RAGIB MOSTOFA

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Professional Summary

Upcoming Computer Science and Applied Mathematics graduate with a passion for and specialization in Machine Learning and Data Science. Extensive background and proven track record of success in academic research projects, which include modifying the traditional Self-Organizing Map algorithm to reduce the number of learning cycles required to reach convergence by 32 percent and applying a hybrid Self-Organizing Map algorithm to predict the grain size and temperature of remote planets with an accuracy of 95 percent.

Skills

- Programming: Proficient in Python, Java, C, MATLAB
- Data Science
- Machine Learning
- Neural Networks

- Natural Language Processing
- Database Systems
- SQL, PostgreSQL

Work History

Undergraduate Research Assistant   Sep 2017 - Aug 2018

Rice University   Houston, TX

- Worked on a hybrid Self-Organizing Map algorithm that incorporates both supervised and unsupervised learning rules and layers
- Tested and applied algorithm to the regression problem of predicting the grain size and temperature of remote planets with an accuracy of 95 percent

Predoctoral Research Fellow   May 2017 - Jan 2018

Aiden Lab, Baylor College Of Medicine   Houston, TX

- Worked in a group of 3 interns on the Assembly Tools feature of Juicebox - software used for the visual exploration of Hi-C heat-maps that represent the genomes of various organisms
- Used Java (namely **AWT** and **Swing** interfaces) to design and implement features (both backend and frontend) that support important operations such as gene translation, inversion etc. which can be used to edit the sequences of the genome being studied

- Final product allows bioinformaticians to visualize and interactively (re)assemble genomes using a simple point-and-click interface at a greatly reduced cost

Data Science Research Intern
May 2016 - Aug 2016

Two Sigma Investments
Houston, TX

- **Research Topic:** Text-based Financial Prediction Models
- Built a Yahoo! News web-spider based on the **bs4** Python package in order to acquire financial news data relevant to specific companies
- Used Python packages such as **numpy**, **sklearn** and **nltk** to implement natural language processing techniques and machine learning algorithms such as Support Vector Machines (SVMs) to train the machine to predict stock market movements based on the aforementioned financial news data
- Performed various feature extraction and selection techniques to improve the accuracy of the base model by at least **15 percent**
- Achieved an FC (Fraction Correct) value of **64.35 percent,** i.e. binary classifier model performed considerably better than most other models that have been proposed as a solution to this research problem in the past

Undergraduate Course Assistant
Jan 2017 - May 2018

Rice University
Houston, TX

Held office hours and graded homework assignments, projects and exams for the following courses:
- COMP 502 (Neural Machine Learning & Data Mining I)
- COMP 130 (Elements of Algorithms & Computation)
- MATH 112 (Calculus and its Applications)
- MATH 111 (Fundamental Theorem of Calculus)
- MATH 102 (Single Variable Calculus II)
- ELEC 220 (Fundamentals of Computer Engineering)

Software Developer Extern
Jan 2017 - Jan 2017

Amazon
Seattle, WA

- A one-day externship/shadowing opportunity exploring the financial and technological operations at Amazon, including the application of various speech recognition and natural language processing paradigms in the Amazon Echo (Alexa) project.

Software Developer Extern
Jan 2016 - Jan 2016

Labatt Foods
San Antonio, TX

- A one-day externship/shadowing opportunity focusing on agile software development methodology and its application to the company's activities.

Education

Bachelor of Science: Computer Science (COMP)   2019

Rice University   Houston, TX

- Dual Degree Track
- **Major GPA:** 3.80
- **Specialization:** Data Science & Machine Learning
- **Relevant Coursework:** Neural Machine Learning & Data Mining I & II, Statistical Machine Learning: Principles and Applications, Introduction To Database Systems

Bachelor of Arts: Computational And Applied Mathematics (CAAM)   2019

Rice University   Houston, TX

- Dual Degree Track
- **Major GPA:** 3.88
- **Specialization:** Optimization Theory
- **Relevant Coursework:** Introduction To Operations Research & Optimization, Introduction To Linear & Integer Programming, Computational Science I & II, Probability & Statistics, Introduction To Analysis I
- **Senior Design Thesis** (Ongoing)**:** Machine learning to predict frontal and cerebellar population receptive field mapping of the human brain using the input of visual areas

