

Education

- 2012–20 **PhD (Engg.)**, *Computer Science and Automation (CSA), Indian Institute of Science (IISc), Bangalore, India.*
Thesis title: *Hypergraph Network Models: Learning, Prediction, & Representation in the Presence of Higher-Order Relations*
- Solved problems involving “higher-order relations” in network science through “hypergraphs”.
 - *Hypergraphs and Link Prediction (LP)*: Questions answered: How hypergraphs affect LP in derived-networks? ◦ How to readjust evaluation criteria for LP? ◦ Transformed LP scores to hypergraphs ◦ Carefully prepared LP data ◦ Performed extensive LP experiments
 - *Higher-order Link Prediction (HLP)*: Established intractability of HLP ◦ Showed that Negative Sampling hugely impacts HLP ◦ Proposed benchmark algorithms ◦ Hypothesized & statistically tested: cliques form hyperedges ◦ Fused hypothesis into objective: C3MM model ◦ Introduced sub-higher-order & proposed sub-optimal heuristic ◦ Deep attention HLP: SHONeNs
 - *Bipartite Higher-order Link Prediction (BHLP)*: Introduced higher-order bipartiteness for the first time ◦ Formulated powerset matching ◦ Rigorously connected them ◦ Segregated cross-attention params ◦ Built a deep model: CATSETMAT ◦ Solved BHLP via CATSETMAT
- 2010–12 **Master of Science (Engg.) – Computer Science**, *CSA, IISc, Bangalore, India.*
Thesis title: *Sentiment-driven Topic Analysis of Song Lyrics*
- Automatically assigned “sentiment topics” to songs based on their lyrics using “topic models”.
 - Mined textual data ◦ Crawled & merged multiple corpora ◦ Handled synonymous/polysemous words ◦ Latent Dirichlet Allocation ◦ WordNet ◦ SentiWordNet
- 2006–10 **Bachelor of Engineering – Electrical & Electronics**, *CGPA 8.72/10.*
Manipal Institute of Technology, Manipal, Karnataka, India
- 2002–05 **Class X & XII**, *Central Board of Secondary Education, 72.8% & 77.2%.*
Nirmal Deepmala School, Rishikesh, Uttarakhand, India

Research Areas/Interests

- Primary **Machine/Deep Learning Theory/Applications** ◦ **Social & Information Networks** ◦ **Higher-order Relations** ◦ **Graphs & Hypergraphs in ML** ◦ **Network Embedding** ◦ **Natural Language Processing** ◦ **Computer Vision** ◦ **Explainability in AI**
- Secondary Online Advertising ◦ Recommendation Systems ◦ Information Retrieval ◦ Statistical Learning Theory ◦ Reinforcement Learning ◦ Stochastic Algorithms ◦ Machine Learning in Life Sciences ◦ Computational Neuroscience

Technical and Academic Skills

- Languages & Technologies **Python** ◦ **Pandas** ◦ **NumPy** ◦ **SkLearn** ◦ **NLTK** ◦ **Tensorflow** ◦ **Keras** ◦ **PyTorch**
Git ◦ **R** ◦ **Spark** ◦ **Jupyter** ◦ **C/C++** ◦ **Java** ◦ **Matlab** ◦ **Unix** ◦ **AWS** ◦ **OpenCV** ◦ **TensorflowLite** ◦ **PyCharm** ◦ **Google DV360 API**
- Mathematical proficiency **Linear Algebra** ◦ **Optimization** ◦ **Probability & Statistics** ◦ **Graphs & Hypergraphs**
Real Analysis ◦ Discrete Mathematics & Number Theory ◦ Calculus ◦ Mathematical Logic

Industry Experience

- 2020–present **R&D Consultant & Developer**, *~1 month*, *114 AI Innovation, New Delhi, India.*
(part-time) ◦ Space-tech based startup; I design and develop mathematical models for path prediction.
◦ Satellite-manoeuve detection and intent extraction thereof with geometric models on TLE data.
- 2018–19 **Senior Data Scientist**, *1.5 years*, *MiQ Digital India, Bangalore, India.*
◦ Design and production of ad-tech based products and solutions, both internal and external
◦ Process/analyze ad-tech data build quick-PoCs; data ingestion and processing.
- 2016–17 **Research Intern**, *1 year*, *Wipro Technologies, Bangalore, India.*
Automating IT Service Management Systems (Under Dr. Anurag Srivastava)
- 2010 **Project Intern**, *0.5 years*, *Center for Artificial Intelligence and Robotics (CAIR).*
Defence Research and Development Organization (DRDO), Bangalore, India
Topic Detection and Clustering of Multiple Documents (Under Dr. Dipti Deodhare)

