Lukshya Ganjoo

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Education

2021–2025 : **Bachelor of Science; Computer Science, Mathematics**, *University of Washington, Seattle*, Relevant Coursework: .

- **Math:** Quantum Probability Theory, Combinatorial Optimization, Modern Algebra, Accelerated Advanced Honors Calculus, Advanced Linear Algebra
- **Computer Science:** Markov Chains, Graduate Algorithms, Graduate Natural Language Processing, Quantum Computing, Toolkit for Modern Algorithms, Introduction to Algorithms, Complexity Theory, Machine Learning, Data Structures.

Research experience

Publications and Pre-prints

2024 **Alex Albors, Hisham Bhatti, Lukshya Ganjoo, Raymond Guo, Dimitry Kunisky, Rohan Mukherjee, Alicia Stepin and Tony Zeng**, On the Structure of Bad Science Matrices, In: *arXiv preprint arXiv 2408.00933*.

Talks

May 2024 *Error estimates and asymptotic analysis for exact qudit universality*, *Undergraduate Research Symposium 2024*, University of Washington.
Slides I used for the talk

Ongoing research

Jun 2024 – *Approximation algorithms for solving quantum max cut*.
Aug 2024 I am presently working with Professor Andrea Coladangelo, where we're focused on developing approximation algorithms to find a high energy state of the QMC Hamiltonian. This Hamiltonian while serving as a generalization to the computational problem of finding a maximum cut, is also physically motivated since it models anti-ferromagnetic Hamiltonians.

Advisor : **Dr. Andrea Coldangelo**, *Assistant Professor, Department of Computer Science & Engineering*(*Personal Web-page*)

Teaching

Fall 2023, **CSE 534: Graduate Quantum Computing**, UW CSE.
2024:
- Taught a special topics graduate class on quantum computing and algorithms.
- Graded homework assignments and conducted office hours.

Spring, 2024: **CSE 434: Introduction to Quantum Computatation**, UW CSE.
- Taught a special topics undergraduate class on quantum computing and algorithms.
- Initiated weekly sections for 30+ students, grading 100+ assignments weekly and conducting office hours

Winter, 2024: **CSE 417: Algorithms and Computational Complexity**, UW CSE.
- Taught a class on designing and analyzing algorithms and data structures, along with efficient models of computation intended for a general undergraduate audience.
- Initiated weekly sections for 20+ students, grading 100+ assignments weekly and conducting office hours

Spring, 2023:	**CSE 311: Foundations of Computing I**, UW CSE.
	○ Taught a class focusing on the fundamentals of logic and computation intended for a general undergraduate CS audience.
	○ Initiated weekly sections for 25+ students, grading 200+ assignments weekly and conducting office hours.
Winter, 2023:	**CSE 446: Introduction to Machine Learning**, UW CSE.
	○ Taught a introductory class on machine learning intended for an advanced undergraduate CS audience.
	○ Initiated weekly sections for 15+ students, grading 100+ assignments weekly and conducting office hours.
Fall, Summer 2022:	**CSE 312: Foundations of Computing II**, UW CSE.
	○ Taught an introductory class on probability and statistics intended for a general undergraduate CS audience.
	○ Initiated weekly sections for 25+ students, grading 200+ assignments weekly and conducting office hours.

Projects

May 2023 - May 2023:	**SVD-based word embeddings**, PYTHON, NUMPY, PANDAS.
	○ Engineered a state-of-the-art word embedding solution, utilizing the top 10,000 words from a vast Wikipedia corpus of 1.5 billion words, enhancing language understanding.
	○ Leveraged Singular Value Decomposition (SVD) to capture semantic and syntactic meaning within a high-dimensional vector space.
	○ Utilized state-of-the-art embeddings to conduct projection analysis, unveiling syntactic relationships and showcasing a high level of proficiency in linguistic concepts.
Nov 2022 - Dec 2022:	**Image Classifier**, PYTHON, PANDAS, PYTORCH, NUMPY.
	○ Analysed different deep learning architectures to classify images using the CIFAR-10 dataset.
	○ Optimized fully connected and convolutional neural network training by designing and implementing a robust architecture using numpy and PyTorch.
	○ Obtained a validation accuracy of >50% and > 65% respectively using a fully connected neural network and a convolutional neural network.
June 2022 - Aug 2022:	**Campus Paths**, JAVA, JAVASCRIPT, REACT, NODE.JS.
	○ Displays the most optimal paths between requested locations at the University of Washington via a custom-built full-stack application.
	○ Implemented a Java-directed graph, Dijkstra's algorithm, REST API endpoints, TypeScript and a React user interface.
	○ Redesigned project deliverables to include specific accessibility enhancements, such as visual cues and intuitive navigation; improved user engagement and satisfaction.
May 2022 - May 2022:	**Quantum and Quantum Inspired algorithms**, LaTeX.
	○ Studied many quantum algorithms in fields ranging from molecular chemistry to machine learning.
	○ Analyzed the advantages of aforementioned quantum algorithms and the ways these techniques could improve pre-existing classical algorithms.
	○ Investigated the differences between complexity classes; classical and quantum and their implications in complexity theory.

Languages and Skills

Languages	Java, Python, Lean, OCaml, C++, C, Racket, Javascript, SQL, MySQL
Technologies	LaTeX, Mathematica, Git, Jupyter Notebooks, AWS, PyTorch, TensorFlow