

Shubham Chandak | CV

shubhamchandak94.github.io

Fourth year PhD student in Electrical Engineering at Stanford University, advised by Prof. [Tsachy Weissman](#). Interested in DNA storage, bioinformatics, data compression, information theory and machine learning.

Education

- Stanford University Stanford, CA, USA
PhD, Electrical Engineering, ongoing 2016–2021
- Stanford University Stanford, CA, USA
MS, Electrical Engineering, GPA 4.2/4 2016–2018
- Indian Institute of Technology Bombay Mumbai, India
B.Tech. (with Honours) Electrical Engineering, CPI 9.99/10, Minor in Math 2012–2016

Work Experience

- Philips Research North America Cambridge, MA, USA
Data Compression Research Intern June–September 2019
Worked on genomic data compression, supervised by Patrick Cheung.

Academic Achievements

- Qualcomm Innovation Fellowship Finalist in 2019.
- Beckman Technology Development Award in 2018 for project on DNA Storage.
- Recipient of The Numerical Technologies Co-Founders Fellowship in 2017-18 awarded to the top performers in Stanford Electrical Engineering PhD qualifying exam.
- Prof. K. C. Mukherjee Award at IIT Bombay for best project among B.Tech. Electrical Engineering students in 2016.
- Silver Medal at IIT Bombay for best academic standing among B.Tech. Electrical Engineering students in 2016.
- Awarded the prestigious Aditya Birla Scholarship for 2012-16 by India's premier business house viz. Aditya Birla Group.
- All India Rank 15 in IIT-JEE 2012 (IIT-Joint Entrance Exam) among more than 470,000 candidates.
- Gold medalist (International Rank 9) at the 44th International Chemistry Olympiad held in Washington DC, USA from 21st to 30th July, 2012.
- Selected for KVPY Fellowship in 2010 with All India Rank 6 (KVPY is a National Program of Fellowship in Basic Sciences, initiated by the Department of Science and Technology, Govt. of India).
- NTSE scholarship (National Talent Search Exam conducted by NCERT, Govt. of India) in 2009.

Publications

Journal

- S. Chandak, K. Tatwawadi, I. Ochoa, M. Hernaez and T. Weissman; SPRING: A next-generation compressor for FASTQ data, *Bioinformatics*, Volume 35, Issue 15, 1 August 2019, Pages 2674–2676.
- S. Chandak, K. Tatwawadi and T. Weissman; Compression of genomic sequencing reads via hash-based reordering: algorithm and analysis, *Bioinformatics*, Volume 34, Issue 4, 15 February 2018, Pages 558–567.
- N. Desai, C. Juvekar, S. Chandak and A. P. Chandrakasan, "An Actively Detuned Wireless Power Receiver With Public Key Cryptographic Authentication and Dynamic Power Allocation," in *IEEE Journal of Solid-State Circuits*, vol. 53, no. 1, pp. 236–246, Jan. 2018.

Conference

- S. Chandak, K. Tatwawadi, B. Lau, J. Mardia, M. Kubit, J. Neu, P. Griffin, M. Wootters, T. Weissman, H. Ji (2019). Improved read/write cost tradeoff in DNA-based data storage using LDPC codes. *2019 57th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, Monticello, IL, USA, 2019, pp. 147–156.
- A. Bhowan, S. Mukherjee, S. Yang, S. Chandak, I. Fischer-Hwang, K. Tatwawadi and T. Weissman; "Humans are still the best lossy image compressors," *2019 Data Compression Conference (DCC)*, Snowbird, UT, USA, 2019, pp. 575–575.

- M. Goyal, K. Tatwawadi, S. Chandak and I. Ochoa; “DeepZip: Lossless Data Compression using Recurrent Neural Networks,” *2019 Data Compression Conference (DCC)*, Snowbird, UT, USA, 2019, pp. 558-558.
- N. V. Desai, C. Juvekar, S. Chandak and A. P. Chandrakasan, “21.8 An actively detuned wireless power receiver with public key cryptographic authentication and dynamic power allocation,” *2017 IEEE International Solid-State Circuits Conference (ISSCC)*, San Francisco, CA, 2017, pp. 366-367.

Patents.....