Teaching/Training Experience

- Teaching **Linear Algebra** (2017), *NPTEL, Ministry of HRD, Govt. of India.*
Assistance **Discrete Structures** (2014), *CSA, IISc, Bangalore, India.*
Teaching **Design and Analysis of Algorithms** (2013), *Wipro Bangalore & VIT Vellore, India.*

Industrial Training *Machine/Deep Learning in Software* (2020), *Deep Learning for Web* (2019), *Machine Learning for Communication Networks* (2019), *Advanced Algorithms & Programming* (2017), *Data Structures & Algorithms* (2016), *Data Clustering Techniques* (2018), *Mathematics in Data Science* (2019), *Foundations of Deep Learning* (2019), *Statistical Data Analysis* (2014) *Softwaves Consultancy Bangalore Pvt. Ltd., Bangalore, India.*

List of Publications

- Published **G. Sharma**, P. Patil, and M. N. Murty, *C3MM: Clique-Closure based Hyperlink Prediction*, Int. Joint Conf. on Artificial Intelligence, 2020, Japan.
- " P. Patil, **G. Sharma**, and M. N. Murty, *Negative Sampling for Hyperlink Prediction in Networks*, Pacific-Asia Conf. on Knowledge Discovery and Data Mining, 2020, Singapore.
- " **G. Sharma** and M. N. Murty, *Mining Sentiments from Songs using Latent Dirichlet Allocation*, Intelligent Data Analysis, 2011, Portugal.
- " D. Deodhare, **G. Sharma**, A. Srivastava, A. Sharma., *Semantically Driven Soft-clustering of Documents using Lexical Chains*, Int. Conf. on Natural Language Processing, 2010, India.
- Under review **G. Sharma**, P. Gupta, and M. N. Murty, *Love tHy Neighbor: Remeasuring Local Structural Node Similarity in Hypergraph-derived Networks*, (Preprint).
- " **G. Sharma**, P. Patil, and M. N. Murty, *SHONeNs: Sub-higher-order Neural Networks for Hyperedges*, ICDM 2020.
- " **G. Sharma**, A. Challa, P. Gupta, and M. N. Murty, *Higher Order Relations Skew Link Prediction in Graphs*, NeurIPS 2020.
- " **G. Sharma**, S. Singh, V. S. Devi, and M. N. Murty, *The CAT SET on the MAT: Cross Attention for Set Matching in Bipartite Hypergraphs*, NeurIPS 2020.

Graduate-level Courses attended

2010–2018 Linear Algebra ◦ Optimization ◦ Real Analysis ◦ Probability & Statistics ◦ Information Retrieval ◦ Probabilistic Graphical Models ◦ Cognition & Machine Intelligence ◦ Natural Language Understanding ◦ Topics in Pattern Recognition ◦ Discrete Structures ◦ Information Theory ◦ Automated Verification ◦ Foundations of Data Science

Miscellaneous

Achievements *Best Newcomer*, 2019, MiQ, Bangalore, India.
Scholarship for Research, 2010–17, Min. of Human Resource Devt., Govt. of India.

Initiatives *Learn Deep Learn*, Reading Group, 2019, MiQ, Bangalore, India.
Mathematics Discussion Club, Discussion Group, 2011–12, IISc, Bangalore, India.

Volunteer *CSA Summer School & Web Team*, 2013–14, " .
CSA Dept. Curriculum Committee (Student Member), 2011–12, " .

Talks *Matrix Factorization Techniques*, 2015, CSA Summer School, " .
Careers after Engineering, 2014, Manipal Institute of Technology, Manipal, India.
Mathematics for Computer Science, 2013, CSA, IISc, Bangalore, India.

Hobbies *Programming, Movies, Documentaries, Poetry, Mentoring, Science Reading.*

References

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Dr. Dilip P. Patil, Professor, IISc, Bangalore, India, ✉ patil@iisc.ac.in.
Dr. C. E. Veni Madhavan, Professor (Retired), IISc, Bangalore, India, ✉ cevm@iisc.ac.in.
Dr. Anurag Srivastava, COO, SID, IISc, Bangalore, India, ✉ anurags@iisc.ac.in.

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