FAN XU

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EDUCATION

University of Luxembourg, Luxembourg 06.2023-present
PhD candidate in Multimodal Machine Learning Department of Computer Science
Technical University of Munich, Germany 10.2019-05.2022
Master of Science in Mathematics in Data Science Department of Mathematics
Northwest University, China 09.2012-07.2016
Bachelor of Science in Financial Mathematics and Statistics School of Mathematics
Northwest University, China 09.2013-07.2015
Bachelor of Arts in Japanese Language and Literature (minor) School of Foreign Languages

THESIS PROJECTS

1. Master's Thesis — **Properties of Linear Operators Related to Gaussian Processes**:
   We investigate the spectral properties of the Hilbert-Schmidt operator defined on the kernels of Gaussian processes induced by neural networks to observe the evolving geometrical structure of data after transforming through networks and study the relationship between kernels and accuracy.

2. Bachelor's Thesis — **Graphic User Interface Design and Quadratic Surface Visualization**:
   We design an integrated GUI via MATLAB, through which we can visualize a variety of quadratic surfaces when entering corresponding values for parameters, helping people to better understand the geometric characteristics of specific objects.

WORK EXPERIENCE & INTERNSHIPS

New Oriental Education & Technology Group 05.2021-07.2021
An Intern as a Data Scientist (full-time) *Beijing, China*

· I was an intern as a data scientist, whose responsibilities were using SQL to manipulate data from databases to acquire desired statistical results, utilizing Python to cluster customers and predict future marketing sales based on Machine Learning/Deep Learning models, constructing a pipeline to form a log collecting system using tools from Apache, and developing a frontend statistical interface that can provide statistical diagnoses together with other colleagues by using JS, etc.

Bank of China 12.2016-06.2017
A Bank Clerk *Xi'an, China*

· I was an employee who conducted risk assessments and financial analyses based on statistical models using customer data in collaboration with other colleagues.

Bank of China 10.2016-12.2016
An Intern as Student Assistant (full-time) *Xi'an, China*

· I was an intern to help with personal transactions and to be familiar with the standard financial process and techniques of financial analysis.

SKILLS

Python	Proficient	**R**	Proficient	**MATLAB**	Proficient
SQL	Proficient	**SPARK**	Proficient	**LATEX**	Proficient
JAVA	Familiar	**Scala**	Familiar	**C++**	Fundamental

FOREIGN LANGUAGES

English (C2), German (B1), Japanese (N2)

BACHELOR STUDENT SUPERVISION

1. Semester Project: Clustering and Visualization of Embedding Spaces of Multimodal Learning Models (18.09.2023 - 23.12.2023)

   The student is expected to use multimodal models to extract features from datasets, and then harness dimensionality reduction methods to reduce the features and visualize them. After that, clustering methods were applied to explore the relationship between the parameters of the method and the incurred clustering results.

2. Semester Project: Evolution of Feature Spaces Across Deep Neural Network Layers (19.02.3024 - 01.06.2024)

   This investigation seeks to unravel the hierarchical feature extraction process inherent in deep neural networks, specifically focusing on how simple to complex features evolve from the initial to the final layers. By understanding this evolution, the study aims to shed light on the interpretability of deep learning models, elucidating how these models perceive and process input data to make predictions. The student will explore the theoretical underpinnings of feature representation within layers and the role of depth in learning representations. Additionally, the student will examine the implications of feature complexity evolution on the model's accuracy, robustness, and ability to generalize across different datasets.

PAPER REVIEWING

SIGIR 2024, CIKM 2024

OUTREACH ACTIVITIES

1. Ellis Summer School: Collaborative and Generative AI, Alto University, Finland (01.07.2024 — 05.07.2024)

2. Ellis Summer School: Probabilistic Machine Learning, University of Cambridge, UK (15.07.2024 — 19.07.2024)

CONFERENCE ATTENDANCE

1. Pending

PUBLICATIONS

1. Fan Xu and Luis A. Leiva. Learning to Align Multimodal Representations. 2024 (submitted)

   We analyzed embedding spaces of multimodal models and unimodal models to investigate the characteristics and goodness of alignment and potential factors that affect downstream tasks like information retrieval. We also used a neural network with contrastive loss to learn cosine similarity, from which we showed the advantages of contrastive learning for achieving better performance on downstream tasks.