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 **GPA - 3.96**

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

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

May 2021 **S. Basu**, G. S. Ramachandran, N. S. Keskar, and L. R. Varshney, **"Mirostat: A Neural Text Decoding Algorithm that Directly Controls Perplexity"**, to appear in Proceedings of the 9th International Conference on Learning Representations (**ICLR**), [Vienna, Austria], 4-8 May 2021. [Paper | Blog]

March 2021 T. Ameen ur Rahman, A. S. Barbehenn, X. Chen, H. Dbouk, J. A. Douglas, Y. Geng, I. George, J. B. Harvill, S. W. Jeon, K. K. Kansal, K. Lee, K. A. Levick, B. Li, Z. Li, Y. Murthy, A. Muthuveeru-Subramaniam, S. Y. Olmez, M. J. Tomei, T. Veeravalli, X. Wang, E. A. Wayman, F. Wu, P. Xu, S. Yan, H. Zhang, Y. Zhang, Y. Zhang, Y. Zhao, **S. Basu**, and L. R. Varshney, " **The Twelvefold Way of Non-Sequential Lossless Compression**," to appear in Proceedings of the IEEE Data Compression Conference (**DCC**), Snowbird, Utah, 23-26 March 2021. [Paper]

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* (**DCC**), [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]

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]

TEACHING AND SERVICE

- **Teaching assistant** ECE 563 Information Theory (Fall 2020)
- **Reviewer** ISIT 2020, ITW 2021

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*: **A**
- **CS 598-Statistical Reinforcement Learning**: Fall 2020 with *Prof. N. Jiang*: **A**

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.