Curriculum Vitae
Apr 2023

Hyunseo "Joelle" Cho

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Education

San Jose State University – College of Science — Aug 2020 - May 2023
B.S. in Applied Mathematics (Statistics Concentration) — GPA: 3.267/4.00

Sookmyung Girls' High School (Seoul, South Korea) — Mar 2015 – Feb 2018

Research Interests

Machine Learning Algorithms, Machine Learning in Biology, Consumer Behaviors

Working Paper in Progress

"Fast, Memory-Efficient Spectral Clustering with Cosine Similarity"

- **Abstract**

Spectral clustering is a popular and effective clustering method, but two major challenges are scalability and out of example extension. In this paper we extend the work of Chen (ICPR 2018) on the speed scalability of spectral clustering in the setting of cosine similarity to deal with massive data that are too large to be fully loaded into computer memory. We start by considering the case of a single batch of data drawn from the full set and develop a memory-efficient algorithm that learns the nonlinear embedding of spectral clustering with cosine similarity from the sample and extends it easily to the rest of the data as they are gradually loaded. We then consider the case when an additional second batch (besides the first batch) is available and present an efficient procedure to refine the spectral embedding using the new data. The combination of the two stages leads to an iterative algorithm that uses new batches of data (as they become available) to sequentially update the spectral embedding, with fixed memory and computational costs. Numerical experiments are conducted on real data to demonstrate the fast speed and excellent accuracy of the proposed algorithms.

- **Keywords:**

Spectral clustering, Cosine similarity, speed scalability, Memory scalability

Teaching Experience

San Jose State University – College of Science

- Calculus 2 Workshop (Undergraduate), Teaching Assistant – Fall 2021
- Calculus 1 Workshop (Undergraduate), Teaching Assistant – Fall 2021

Chungdahm Learning Institution, Seoul, South Korea

- English as a Second Language Instructor (Jan 2020 – June 2020)

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Relevant Coursework (at San Jose State University)

Applied Mathematics
(Statistics – Data Science)

Machine Learning in Large Data
Statistics for Bioinformatics
Mathematical Modeling for Life Sciences
Mathematical Modeling

Mathematical Cryptography
Mathematical Statistics
Probability Theory
Applied Probability and Statistics
Advanced Calculus
Calculus 3

Programming
Data Structure and Algorithms
R programming
Python & SQL

Business
Marketing Research with SPSS
System Analysis & Information
Marketing
Microeconomics/Macroeconomics

Technical Skills

Data Analysis/Visualization

- IBM SPSS Statistics, Tableau, Excel

- NumPy, Pandas, Matplotlib, Seaborn, Plotly, Biopython, Streamlit

Machine Learning
Scikit-Learn, Tensorflow, Pytorch

- **Supervised Learning** (Regression, KNN, SVM, Random Forest, LDA)
- Clustering (KMeans, Spectral Clustering, DBSCAN)
- Dimensionality Reduction, SGD

Neural Network

Programming
Python, R, SQL, MATLAB, LaTeX
JAVA, html, Linux

Business
Marketing Research, Social Media Analytics, Media Strategy, SDLC,
Business Documentations (BRD, FRD, URS), Lucid Chart (DFD, ERD, UML), Project Management Tools (Asana, Jira, MS Project), Agile, SCRUM, Qualtrics

Additional
Korean/English (Native), MS Office Suite, Adobe Creative, Golf, Hiking

Relevant Projects (at San Jose State University)

"Predicting Mice Class Based on 77 Protein Level" Jan 2023

- **Abstract**

The objective of this study was to predict genotypes of mice and their respective classes using protein levels as features. To achieve this, we performed exploratory data analysis and data preprocessing using Python. We employed machine learning techniques such as dimensionality reduction (t-SNE), decision tree, random forest, and KNN classification to predict genotypes of mice and eight different mice classes based on 77 different protein levels. Our results indicate

that we achieved an accuracy of 73% in predicting mice genotypes and 98% accuracy in predicting mice classes. We also visualized the results in 3-D, allowing for a better understanding of the data. Overall, our study provides insight into the utility of machine learning techniques for predicting genotypes and classes of mice based on protein levels, which may have important implications for future research in this field.

