Gaurush Hiranandani

Personal Information

Current Position:	Ph.D. Candidate, Department of Computer Science, Univeristy of Illinois Urbana-Champaign
email:	gaurush.hiranandani@gmail.com, gaurush2@illinois.edu
website:	www.gaurush.com
LinkedIn, Scholar:	in.linkedin.com/in/gaurushh, scholar.google.co.in/gaurushh

Research Interests

Machine Learning, Statistical Inference, Learning to Rank, Preference Elicitation

Education and Experience

2017-Present	Ph.D. in Computer Science, University of Illinois - Urbana Champaign CGPA: **4.0/4.0**
May-Aug 2018	Research Intern, Microsoft Research Paper in preparation for improved activity feed by factoring three way (tensor) interactions
2015-2017	Member of Research Staff, Big Data Experience Lab, Adobe Research, Bengaluru Authored **17** patents and transferred several technologies to Adobe Analytics
2010-2015	M.Sc. (Integrated) in Mathematics and Scientific Computing, Indian Institute of Technology Kanpur CGPA: **9.4/10.0** Department Rank: **1** (out of 45 students) Institute Rank: **1** (out of 830 students in the years 2013-14 and 2014-15)

Awards and Honors

1. **B.D. Sanghi Gold Medal:** For best academic performance in Mathematics & Statistics Department *(2015)*
2. **S. Gupta Gold Medal:** For highest CGPA in Mathematics & Scientific Computing M.Sc.(Int.) program *(2015)*
3. **Project Proficiency Medal:** For best project in Mathematics & Scientific Computing M.Sc.(Int.) Program *(2015)*
4. **General Proficiency Medal:** For best academic performance in Mathematics & Scientific Computing program *(2015)*
5. **Academic Excellence Awards:** For being among the top 7% of the batch (830 students) academically *(2013, 2014)*

Research Publications

Accepted Papers:

1. **Gaurush Hiranandani**, Shant Boodaghians, Ruta Mehta, and Oluwasanmi Koyejo. Performance Metric Elicitation from Pairwise Classifier Comparisons. In *Artificial Intelligence and Statistics - AISTATS*, 2019.
2. **Gaurush Hiranandani***, Raghav Somani*, Sreangsu Accharya, Oluwasanmi Koyejo. Clustered Monotone Transforms for Rating Factorization. In *Web Search and Data Mining - WSDM*, 2019.
3. Sunav Choudhary, **Gaurush Hiranandani**, and Shiv Kumar Saini. Sparse Decomposition for Time Series Forecasting and Anomaly Detection. Accepted to *SIAM International Conference on Data Mining - SDM*, 2018.
4. **Gaurush Hiranandani**, K. Ayush, A. R. Sinha, S.V.R. Maram, C. Varsha, and P. Maneriker. Enhanced Personalized Targeting Using Augmented Reality. In *International Symposium on Mixed and Augmented Reality - ISMAR*, 2017.
5. **Gaurush Hiranandani**, Pranav Maneriker, and Harsh Jhamtani. Generating Appealing Brand Names. In *International Conference on Computational Linguistics and Intelligent Text Processing - CICLing*, 2017.
6. **Gaurush Hiranandani**, and Jean-Marc Schlenker. Small Circulant Complex Hadamard Matrices of Butson Type. In *European Journal of Combinatorics*, pp. 306-314 (50), 2016.
7. Natwar Modani, P. Maneriker, **Gaurush Hiranandani**, A. R. Sinha, Utpal, Vaishnavi S., and S. Gupta. Summarizing Multimedia Content. In *International Conference on Web Information Systems Engineering - WISE*, 2016.

*Equal Contribution

8. **Gaurush Hiranandani**, and Harish Karnick. Improved Classification and Reconstruction by Introducing Independence and Randomization in DNNs. In *Digital Image Computing: Techniques and Applications - DICTA*, 2015.

Submitted / Prepared Papers:

1. **Gaurush Hiranandani**, Shant Boodaghians, Ruta Mehta, and Oluwasanmi Koyejo. Multiclass Performance Metrics Elicitation. Submitted to a top-tier double blind conference.
2. **Gaurush Hiranandani**, Amar Budhiraja, Navya Yarrabelly, Ayush Choure, Oluwasanmi Koyejo and Prateek Jain. Recommendations with Multiple Entity-graph based Side-information. Submitted to a top-tier double blind conference.
3. Prakhar Gupta*, **Gaurush Hiranandani***, Harvineet Singh*, Iftikhar Ahamath Burhanuddin, Zheng Wen, and Branislav Kveton. Online Recommendation of Diverse Items. Paper prepared.

