Nived Rajaraman

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Education

Indian Institute of Technology Madras, India *(B. Tech + M. Tech) Dual Degree in EE*	*Aug 2014 - May 2019**	8.32 CGPA
Sri Chaithanya College, Hyderabad, India	*July 2012 - May 2014*	97.5%
Delhi Public School, Hyderabad, India	*July 2010 - June 2012*	10.0 GPA

Select Coursework

- Information Theory I, II
- Approximation Algorithms
- Optimization Methods in Signal Processing
- Advanced Topics in Networks*
- Modern Coding Theory
- Advanced Topics in Signal Processing
- Speech Signal Processing
- Error Control Coding
- Quantum Computation & Quantum Information*

Publications and Preprints

Apr 18 - Aug 18 | **Not Just Age but Age and Quality of Information (AQI)** **(pending review at INFOCOM 2018)**
Advisor: *Prof. Rahul Vaze, TIFR, Mumbai*
AQI is a versatile scheduling problem that models a three-way tradeoff between delay/age, distortion, and energy cost - generalizes AoI and speed scaling problems among others. Designed a 2-competitive algorithm for AQI based on local maximum-weight matching.

Nov 17 - Jan 18 | **Improved Greedy Selection for Submodular Maximization over a Matroid (preprint)**
Advisor: *Prof. Rahul Vaze, TIFR, Mumbai*
Provided improved instance-dependent guarantees on the competitiveness of the greedy algorithm for on/offline SMM, based on a computable parameter called *discriminant*.

Research Experience

***Current* Jul 2018** | **Fast Algorithms for Approximate NNS (Thesis)**
Advisor: *Dr. Ravishankar Krishnswamy, Microsoft Research, Bengaluru*
Designing streaming algorithms for the approximate k-Nearest Neighbor Search problem. Currently developing a theoretical framework to understand and design search-over-graph methods (which empirically outperform LSH and other spatial partitioning schemes).

***Current* Apr 2018** | **Theoretical underpinnings of the Anne-Chao estimator for Support Size Estimation** †
Advisor: *Prof. Andrew Thangaraj, IIT Madras, Chennai*
Provided the first theoretical analysis for the ubiquitous Anne Chao estimator for SSE. Currently formulating improved estimators among the unstudied class of rational function estimators.

Apr 17 - Aug 17 | **Fast Sparse Linear Transforms based on Sparse Graph Codes**
Targeted to extend the FFAST architecture for fast computation of sparse FFTs to other deterministic transforms. With the property that DFT matrices diagonalize circulant matrices as foundation, attempted to identify said classes through the lens of algebraic representation theory.

Relevant Course Projects

Feb 18 - Apr 18 | **A constant factor approximation for the Asymmetric Traveling Salesman Problem (ATSP)**
Course: *Approximation Algorithms*
Delivered a presentation on the breakthrough 2017 paper by Svensson et al describing the first constant factor approximation algorithm for ATSP.

Jul 17 - Nov 17 | **MusicNet - LSTM network based music generation**
Course: *Speech Signal Processing*
Trained an LSTM network on a symbolically annotated dataset (MusicNet) - compositions generated by iteratively sampling from the network and using it to update the priming sequence.

∗ in progress
† in preparation

Mar 17 - Apr 17 | **LDPC codes with large girth Tanner graphs**
Course: *Modern Coding Theory*
Generated high-girth Tanner graphs for the LDPC code using an improved Neal-MacKay construction. A soft-decision belief propagation SPA decoder was also implemented as the decoder.

Jan 17 - Apr 17 | **Gaussian Sampling based Lattice Decoding (GSLD)**
Course: *Introduction to Information Theory and Coding*
GSLD is a lattice decoding algorithm that converges in probability to the ML solution via alternating co-ordinate descent and quantization. Implemented and delivered a presentation on GSLD.

Experience

Jul-Nov 18 | **Teaching Assistant**
Course: *Speech Signal Processing* [EE5170], *IIT Madras* under Prof. S. Umesh.

May-Jul 18 *and* Nov 17 - Jan 18 | **Internship**
TIFR, *Mumbai, India*
See *Publications and Preprints.*

May-Jul 17 | **Summer Internship**
Texas Instruments, *Bengaluru, India*
Automated generation of hierarchical trees of modules from high level schematic diagrams.

May-Jul 16 | **Summer Internship**
Centre for Excellence in Wireless Technology (CEWiT), *Research Park, IIT Madras*
Developed a highly vectorized module in C for channel estimation and equalization in single-antenna OFDM systems, for integration with tx and rx chains being developed by CEWiT.

Extra-Curricular Activities

Aug 15 - Jul 17 | **AUV Amogh (Autonomous Underwater Vehicle)**
Joined and later led a team of 20 in prototyping a low-budget AUV for underwater surveillance and shallow water exploration equipped with state-of-the-art image processing algorithms for identification and pre-programmed response to a wide range of objects/obstacles.

Aug 16 - Apr 17 | **Hostel Representative, I&AR IITM**
Working as a part of I&AR IITM - a student council that concerns with international relations (exchange programs, delegation visits etc.) and alumni relations and funding.

Jul 15 - Feb 16 | **Magnetic Levitation**
Led a group of 6 to design a magnetic levitation system for dynamic-altitude levitation of a fixed dimension magnet using a self tuning feedback algorithm.

Volunteering

- Mentored underprivileged girl students via CBSE's UDAAN initiative through a series of video lessons.
- Volunteered for National Service Scheme "Education via Blogging" initiative for generating content for grades 11 and 12 syllabus in developing localities.
- Correspondent for IITM's student news body, The Fifth Estate (T5E).

Achievements

- Indian National Astronomy Olympiad 2014 — Among top 300 nationally
- Recipient of KVPY Scholarship 2014 — Ranked 148 nationally
- JEE Advanced, 2014 — Ranked 316 among over 200,000 applicants
- JEE Mains, 2014 — Ranked 207 among over 1,000,000 applicants
- 14^{th} Haryana State Junior Chess Championship — Ranked 4^{th}
- 2^{nd} National Geographic Junior Hunt — Made it to final 20 among over 20,000 contestants

Skills and Interests

- Proficient in C/C++, Python, MATLAB.
- Proficient in TEX.
- Passionate about music and in particular drumming / percussion.