Rukmal Weerawarana

rukmal.weerawarana@gmail.com • http://rukmal.me • (206) 839-6891

Education

Master of Science (Financial Engineering) — **May '19**
Stevens Institute of Technology — Hoboken, NJ
School of Business (Division of Financial Engineering)
GPA (4.0 Scale): 3.7
Awards: Provost's Master's Fellowship

Bachelor of Arts in Business Administration (Finance) — **Jun '17**
University of Washington — Seattle, WA
Michael G. Foster School of Business (Department of Finance and Business Economics)

Certificate in Quantitative Fundamentals of Computational Finance — **Aug '16**
University of Washington — Seattle, WA
College of Arts and Sciences (Department of Applied Mathematics)

Work Experience

Research Assistant — **Hoboken, NJ**
Sensorimotor Control Laboratory — Aug '18 - Present
Department of Biomedical Engineering; Stevens Institute of Technology
Stevens Institute for Artificial Intelligence; Stevens Institute of Technology

- Designed and implemented algorithms to assess and classify tremor severity in patients with late-stage Parkinson's Disease.
- Created a highly scalable and extensible web application to be used by the researchers in the lab during this project. This web application incorporated HIPAA-compliant data storage and access, as well as efficient cluster management with Docker and Kubernetes.
- Provided input to hardware research based on statistical tremor analysis results, with the goal of designing a complete low-cost system for tremor analysis. Contributed to additive manufacturing models and designing sensor arrays for a data collection glove to be used for the tremor analysis project.
- Performed cost comparisons to identify the most economical Infrastructure-as-a-Service (IaaS) provider, given the storage, computation, and cost constraints of the project.

Summer Research Fellow — **Troy, NY**
RPI-IBM HEALS Research Center — May '18 - Aug '18
AI Horizons Network; IBM Research
Tetherless World Constellation; Rensselaer Polytechnic Institute

- Led the design and development of the PaperRank Framework, a methodology for deriving probabilistic community trust in academic publications. PaperRank utilized the PageRank algorithm, coupled with a Gamma Mixture Model applied to citation networks of academic publications. A proof-of-concept was implemented, from extraction to final trust score computation, analyzing over 14 Million articles from the NCBI PubMed Database.
- Formulated and implemented novel strategies for semantically-enhanced automated extraction of medical directives from Clinical Practice Guidelines (CPGs), for eventual inclusion in a knowledge graph of Diabetes diagnosis and treatment directives. Built the 'Guideline Explorer', a tool for efficiently visualizing and examining the American Diabetes Association's 2018 CPGs.
- Explored the field of 'Semantalytics', which lies at the intersection of Semantics and Analytics. Drafted a Vision statement for the future exploration of this novel field of research, through the lens of bioinformatics.
- Formulated an Electronic Health Record (EHR) simulation engine, which utilized Monte Carlo simulations based on a generalized population heuristic to vary idiosyncratic patient attributes. The EHR Simulation engine would suggest medical tests that would be statistically likely to identify previously unknown medical issues.
- Developed the 'Guideline Analysis Framework', a mathematical formulation of CPGs. This framework was designed to enable the comparison of various CPGs from differing medical authorities addressing the same set of diseases, and to detect disparities in treatment directives.

Laboratory Assistant **Hoboken, NJ**
Hanlon Financial Systems Laboratory Sep '17 - Dec '18
School of Business; Stevens Institute of Technology
Stevens Institute for Artificial Intelligence; Stevens Institute of Technology

- Spearheaded an effort to discover and implement new technology solutions to help realize the teaching and research goals of the lab.
- Assisted in the daily operations of the lab, including assisting instructors and students (Graduate and Undergraduate), and maintaining hardware and software resources.

Business Management Team Lead **Seattle, WA**
UW Hyperloop May '16 - Aug '17
College of Engineering; University of Washington
Other Titles: Control Systems Team Member, Impact Development Team Lead