Patents

1. **Gaurush Hiranandani**, Sai Varun Reddy Maram, Kumar Ayush, Chinnaobireddy Varsha, and Siddhant Jain. Product Recommendations Based on Augmented Reality Viewpoints. *US62/415332 (Filed in multiple countries)*.
2. **Gaurush Hiranandani**, T. Goyal, P. Bajaj, and S. Shekhar. Determination of Paywall Metrics. *US15/277,136*.
3. **Gaurush Hiranandani**, Chinnaobireddy Varsha, Sai Varun Reddy Maram, Kumar Ayush, and Atanu R. Sinha. Identifying Augmented Reality Visuals Influencing User Behavior in Virtual-Commerce Environments. *US15/433,834*.
4. **Gaurush Hiranandani**, S. K. Saini, and M. Sinha. Anomaly Detection at Coarse Granularity of Data. *US15/428,523*.
5. **Gaurush Hiranandani**, Kumar Ayush, Chinnaobireddy Varsha, and Sai Varun Reddy Maram. Creating Targeted Content Based on Detected Characteristics of an Augmented Reality Scene. *US15/454,750*.
6. **Gaurush Hiranandani**, and N. Modani. Representative Metrics for Efficient Anomaly Detection. *US15/178,403*.
7. **Gaurush Hiranandani**, Pawan Vaishnav, Aditya Jain, Moumita Sinha, and Kushal Chawla. Augmented Reality Predictions using Machine Learning. *US15/868,531*.
8. Branislav Kveton, **Gaurush Hiranandani**, Prakhar Gupta, Harvineet Singh, Iftikhar Ahamath Burhanuddin, and Zheng Wen. Online Diverse Set Generation from Partial Click Feedback. *US15/892,085*.
9. Prakhar Gupta, **Gaurush Hiranandani**, H. Singh, and S. K. Saini. End of Day Metric Projection. *US15/609,254*.
10. S. Choudhary, **Gaurush Hiranandani**, and S.K. Saini. Sparse Decomposition of Time Series Data. *US15/804,012*.
11. Shivani Gupta, **Gaurush Hiranandani**, Charanjit Ghai, and Anshul Agrawal. Target Audience Content Interaction Quantification. *US14/548,061 (Published)*.
12. Natwar Modani, Pranav Maneriker, **Gaurush Hiranandani**, Atanu R. Sinha, Utpal, Vaishnavi S., and Shivani Gupta. Determining Quality of a Summary of Multimedia Content. *US14/959,219 (Granted)*.
13. Shivani Gupta, Charanjit Ghai, **Gaurush Hiranandani**, and Anshul Agrawal. User Interest Learning through Hierarchical Interest Graphs. *US14/548,116 (Published)*.
14. Natwar Modani, Pranav Maneriker, **Gaurush Hiranandani**, Atanu R. Sinha, Utpal, Vaishnavi S., and Shivani Gupta. Multimedia Document Summarization. *US14/947,964 (Published)*.
15. Kumar Ayush, and **Gaurush Hiranandani**. Context Aware Recommendations Embedded in Augmented Viewpoint to Retarget Consumers in v-commerce. *In filing process*.
16. Natwar Modani, Iftikhar Ahamath Burhanuddin, **Gaurush Hiranandani**, and Shiv Kumar Saini. Providing Personalized Alerts and Anomaly Summarization. *US15/238,208*.
17. Balaji Vasan Srinivasan, Sanket Mehta, **Gaurush Hiranandani**, Harsh Jhamtani, Natwar Modani, and Cedric Huesler. Propagation of Changes in Master Content to Variant Content. *US15/184,959*.

Teaching and Responsibilities

1. *Teaching Assistant, Machine Learning (Fall 2017)*: Assisted in teaching Machine Learning to 130+ students.
2. *Internship Mentor, Adobe Research (Summer 2016)*: Mentored a team of 3 students on a project based on *Augmented Reality for Digital Marketing*. The project resulted in 3 patents and a paper accepted to *ISMAR'2017*.
3. *Internship Co-Mentor, Adobe Research (Summer 2015)*: Co-mentored a team of 3 students on a project based on *Multimedia Content Summarization*. The project resulted in 2 patents and a paper accepted to *WISE'2016*.

Selected Projects

Organisation
Aug'17 - Present

University of Illinois Urbana-Champaign, USA
Performance Metric Elicitation from Pairwise Classifier Comparisons
Abstract: Given a prediction problem, which performance metric should the classifier optimize? We address this question through *Metric Elicitation* - a new framework to discover the performance metric of a practitioner reflecting her innate rewards (costs) for correct (incorrect) classification. We elicit performance metrics from pairwise feedback, where a practitioner is asked to provide relative preference between two classifiers. By exploiting key geometric properties of the space of confusion matrices, we obtain provably query efficient algorithms for eliciting linear and linear-fractional performance metrics.
Outcome: Binary performance metric elicitation is accepted to *AISTATS'19*. An extension to multi-class metric elicitation is under review. Worked under the guidance of **Prof. Sanmi Koyejo**

Sep'17 - Aug'18

Clustered Monotone Transforms for Rating Factorization
Abstract: Recommendation engines force raters to map their natural rating scales to an arbitrary scale. We propose CMTRF, which searches for monotonic transformations of the rating scales combined with an underlying matrix factorization model. The transformations can be generated for each user, for a cluster of users, or for all the users at once, forming the basis of the three proposed algorithms.
Outcome: Paper accepted to *WSDM'19* under the guidance of **Prof. Sanmi Koyejo**.