Keywords : Binary Classification, Multiclassification, Dimensionality Reduction(t-SNE)

"Mathematical Modeling on the Great Plague of London" Dec 2022

- **Abstract**

The Great Plague of London, also known as the Bubonic Plague, was a devastating epidemic that hit London in 1665. With a high mortality rate and a low recovery rate, it was a significant event in medical history due to the lack of knowledge at the time. Using an NSIRS model with 4 blocks, this paper provides a description of the disease and its modeling. The blocks consist of N (overall population), S (susceptible population), I (infectious population), and R (recovered population), and are linked through suitable labeled rates. Mortality rates stemmed from each of the SIR blocks. Symptoms of the disease included black patches on the skin, vomiting, swollen tongues, and agonizing headaches. The epidemic claimed the lives of an estimated 100,000 people out of a total population of 460,000 in London.

Keywords: Mathematical Modeling, NSIRS Model

"What are Consumer Perceptions of Metaverse?" Dec 2022

- **Abstract**

This study explores consumers' perception of the metaverse, with a particular focus on its use in education. A survey was conducted to examine consumers' intentions to use the metaverse, with 67 responses collected and analyzed using statistical methods in SPSS. The results show that consumers' perception of the metaverse's effectiveness positively influences their intention to use it, and the presence of a brand in the metaverse is associated with a more positive consumer perception. The study also finds that the metaverse has a positive impact on consumers in the education industry, and social media is an influential factor in increasing awareness of the metaverse. These findings suggest that the metaverse has great potential as a tool for education, and that brands can benefit from having a presence in this emerging space.

Keywords: Metaverse, Consumer Perception, Consumer Behavior

Professional Work Experience

Machine Learning Research Assistant Jan 2023 – Present

– SJSU Department of Mathematics & Statistics

- Assisted Professor in developing a neural network approach to scalable spectral clustering, specifically in cosine similarity.
- Validate the scalable spectral clustering methods through 100 simulations and visualize results for computational efficiency
- Working with Machine Learning applications, Model training/Inferencing on a Linux server
- Build reports and statistical models, and conduct statistical analysis as necessary for the data and reporting needs

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Administrative Assistant Jan 2022 – Present

– SJSU Department of Mathematics & Statistics

- Developed a Courses Catalog Analyzer using Python, resulting in streamlined administrative tasks and improved efficiency.
- Assisted faculty members in conducting administrative duties and other office events, ensuring smooth operations
- Collaborated with the Financial Team at the Dean's office to compile monthly financial and activity reports, providing accurate and up-to-date information for decision-making.
- Monitored office expenses, submitted purchase orders, and managed office budgets, ensuring financial accountability and proper allocation of resources.

Social Media Data Analyst/Coordinator Aug 2022 – Jan 2023

– NCAA Women's Basketball Team at SJSU

- Analyzed social media data and Developed a strategy to increase exposure to internal and external audiences by 15%
- Led social media initiatives by collaborating with coaches, athletes, and media teams, to create high-quality content.
- Developed skills in social media analytics, digital storytelling, photography/videography, digital art/illustrations, media strategy, and social media management.

Math Teaching Assistant Aug 2021 – Dec 2021

– SJSU Department of Mathematics & Statistics

- Plan and execute rigorous instruction of the Calculus 1 and 2 curricula while identifying subjects students struggle with.
- Honed time management skills through balancing 20+ hours a week to communicate with professors, curate specialized subject matter, and work individually with students

Leadership

Resident Advisor Aug 2021 – Dec 2021

– SJSU University Housing Services

- Counseled and advised 34 First year Student-Athletes while enforcing Campus Living Policies.
- Collaborated with other resident assistants to develop a successful hall community and program. Managed Administrative duties: Incident Reports, Maintenance Requests, Event Managing, etc.

International Peer Mentor May 2021 – Present

– SJSU International Student and Scholar Services

- Assisted international students to successfully get adapted to the U.S. college culture and systems and led the Peer Mentor teams to develop meetings/programs with our mentees.

VOLUNTEER

SK Young Volunteer Group SUNNY – South Korea Apr 2020 – Jun 2020

Samsung Universal Flash Storage Association (UFSA) Volunteer – Santa Clara, CA Aug 2018