- S. Chandak, K. Tatwawadi, I. Ochoa, M. Hernaez and T. Weissman. Systems and Methods for Compressing Genetic Sequencing Data and Uses Thereof. *Patent application filed.*
- C. Wen, L. Wang, J. Aparicio, S. Chandak, K. Tatwawadi, T. Weissman. Embedded Deep Compression for Time Series Data. *Patent application filed.*
- A. P. Chandrakasan, N. Desai, C. Juvekar and S. Chandak. Detuning for a resonant wireless power transfer system including cryptography. *Patent application filed.*

Talks.....

- Error correcting codes for DNA based data storage. *ISMB/ECCB 2019*, Basel, July 21-25, 2019.
- SPRING: A next-generation compressor for FASTQ data. *ISMB/ECCB 2019*, Basel, July 21-25, 2019. *Invited.*
- SPRING: A next-generation compressor for FASTQ data. *Stanford Compression Workshop 2019*, Stanford, February 15, 2019. *Invited.*
- SPRING: A practical compressor for short-read FASTQ data. *56th Annual Allerton Conference on Communication, Control, and Computing*, Urbana, IL, October 3-5, 2018. *Invited.*

Poster.....

- Error correcting codes for DNA based data storage. *ISMB/ECCB 2019*, Basel, July 21-25, 2019.
- SPRING: A practical compressor for short-read FASTQ data. *ISMB 2018*, Chicago, IL, July 6-10, 2018.
- Compression of genomic sequencing reads with and without preserving the order. *2017 Biomedical Computation at Stanford Symposium*, Stanford University, 10 April, 2017.

Course Projects

- **Implementation and analysis of stabilizer codes in pyQuil** *Spring 2018-19*
Stabilizer codes form a large family of quantum error correcting codes that includes well-known codes such as Shor code, Steane code, CSS codes and toric codes.
 - As part of “CS 269Q: Quantum Computer Programming”, we built a framework for encoding and decoding of general stabilizer codes on pyQuil and tested specific single qubit codes with standard quantum noise models.
- **Codes for DNA storage** *Spring 2017-18*
 - Studied the trade-off between coding density and reading efficiency for DNA storage as part of course project for “EE 388: Modern Coding Theory”.
 - Proposed practical error-correction schemes based on RaptorQ codes, BCH codes and LDPC codes.
 - Proposed schemes for run-length constrained coding using Fibonacci codes.
 - Achieved close-to-optimal results for a range of error rates.
- **Understanding the Amazon Rainforest from Space using CNNs** *Spring 2016-17*
 - Participated in Kaggle contest “Understanding the Amazon from Space” by Planet Labs, as part of course project for “CS231N: Convolutional Neural Networks for Visual Recognition”.
 - Tested various architectures for multi-class, multi-label prediction of weather and land-use features based on satellite images of the Amazon rainforest.
 - Received Bronze medal from Kaggle for getting leaderboard rank of 67 among 938 teams.

Coursework

- **Electrical Engineering:** Modern Coding Theory, Universal Schemes in Information Theory, Information Theory, Convex Optimization, Digital Signal Processing, Digital Communications, Control Systems, Microprocessors
- **Computer Science:** Advanced Cryptography, Quantum Computing, Cryptocurrencies & Blockchain Technologies, Cryptography, Convolutional Neural Networks for Visual Recognition, Probabilistic Graphical Models, Automata &

Complexity Theory, Machine Learning, Web Applications

- **Statistics & Probability:** Advanced Probability & Random Processes
- **Mathematics:** Measure Theory, General Topology, Graph Theory, Abstract Algebra, Fourier Analysis, Complex Analysis, Real Analysis, Partial Differential Equations
- **Humanities & Social Sciences:** Economics, Sociology, Environmental Studies

Other Experience

- Collaboration project with Siemens on compression of sensor data in 2017-19.
- Teaching Assistant for EE 178 - Probabilistic Systems Analysis in Autumn 2017-18 and EE 376A - Information Theory in Winter 2018-19.
- Co-organizer of Stanford Compression Workshop 2019.
- Contributing to genie, an open-source codec for the MPEG-G standard for genomic information representation.

Technical and Personal Skills

- **Programming:**
 - Proficient in: C++, Python, NumPy, Matlab, \LaTeX
 - Experience with: Tensorflow, Keras, R, VHDL, Arduino, SageMath, CVX, Javascript, MEAN stack
- Introductory Piano Class at Stanford.
- **Languages:** Hindi, English