Organisation
May'18 - Present

Microsoft Research
Recommendations with multiple Entity-graph based Side-information
Abstract: We study the three way interaction in an activity feed module for a user consuming an activity, a user creating an activity, and a location where activities are created. We build a recommendation model under graph based smoothing conditions, which represent auxiliary information among the three entities. Moreover, we introduce a new performance metric suitable for bipartite ranking tasks.
Outcome: Paper submitted to a double-blind conference under the guidance of **Dr. Prateek Jain**.

Organisation
Jul'16 - Aug'17

Adobe Research
Online Diverse Recommendations from Partial Click Feedback
Abstract: Traditionally, analysts used to set up manual alerts on web metrics of interest, but this process is time intensive. After learning user preferences from implicit signals, online learning methods are deployed to select key but diverse metrics of interest to a particular user. With every alert being sent, the model is updated continuously resulting in convergence to a near optimal solution.
Outcome: Paper prepared in collaboration with **Dr. Branislav Kveton**.

May'16 - Aug'17

Augmented Reality based Catalogues Having Embedded Recommendations
Abstract: We create a novel consumer targeting system by exploiting the rich data from Augmented Reality systems. First, we analyze consumer interactions on AR-based retail apps to identify her preferred purchase viewpoint. We then target the consumer through a personalized catalog, created by embedding recommended products in her viewpoint visual. The color and style of the embedded product are matched with the viewpoint to create recommendations and personalized text content.
Outcome: Mentored the project during the summer internship program at Adobe Research. Filed 3 patents. Research paper accepted to *ISMAR'2017*. Collaborated with **Dr. Atanu R. Sinha.**

Feb'16 - Oct'17

Sparse Decomposition for Time Series Forecasting and Anomaly Detection
Abstract: Existing forecasting and anomaly detection approaches assume perfect knowledge about the seasonality and/or presence of anomaly free time windows. This knowledge is unexpected by a novice analyst. Relaxing these assumptions, we propose an approach based on (a) sparse modeling of the different latent components of the time series *viz* seasonal, level, and spikes and (b) ARMA modeling for fitting the error.
Outcome: Paper accepted to SDM'2018. Collaborated with **Dr. Sunav Choudhary**.

Organisation
May - Jul'13

University of Luxembourg, Luxembourg
Small circulant complex Hadamard matrices of Butson type
Abstract: We study the circulant complex Hadamard matrices of order n whose entries are l^{th} roots of unity. For $n = l$ prime we prove that the only such matrix, up to equivalence, is the Fourier matrix, while for $n = p + q$, $l = pq$ with p, q distinct primes there is no such matrix. We then provide a list of equivalence classes of such matrices, for small values of n, l.
Outcome: Publicaton in the *European Journal of Combinatorics* with **Prof. Jean-Marc Schlenker**.

Relevant Courses with Grades

Machine Learning: Tools and Techniques (A)
Mathematics for Machine Learning (A)
Applied Nonlinear Programming (A)
Data Mining: Principles and Algorithms (A)
Introduction to Game Theory (A)
Statistical Simulation and Data Analysis (A)
Non-Linear Regression (A)
Discrete Mathematics (A)
Graph Theory (A)
Partial Differential Equations (A)
Machine Learning Theory (A)
Computational Inference and Learning (A)
Regression Analysis (A)
Time Series Analysis (A)
Inference I (A)
Applied Stochastic Processes (A)
Probability Theory (A)
Linear Programming and Extensions (A)
Topology (A)
Algebraic Topology (A)

Extra Curricular Activities

1. First Prize in mechanical model making competition - Gearloose, Teckriti (IIT Kanpur's Technical Festival, 2011).
2. First Prize in both Street Dance and Main Dance competition in Antragni (IIT Kanpur's Cultural Festival, 2011).
3. First Prize in Street Dance competition in Rendevouz (IIT Delhi's Cultural Festival, 2011).
4. Third Prize in Main Dance competition in Mood Indigo (IIT Bombay's Cultural Festival, 2011).
5. First Prize in both Monomode and Black & White Photography competition in Spectrum (IIT Kanpur, 2012).
6. Link Student, Counseling Service (2012-13), IIT Kanpur: Successfully aided 1 student to come out of Academic Probation by motivating and helping him academically.
7. Professional Shows Coordinator (2012), IIT Kanpur: Worked in a team of 5 to bring together 5 shows involving budget of $35,000 which witnessed a total audience of 30,000+ people in Antragni'12 (IIT Kanpur's cultural festival).
8. Student Guide, Counseling Service (2011-12), IIT Kanpur: Successfully performed the role by looking after the orientation and guidance of 9 new students. Apart from regular guidance, undertook the initiative to motivate the students for performing academically as well as in extra-curricular activities.