- Represented the University of Washington at the inaugural SpaceX Hyperloop Pod Competition in Hawthorne, CA. We placed 4th in the United States, and 6th globally; the competition initially received 1,700 team proposals, which were narrowed down to 30 finalists.
- Led the Business Management Team to launch a highly successful crowdfunding campaign, raising over $20,000 in cash (with an initial goal of $10,000), and over $80,000 of source materials used in the construction of the Pod. The collective effort of the team led us to have the lowest-cost Pod among the 30 final teams.
- Spearheaded the sourcing and delivery of over $50,000 of raw material, including high-density Carbon Fiber, release agents, and powerful Neodymium magnets for the final Pod assembly.
- Led sponsor outreach, and maintained relationships with internal (at the University of Washington) and external supervisors and supporters.
- Assisted the Controls Team Lead in the final design and implementation of electronic mapping and wiring on the Pod.
- Contributed to late-stage troubleshooting efforts that led to the successful implementation and deployment of Halbach arrays on the Pod, which facilitated levitation and magnetic propulsion on the test track.
- Explored the transformative economic and social effects a hypothetical Hyperloop system could have on the Pacific Northwest of the United States.

Undergraduate Research Assistant **Seattle, WA**
UW CubeSAT Team Mar '15 - Jul '15
Advanced Propulsion Laboratory; University of Washington
Other Titles: Avionics Team Lead

- Led the avionics team to design a communications software architecture paradigm for the on-board computer systems of the Lunar CubeSAT.
- Investigated the effect of radiation beyond the Van-Allen belts (experienced during translunar flight). Recommended ideal processor architectures and other redundant measures that may be taken to mitigate the effect of this radiation on the flight systems of the CubeSAT.
- Proposed a system of Hamming codes to increase data transfer fidelity during data dumps from the CubeSAT to the ground station at the University of Washington. Identified specific data encoding paradigms to increase data throughput to the Earth downlink from the CubeSAT.
- Presented a final communications software architecture proposal to a panel of researchers from the Advanced Propulsion Laboratory and NASA. The UW Lunar CubeSAT is expected to launch as a secondary payload aboard the Space Launch System (SLS) Exploration Mission 1 (EM-1) demonstration flight.

Software Engineering Team Lead **Seattle, WA**
ZocialGPA, Inc. Feb '15 - Jan '16
Other Titles: Software Engineering Intern

- Designed a highly scalable and efficient software ETL stack, building datasets from various social networking platforms, including Facebook, Twitter, and LinkedIn.
- Developed natural language processing and sentiment analysis algorithms to derive "social GPA" scores from a user's social profiles.
- Refactored and modularized the entire company codebase, to enable efficient component-based auto scaling with Apache Stratos and Amazon AWS.
- Implemented a mobile-first web end user interface for the platform, and redesigned the internal company management console.

Software Engineering Intern **Colombo, Sri Lanka**
Apache Stratos Team Jun '14 - Sep '14
WSO2, Inc.

- Investigated the viability of alternate hypervisor stacks for eventual integration with the Apache Stratos Platform-as-a-Service (PaaS) framework.
- Developed a new user interface for the Stratos Manager Console using the JaggeryJS MVC framework, which was packaged and shipped with Stratos version 4.1.0.
- Conducted isolated integration tests with the CoreOS+Docker (LXC-based) hypervisor stack as an alternative to the existing hypervisor (KVM) used in Stratos.

Undergraduate Research Assistant **Seattle, WA**
Mullins Molecular Retrovirology Laboratory Apr '14 - Aug '14
Department of Microbiology; University of Washington

- Assisted the Lead Scientific Programmer of the lab in identifying and extracting sequences of mutated genes in human genome sequences.
- Developed algorithms which aided in the creation of targeted retroviral therapies for patients with HIV/AIDS.
- Created efficient and scalable data traversal algorithms for the ingestion and transformation of large human genome sequences.
- Utilized Hyperfreq, a tool for Bayesian analysis of APOBEC3G-induced hypermutations, to identify sequences of the genome likely to have been mutated.

PUBLICATIONS

(Draft) **Inferring Community Trust from Citation Graphs** **2019**
James P. McCusker, Rukmal Weerawarana, Alexander New, Kristin P. Bennett, Deborah L. McGuinness
https://drive.google.com/open?id=1SlSfZrwOQYPOmrKbrGLjjAFzWCk-qlwm

- We introduce the PaperRank scoring algorithm; a proxy of scientific community trust in a given publication. This score is derived from the classic PageRank algorithm (applied to academic citation networks), in conjunction with a one-dimensional Gamma Mixture Model to normalize the PageRank scores on a 3-group publication notoriety heuristic.
- The key contributions of this publication are the PaperRank Framework (currently configured for use with the NCBI PubMed Database), and a generalized algorithm for optimizing a Gamma Mixture Model (GMM).
- A key application of PaperRank would be to underwrite provenance-enabled Knowledge Graphs (where assertions are justified by academic publication references) with a 'trust' heuristic, to enable quasi-probabilistic behavior during inference and traversal.

