semi-Supervised Stance Detection in Tweets
- Implemented a heuristic-based semi-supervised learning approach, LDA2Vec (Moody CoNLL 2016) for stance detection that learns a coherent and informed embedding comparable to Para2Vec, concurrently bolstering interpretability of topics by creating representations similar to those in Latent Dirichlet Allocation.

Deep Learning Based Dynamic Taxonomy Generation
- Developed a semi-supervised learning approach for dynamically generating a large taxonomy over a large dataset of keywords; Proposed a novel LSTM based architecture that learns over random branches of a small seed taxonomy and uses the trained model to place unseen words under an appropriate parent word.

Speech-Based Distress Detection
- Created an android application that uses a two-stage contextual supervised learning algorithm (Sharma et al. TASLP 2015) to robustly detect speech based distress activity in urban spaces; Developed a web dashboard to monitor the generated alarms and mine for large-scale occurrence patterns in real-time data.

Multi-Agent Path Planning (MAPP) for Warehouse Butlers
- Hacked an implementation of Pacman to create a simulator with multiple robots trying to reach their resp. goals simultaneously. Implemented a Multi-Agent Path Planning Algorithm (Wang et al. ECAI 2010) and analyzed characteristic warehouse designs and how they affect the quality of the generated plans.

Academic Service
- Reviewer, Conference on Information and Knowledge Management 2019

Workshops Attended

International Institute of Information Technology, Hyderabad   July 2016
Summer School, Deep Learning in Computer Vision

Selected Honors and Awards
- Awarded the Graduate Student Conference Funding by the Graduate Student Assembly and the Provosts Office to present research at AAMAS 2019.
- J.N. Tata Scholar - Awarded the J.N. Tata Scholarship 2019 for pursuing graduate studies at CMU.
- Runners-Up, Space Innovation Challenge 2018, CMU Tepper School of Business.
- Winning Team, Consensys Award at HackInOut 2017, for the developing "VoteChain - Blockchains for Decentralized Elections".
- Awarded the IBM Manager's Choice Award 2016.
- Awarded the All Round Performance Medal for the overall performance in curricular and extra-curricular activities in the B.Tech. (CSE) program 2016.
- First Prize in the Technical Paper Presentation event at Cogenesis 2016, Delhi Technological University for "Multi-Sensor Data Fusion for Human Activity Recognition".
- Best Demo Award in the Elevator Pitch Event at IIIT-Delhi Research Showcase 2015 for "Distress Detection".

Teaching Experience

Teaching Assistant

- 46-891: Mining Unstructured Data, CMU	Fall 2018
- CSE344/544: Computer Vision, IIIT-Delhi	Winter 2016
- CSE201: Advanced Programming, IIIT-Delhi	Monsoon 2015
- CSE102: Data Structures and Algorithms, IIIT-Delhi	Winter 2015
- CSE101: Introduction to Programming, IIIT-Delhi	Monsoon 2014