

# Umang Gupta

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## Education

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### 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

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### 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*. 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)*. 2015.
- [GC13] **Umang Gupta** and Niladri Chatterjee. "Personality traits identification using rough sets based machine learning." In: *International Symposium on Computational and Business Intelligence*. 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).

## Projects

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

- Investigating information theoretic measures to ensure average case data-privacy in training neural networks
- Investigating information theoretic measures for fairness and invariance [Gup+21a]

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

- Developed algorithms to find approximate nash-strategies in security games with continuous high-dimensional action space
- Extended fictitious play to work with implicit density models parametrized with neural network, approximate best response 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 Star** 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]

## Work Experience

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Research Intern, **Huawei Research**, Santa Clara, CA Jun'18 - Aug'18

- Worked on neural models for chat bots
- Investigated reinforcement learning based algorithm for training end-to-end dialogue models

Sr. Software Engineer, **Visa Inc.**, Bangalore, India Aug'15 - Jul'17

- Developed BackboneJS based UI application to manage Digital Configuration Platform
- Spearheaded development of ReactJS based common components enforcing best practices
- Revamped and improved older applications for better performance and interfacing
- Received excellent rating at year end review for outstanding performance, participation and developing deliverables on time

Research Intern, **LCI Lab, University of British Columbia**, Vancouver, Canada May'14 - Jul'14

- Engineered a tool for labeling human motion in video [Github Demo]
- Experimented with optical flow & flexible mixture of parts models for propagating labels across frames

- Refactored 'action recognition in videos' project to enable reproducibility and easy hyperparameter tuning

Software Development Intern, **Amagi Media Labs**, Bangalore, India

May'13 - Jul'13

- 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

Intern, **Sohum Innovation Labs**, Delhi, India

May'12 - Dec'12

- 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

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*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

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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

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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