(Draft) **What is a Knowledge Graph?** **2019**
James P. McCusker, John S. Erickson, Katherine Chastain, Sabbir Rashid, Rukmal Weerawarana, Marcello Bax, Deborah L. McGuinness
https://drive.google.com/open?id=19uND_fkRTd_m-i-SYBznq1wuCq1IvHhO

- This work attempts to synthesize a clear and unambiguous definition of a 'Knowledge Graph' that conforms to current knowledge graph research, while constraining the research space that may be considered a knowledge graph.
- We evaluate a wide variety of knowledge resources, graphs, and other ontologies to determine if they qualify under our definition, and built a 'Knowledge Graph Catalog' to support this effort.

Semantic Modeling of Cohort Descriptions in Research Studies **2018**
Shruthi Chari, Rukmal Weerawarana, Oshani Seneviratne, James P. McCusker, Deborah L. McGuinness, Amar Das
https://tw.rpi.edu/web/doc/semantic_modeling_of_cohort

- This research addresses a key challenge faced by physicians using Clinical Practice Guideline recommendations; determining how well idiosyncratic cohort evidence generalizes to the greater clinical population.
- The end goal of this system is to enable the parsing of publications broadly identified as research studies to extract cohort variables and exposure/intervention groups defined within the structured population descriptions to better inform treatment decisions.

Selected Knowledge Areas

Artificial Intelligence and Data Science
Semi-Supervised Learning, Dimensionality Reduction, Cluster Analysis, Knowledge Representation, Graph Analytics, Anomaly Detection, Predictive Modeling, Machine Learning, Unsupervised Learning, Statistical Classification, Semantic Analysis, Data Visualization, Time Series Analysis, Natural Language Processing, Bibliometrics

Computer Science and Software Engineering
Distributed Systems, Scientific Computing, Cloud Computing, Scalable System Architecture and Design, Data Structures, Operating Systems, Object Oriented Design, Algorithms

Economics and Econometrics
Credit Risk Modeling, Computational Econometrics, Macroeconomics, Managerial Economics, Microeconomics, Yield Curve Modeling

Finance
Advanced Derivatives, International Finance, Financial Reporting, Computational Finance, Modern Portfolio Theory, Market Microstructure, Managerial Accounting, Exotic Derivative Pricing, Corporate Finance, Asset-Backed Securities, Risk Analytics, Capital Budgeting, Banking and Financial Systems, Fixed Income, Foreign Exchange Risk

Mathematics
Real Analysis, Graph Theory, Convex Optimization, Linear Algebra, Non-Convex Optimization, Stochastic Calculus, Nonparametric Statistics, Mathematical Logic, Combinatorics, Multivariable Calculus, Partial Differential Equations, Advanced Probability Theory, Differential Equations, Statistical Modeling

Other
Sociology of Science, AI Ethics, Elementary Quantum Computing, Elementary Computational Genomics

Skills and Technologies

Application Software
Bloomberg Terminal, Protege, SolidWorks, Blender, Microsoft Office, Autodesk AutoCAD, Adobe Creative Cloud

Databases
Apache Jena, Neo4j, MongoDB, Blazegraph, MySQL, Redis

Deployment, Orchestration, and Continuous Integration Tools
Docker, Amazon Web Services, Google Cloud Platform, Microsoft Azure, Heroku, Kubernetes, Travis CI, GNU Make

Frameworks and Libraries
Electron, R Shiny, Flask, TensorFlow, SciPy, NLTK, Go Revel, Node.js, scikit-learn, Spring, RDFLib

Operating Systems
macOS, Linux (Ubuntu, Fedora, etc.), Windows

Programming and Scripting Languages
Perl, LaTeX, SQL, R, Jinja, Java, MATLAB, SPARQL, HTML, Python, JavaScript, Bash, CSS, Go

Reproducible Research Tools
Read the Docs, Overleaf, Microsoft Azure Notebooks, Knitr, GitHub, Google Colaboratory, Project Jupyter

Soft Skills
Extensive Leadership Experience, Excellent Communication Skills, Conflict Resolution, Project Management, Public Speaking, Excellent Writing Skills