Umang Gupta

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Education

University of Southern California (USC), Los Angeles **2017 - present**
Ph.D. in Computer Science Current GPA: 3.81/4
Advisor: Prof. Greg Ver Steeg, Information Sciences Institute USC

Indian Institute of Technology Delhi (IIT Delhi), India **2010 - 2015**
B.Tech & M.Tech (Dual Degree), Electrical Engineering GPA-8.9/10
Advisor: Prof. Santanu Chaudhury, Dept. of Electrical Engineering, IIT Delhi
Thesis: Image Classification with Ontology and Deep Learning

Publications

Journal and conference publications

[Gup+21a] **Umang Gupta**, Aaron Ferber, Bistra Dilkina, and Greg Ver Steeg. "Controllable Guarantees for Fair Outcomes via Contrastive Information Estimation." In: *Thirty-Fifth AAAI Conference on Artificial Intelligence*. 2021.

[Gup+21b] **Umang Gupta**, Pradeep Lam, Greg Ver Steeg, and Paul Thompson. "Improved brain age estimation with slice-based set networks." In: *IEEE International Symposium on Biomedical Imaging (ISBI)*. 2021.

[Kam+19a] Nitin Kamra, **Umang Gupta**, Kai Wang, Fei Fang, Yan Liu, and Milind Tambe. "DeepFP for Finding Nash Equilibrium in Continuous Action Spaces." In: *International Conference on Decision and Game Theory for Security*. Springer. 2019.

[Kam+18] Nitin Kamra, **Umang Gupta**, Fei Fang, Yan Liu, and Milind Tambe. "Policy Learning for Continuous Space Security Games using Neural Networks." In: *Thirty-Second AAAI Conference on Artificial Intelligence*. 2018.

[Dat+15] Abhisek Datta, Anwesh Mazumdar, **Umang Gupta**, and Saskia Hekker. "Automated determination of g-mode period spacing of red giant stars." In: *Monthly Notices of the Royal Astronomical Society* 447.2 (2015).

[GC15] **Umang Gupta** and Santanu Chaudhury. "Deep transfer learning with ontology for image classification." In: *2015 Fifth National Conference on Computer Vision, Pattern Recognition, Image Processing and Graphics (NCVPRIPG)*. IEEE. 2015.

[GC13] **Umang Gupta** and Niladri Chatterjee. "Personality traits identification using rough sets based machine learning." In: *International Symposium on Computational and Business Intelligence*. IEEE. 2013.

Preprints

[KGL17] Nitin Kamra, **Umang Gupta**, and Yan Liu. "Deep Generative Dual Memory Network for Continual Learning." In: *arXiv preprint arXiv:1710.10368* (2017).

Workshop and others

[Fer+20] Aaron Ferber, **Umang Gupta**, Greg Ver Steeg, and Bistra Dilkina. "Differentiable Optimal Adversaries for Learning Fair Representations." In: *IJCAI AI for Social Good Workshop* (2020).

[Gup+20] **Umang Gupta**, Aaron Ferber, Bistra Dilkina, and Greg Ver Steeg. "Controllable Guarantees for Fair Outcomes via Contrastive Information Estimation." In: *IJCAI AI for Social Good Workshop* (2020).

[Kam+19b] Nitin Kamra, **Umang Gupta**, Kai Wang, Fei Fang, Yan Liu, and Milind Tambe. "Deep Fictitious Play for Games with Continuous Action Spaces." In: *Proceedings of the 18th International Conference on Autonomous Agents and MultiAgent Systems (AAMAS)*. 2019.

[Seo+19] Sungyong Seo, **Umang Gupta**, Jiageng Zhu, P. Jeffrey Brantingham, and Yan Liu. "Contextual Understanding of Homicide Reports in Los Angeles County." In: *SoCal NLP Symposium* (2019).

Work Experience

Huawei Research, Santa Clara, CA Jun'18 - Aug'18
Research Intern
- Worked on neural models for chat bots
- Investigated reinforcement learning based algorithm for training end-to-end dialogue models

Visa Inc., Bangalore, India Aug'15 - Jul'17
Senior Software Engineer
- Developed BackboneJS based UI application to manage Digital Configuration Platform
- Spearheaded development of ReactJS based common components enforcing best practices
- Revamped older applications for better performance and improved development environment
- Received excellent rating at the year end review for outstanding performance, participation and developing deliverables on time

LCI Lab, University of British Columbia , Vancouver, Canada May'14 - Jul'14
MITACS Research Intern
- Engineered a tool for labeling human motion in video [Github Demo]
- Experimented with optical flow & flexible mixture of parts models for propogating labels across frames
- Refactored 'action recognition in videos' project to enable reproducibility and easy hyperparameter tuning

