Curriculum Vitae

Sourya Basu
Graduate student
Electrical & Computer Engineering
University of Illinois at Urbana-Champaign

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Research Interests

Natural language processing, machine learning, information theory, and abstract algebra.

Education

2020 - present **PhD in Electrical & Computer Engineering**, *University of Illinois at Urbana-Champaign*
Advisor: Prof. Lav R. Varshney

2018 - 2020 **MS in Electrical & Computer Engineering**, *University of Illinois at Urbana-Champaign*
Advisor: Prof. Lav R. Varshney
GPA - 3.95

2017 **B. Tech. in Electrical Engineering**, *Indian Institute of Technology Kanpur*
Minor in Artificial Intelligence, **CPI - 9.6/10.0**

2013 **Senior School Certificate Examination,** *S.M.Arya Public School, New Delhi*
Scored 89.8% marks in XII AISSCE

2011 **Secondary School Certificate Examination,** *S.M.Arya Public School, New Delhi*
CGPA - 9.8 in X AISSE

Publications & Preprints

July 2020 **S. Basu**, G. S. Ramachandran, N. S. Keskar, and L. R. Varshney, **"Mirostat: A Perplexity-Controlled Neural Text Decoding Algorithm"**, arXiv:2007.14966 [cs.CL]. [Paper | Blog]

June 2020 **S. Basu**, D. Seo, and L. R. Varshney, **"Hypergraph-based Coding Schemes for Two Source Coding Problems under Maximal Distortion"**, in *Proceedings of the 2020 IEEE International Symposium on Information Theory (ISIT)*, [Los Angeles, California], 21-26 June 2020. [Paper]

March 2020 **S. Basu**, D. Seo, and L. R. Varshney, **"Functional Epsilon Entropy"**, to appear in *Proceedings of the IEEE Data Compression Conference*, [Snowbird, Utah], 24-27 March 2020. [Paper]

July 2019 **S. Basu** and L. R. Varshney, **"Polar Codes for Simultaneous Information and Energy Transmission"**, in *Proceedings of the 20th IEEE International Workshop on Signal Processing Advances in Wireless Communications* (SPAWC), [Cannes, France], 2-5 July 2019. [Paper]

December 2018 **S. Basu** and L. R. Varshney, **"Succinct Source Coding of Deep Neural Networks"**, in *Proceedings of NeurIPS Compact Deep Neural Network Representation with Industrial Applications Workshop (CDNNRIA)*, Montreal, Canada. [Paper]

November 2018 A. Raikar, **S. Basu**, and R. M. Hegde, **"Single Channel Joint Speech Dereverberation and Denoising using Deep Priors"**, 2018 IEEE *Global Conference on Signal and Information Processing* (GlobalSIP).[Paper]

April 2018 **S. Basu** and L. R. Varshney, **"Universal and Succinct Source Coding of Deep Neural Networks"**, (*submitted* to IEEE Transactions on Information Theory). [Paper]

April 2017 **S. Basu** and L. R. Varshney, **"Universal Source Coding of Deep Neural Networks"**, in *Proceedings of the IEEE Data Compression Conference*, [Snowbird, Utah], 4-7 April 2017. [Paper]

June 2016 **S. Basu**, S. Chaturvedi, and R. M. Hegde, **"Text Compression Using Lexicographic Permutation of Binary Strings"**, *Eleventh International Conference on Signal Processing and Communications (SPCOM)*, IEEE, 2016. [Paper | Presentation]

March 2016 M. Seth, **S. Basu**, S. Chaturvedi, and R. M. Hegde, **"Multi Character Frequency based Encoding for Efficient Text Messaging in Indian Languages"**, *Communications (NCC), 2016 Twenty Second National Conference on*. IEEE, 2016. [Paper | Poster]