Honors & Awards

- **Rice Undergraduate Scholars Program (RUSP) 2017-2018:** A two-semester, 1-credit undergraduate honors research program aimed at students interested in careers in academia and research. Under the guidance of a faculty mentor in their discipline, students work on a year-long research project.
- **NSF Student Travel Award:** Sponsored and invited to present research poster on "Applying the Efficient Market Hypothesis to Sports Binaries" at the 34th Quality and Productivity Research Conference (QPRC)
- **Best Undergraduate Poster Presentation Award:** Undergraduate poster session winner at conference on real world markets for poster presentation on "The Efficient Market Hypothesis Applied to Sports Binaries Market"
- **Owl Edge Summer Experience Fund:** The Owl Edge Experience Fund, through generous donations from Rice alumni, parents and friends, provides qualified students with grants of up to $5,000 in support of unpaid summer research positions, that students have identified but do not have the financial means to accept
- **Gulf Coast Undergraduate Research Symposium, Electrical and Computer Engineering Session Winner:** Electrical and Computer Engineering Session winner at research symposium for Powerpoint presentation on "Text-based Financial Prediction Models"

- **UChicago Midwest Trading Competition 2016:** Devised, implemented and backtested various trading algorithms, including financial time series (specifically the Auto Regressive Model) in Java for 3 different cases of 3 rounds each.

  - Won 1st place on Case II: Algorithmic Sales and Trading Case

  - Won 1st place on first round of Case III: Options Market-Making Case

  - Placed 9th overall out of 25 different teams from at least 20 different universities

Relevant Projects

Link to Github profile containing implementation of the projects below: https://github.com/ranganmostofa

- **Generalized Decrease Schedule of Learning Parameters for SOMs:** Utilized computationally efficient metrics such as the map embedding and topographic accuracies to develop and implement a generalized decrease schedule for learning parameters of the Self-Organizing Map (SOM) algorithm, which resulted in a **32 percent** reduction in the number of learning steps required to reach convergence when compared to the baseline traditional algorithm. A comprehensive project report can be found at https://github.com/ranganmostofa/Generalized-Decrease-Schedule-of-Learning-Parameters-for-SOMs/blob/master/doc/report.pdf

- **Optimization Models for NFL Fantasy Survivor:** Formulated a binary integer program for the problem of selecting the optimal set of teams for a given season of NFL Survivor Football. Linearized the model via constructing various proofs. Proposed a shortest path graphical formulation and proved the equivalence of the two models which allowed easy implementation of a solution to the original problem. Constructed proofs of key propositions concerning the graphical model that resulted in a great reduction in the running time of the implemented solution. A detailed project report can be found at https://github.com/ranganmostofa/Optimization-Models-For-NFL-Fantasy-Survivor/blob/master/NFL%20Survivor%20Optimization.pdf

- **NFL Roster Optimization (Ongoing):** Formulated a stochastic binary integer program for the problem of selecting the optimal roster (assignment of players to available positions) for teams in a given season of the NFL. Implemented a homegrown graph module in Python as well as algorithms related to the project, such as Kuhn-Munkres, Edmonds-Karp etc.

- **Beating the House - Identifying Inefficiencies in Sports Betting Markets:** Used Python to implement web-spiders that acquire money-lines, point spreads and win-loss statistics from the Vegas Insiders and Killer Sports websites. Integrated the epsilon hyper-parameter into baseline model which accounted for outlying money-lines and resulted in increased positive returns during backtesting. Implemented final algorithm, backtesting and bootstrapping procedures in Python and MATLAB to produce charts, graphs and figures for working paper (check Publications section below)

- **Number Encryptor:** Devised and implemented an encryptor in Python, that accepts a 10-20 digit number as input and produces a cipher (containing letters and numbers) that can be decrypted back into the original number. The encryptor uses the Markov Chain Metropolis Algorithm and a predefined

novel (such as War & Peace) to encrypt the input number. A corresponding decryptor was also built on the same basis.

- **Auto-Regressive Model:** Implemented an auto-regressive model of user-defined order in Java, as part of the solution to Case I: Cross-Listed Shares Trading of the 4th Annual UChicago Midwest Trading Competition (check Honors & Awards section above)

Publications

- Olga Dudchenko, Muhammad S. Shamim, Sanjit Batra, Neva C. Durand, Nathaniel T. Musial, **Ragib Mostofa**, Melanie Pham, Brian Glenn St Hilaire, Weijie Yao, Elena Stamenova, Marie Hoeger, Sarah K. Nyquist, Valeriya Korchina, Kelcie Pletch, Joseph P. Flanagan, Ania Tomaszewicz, Denise McAloose, Cynthia Pérez Estrada, Ben J. Novak, Arina D. Omer, Erez Lieberman Aiden, "The Juicebox Assembly Tools module facilitates de novo assembly of mammalian genomes with chromosome-length scaffolds for under $1000", 2018. **Link:** https://www.biorxiv.org/content/early/2018/01/28/254797
- Sathya Ramesh, **Ragib Mostofa**, Marc I. Bornstein, "Beating the House: Identifying Inefficiencies in Sports Betting Markets" (Working paper)

Languages

Bilingual in English and Bangla