Amagi Media Labs, Bangalore, India May'13 - Jul'13
Software Development Intern
- Achieved benchmark results on ARMv7 processor exploiting SIMD arch. for audio & video processing
- Automated tasks for processing & detecting video-splicing error, saved significant human time

Sohum Innovation Labs, Delhi, India May'12 - Dec'12
Intern
- Investigated hardware for EEG signal acquisition for early detection of hearing impairments in infants
- Developed a device-to-PC hardware interface for signal visualization
- Reviewed signal processing techniques for low voltage-high noise auditory brain stem response

Teaching Experience

Teaching Assistant at USC
- Machine Learning, CSCI567 (summer 2020, summer 2019, spring 2018)
- Applied Natural Language Processing, CSCI544 (spring 2019)
- Software Engineering, CSCI310 (fall 2017)

Teaching Assistant at IIT, Delhi
- Pattern Recognition, EEL709 (spring 2015)
- Digital Signal Processing, EEL319 (fall 2014)
- Circuit Theory, EEL202 (fall 2013)

Technical Skills

Can code in	python, C, shell-scripts (awk/sed/bash), javascript, java
Worked with	PyTorch, TensorFlow, ReactJS, BackboneJS, NodeJS
Relevant coursework	(USC) Learning & Game Theory, Deep Learning, Natural Language Processing, Information Extraction, Advanced Topics in Deep Learning, Statistical Methodology & Machine Learning, (IITD) Algorithms, Computer Vision, Probabilistic Graphical Models, Machine Learning, Statistical Methods, Numerical Optimization, Scientific Computing, Signal Theory, Coding Theory, Detection & Estimation Theory, System Software, Econometric Methods

Achievements

Program	Accredited with IITD Semester Merit Award for 4 out of 8 semesters, 2010-2015
Rank 1	Received Silver Medal for securing highest GPA in Dual Degree Prog., Dept. of Elec. Engineering
Hackathons	First Prize at GS Quantify 2014, annual computing competition organized by Goldman Sachs First Prize at Bing Hackathon 2016, machine learning contest organized by Microsoft Bing
Best Essay	Among top 20 National Winners, International Year of Forest, 2011 certification program

NIUS 2011	Among 30 undergrad students invited to research at HBCSE, Mumbai under National Initiative for Undergraduate Science (NIUS) program
Competitive Exams	Recipient of Kishore Vaigyanik Protsahan Yojana scholarship 2010 Among top 1% in Physics (NSEP); Astronomy (NSEA); Chemistry (NSEC) Olympiads 2009 Secured All India Rank 410 in IIT-Joint Entrance Exam among 0.5 million candidates

Projects

Information theoretic measures for privacy & fairness Jul'19 - Current

- Proposed information theoretic measures to control fairness and invariance [Gup+21a]
- Investigating information theoretic measures to ensure average case data-privacy for training neural networks, and applications to brain age prediction [Gup+21b]

Finding equilibrium strategies for security games Aug'17 - Dec'18

- Developed algorithms to find approximate best responses of agents in Stackelberg security games with continuous high-dimensional action space
- Extended fictitious play to work with implicit density models parametrized with neural network, approximate best respone and reward function
- Demonstrated application to finding good patrolling strategy for forest protection
- See [Kam+19a; Kam+19b; Kam+18]

Continual learning with neural networks Aug'17 - Jan'18

- Proposed dual generative (memory) model to solve the problem of catastrophic forgetting
- Inspired from learning in humans and has two distinct generative memories—long term & short term
- Demonstrated better retention in learning from non-iid, sequentially arriving samples [KGL17]

Deep learning with ontology (Master's Thesis) Aug'14 - Jul'15

Supervisor: Prof. Santanu Chaudhury, IIT Delhi

- Investigated combination of Neural Networks & Ontology to classify Indian Monument Images
- Enhanced ontology and combined with Deep Network for better inference
- Demonstrated 17% classification improvement over traditional Convolutional Neural Networks [GC15]

Personality identification from text May'12 - Feb'13

Supervisor: Prof. Niladri Chatterjee, IIT Delhi

- Investigated Rough Set based feature reduction for personality classification from texts
- Reduced feature set showed 15% improvement over baseline models for personality classification [GC13]

Asteroseismology of Red Giant Stars Dec'11 - Dec'12

Supervisor: Prof. A Mazumdar, HBCSE-TIFR, Mumbai

- Customised & deployed MESA (stellar evolution code) on clusters to generate stellar models
- Automated generation and storage of stellar models with python & shell scripts
- Developed method for computationally estimating period spacing from Asteroseismic data. See [Dat+15]