Awards and Achievements

- **ECE Distinguished Research Fellow** at the University of Illinois at Urbana-Champaign. (2019-2022)
- **James M. Henderson Fellow** at the University of Illinois at Urbana-Champaign. (2019-2020)
- **Dilip and Sandhya Sarwate Graduate Fellow** at the University of Illinois at Urbana-Champaign. (2018-2019)
- Received **Academic Excellence Award** at IIT Kanpur for distinctive academic performance for the years **2013-14**, **2014-15**, **2015-16**.
- Ranked amongst the **top 10** teams across all the IITs in **Ericsson Innovation Award 2014-2015**.
- Secured **All India Rank 181** in **JEE ADVANCED 2013** out of 0.15 million students.
- Kishore Vaigyanik Protsahan Yojna (**KVPY**) Scholar, awarded to top 600 students in India.
- **Certificate of Merit** for qualifying for **Indian National Chemistry Olympiad (Theory) 2013**.
- **Certificate of Merit** for being placed in National **Top 1%** in **National Standard Examination in Physics-2012-13** among **40,000 candidates**.
- **Certificate of Merit** for being placed in State wise **Top 1%** in **National Standard Examination in Astronomy-2012-13**.
- Secured **16**th rank in **Junior Science Talent Search Examination**, conducted by Science Branch, Directorate of Education, Govt. of NCT of Delhi (in 9th grade).
- Participated in the **Kishore Vaigyanik Protsahan Yojna (KVPY) Camp** held at IISER Mohali and IISc Bangalore during May 2012 and December 2012 respectively.

Graduate coursework

- **ECE 534-Random Processes**: Fall 2018 with *Prof. O. Milenkovic*: **A+**
- **ECE 563-Information Theory**: Fall 2018 with *Prof. L. Varshney*: **A+**
- **ECE 561-Detection and Estimation Theory**: Spring 2019 with *Prof. V. Veeravalli*: **A**
- **ECE 543-Statistical Learning Theory**: Spring 2019 with *Prof. B. Hajek*: **A**
- **Math 417-Introduction to Abstract Algebra**: Fall 2019 with *Prof. F. Boca*: **A+**
- **Math 598-Concentration Inequalities and Stein's Method**: Fall 2019 with *Prof. P. Dey*: **A-**
- **ECE 556-Coding Theory**: Spring 2020 with *Prof. O. Milenkovic*: **A+**
- **ECE 544-Pattern Recognition**: Fall 2020 with *Prof. A. Schwing*: (Ongoing)
- **CS 598-Statistical Reinforcement Learning**: Fall 2020 with *Prof. N. Jiang*: (Ongoing)

Relevant undergraduate coursework

- **Computer Science:** Artificial intelligence programming, Machine learning techniques, Data structures and algorithms, Fundamentals of computing.
- **Signal Processing:** Signals, systems and networks, Digital Signal Processing, Speech Signal Processing.
- **Mathematics:** Probability and Statistics, Linear Algebra, Complex Analysis, Differential Equations, Calculus, Mathematical Logic.
- **Other relevant course:** Neural Networks, Introduction to game theory.

Undergraduate Research Internship

Universal Compression of Graphs and Graph Signals — Summer 2016

Guided by Prof. Lav R. Varshney, University of Illinois at Urbana-Champaign

- **Aim:** To develop universal compression algorithms for graphs and graph signals, taking into account various invariant properties that are present in group-theoretic characterization of these discrete structures.
- **Results:** Computed entropy bounds for several graphical structures, graph signal models and proposed efficient compression algorithms whose performance was compared to the achieved bounds. The work was published in **Data Compression Conference (DCC), 2017**.

Technical Skills

Languages: C,C++, Python
Tools: PyTorch, MATLAB, Mathematica

Positions of responsibility & Social initiatives

Secretary, Electronics Club, IITK: Fall 2014

- Conducted workshops on Digital Clock for freshmen giving them hands-on experience of several ICs and their application in digital devices. Also, mentored freshmen for Electromania, an event under electronics club in TAKNEEK 2014, intra-IITK Science and Technology Championship.

National Service Scheme: Fall 2013 & Spring 2014

- Tutored students from class 5^{th} to 8^{th} in the topics of mathematics and science.
- Conducted a science exhibition for elementary and middle school students.