Curriculum Vitae

Personal Data

Name:	Gu, Boyang
Date of Birth:	5th of January, 2001
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Education

Sep. 2023 - Sep. 2024	Computing (Artificial Intelligence and Machine Learning) (MSc 1YFT) at Imperial College London
Sep. 2019 - Jun 2023	Mathematics (MSci 4YFT) at Imperial College London Diploma: First Class Honours
Sep. 2016 - Jun. 2019	Nanjing Foreign Language School (NFLS) Diploma: Senior High Diploma
Sep. 2013 - Jun. 2016	High School Affiliated to Nanjing Normal University Shuren Campus Diploma: Junior High Diploma

Project Experience

- **Survey of large language model in the biomedical domain (Summer 2023)**

  We summarized the current progress of large language models' performance in biomedical natural language processing tasks. The survey discussed the performances, challenges, applications, and future works of biomedical LLMs. The paper is on https://arxiv.org/abs/2311.05112. The whole project can also be viewed at https://github.com/simon599/MedicalLLMsPracticalGuide

- **Using minimum energy path to study neural network structures under Prof. Anastasia Borovykh (Summer 2023)**

  Understanding how the neural network views its own input space and how the latent spaces are structured has value for explainability and robustness. We studied whether inputs from the same class can be connected by a continuous path, in original or latent representation space. The paper is on https://arxiv.org/abs/2311.06816

- **Machine Learning - Random Dynamic System Project about the Koopman theory under Prof. Jeroen Lamb and Dr. Kevin Webster (Spring 2023)**

  In this project, I studied the Koopman theory, a theory about the Koopman operator. I discussed the Dynamic Mode Decomposition algorithm and its relation to the Koopman operator. I also studied some data-driven machine-learning models to find eigenpairs of the Koopman operator. The whole project can be viewed at https://drive.google.com/file/d/1oWsX_pehgdp0ygK3d056qtFl4s5AJzVD/view?usp=sharing.

- **Planning for Autonomous Robots Summer Program under Professor Nick Hawes (Summer 2022)**

  In this project, we implement an environment and solve the Job Shop Scheduling Problem by the Q-learning algorithm. The paper is on https://arxiv.org/abs/2210.03674

and has been accepted by the 3rd International Conference on Signal Processing and Machine Learning (CONF-SPML 2023). The whole project can also be viewed at https://github.com/MZhouke/RL-Research-2022-Summer.

- Undergraduate Research Opportunities Programme about representation theory
under Prof. Martin Liebeck (Summer 2021)

  In this programme, I studied Thompson's Conjecture in Representation Theory. I checked the conjecture to projective special linear groups and alternative groups. The whole project can be viewed at
  https://drive.google.com/file/d/1efptgJzgWJQ5-BXE43-20rgtxV4s_vZJ/view?usp=sharing.

- Group Research Project about Hyperbolic Shapes
under Dr. Stergios Antonakoudis (Summer 2021)

  In this group research, we studied the Riemann surfaces, the Uniformisation Theorem, and Poincar´e's Polygon Theorem. The whole project can be viewed at
  https://drive.google.com/file/d/1WU_JIXODcuiOej3Tnf7VBraxcqENZv2u/view?usp=sharing.

COMPUTER SKILLS

- Python, MatLab, and R.

- Algorithms and topics of data science and reinforcement learning, including but not limited to linear regression, k-nearest neighbours, logistic regression, naive Bayes classifier, decision trees and random forests, support vector machines (SVMs), neural networks, k-means and hierarchical clustering, spectral methods for dimensionality reduction, and graph-based learning.

- Algorithms for autonomous robots, including but not limited to uninformed and informed graph search, classical planning, planning under uncertainty using MDPs, and sampling-based motion planning.

- Linear algebra algorithms in Python, including but not limited to QR and LU decomposition, Krylov subspace method, Arnoldi iteration, GMRES, power iteration, inverse iteration, Rayleigh quotient iteration, and simultaneous iteration.

- IDA/EDA techniques, including but not limited to various regression models, PCA analysis, configuration fitting, density estimation, multiresolution analysis, projection pursuit or PPR, independent component analysis (ICA), bootstrapping, and bagging.

PUBLICATIONS

- **B. Gu** and A. Borovykh, "On original and latent space connectivity in deep neural networks," *arXiv preprint arXiv:2311.06816*, 2023.

- H. Zhou, **B. Gu**, and C. Jin, "Reinforcement learning approach for multi-agent flexible scheduling problems," in *Journal of Physics: Conference Series*, IOP Publishing, vol. 2580, 2023, p. 012053.

- H. Zhou, **B. Gu**, X. Zou, Y. Li, S. S. Chen, P. Zhou, J. Liu, Y. Hua, C. Mao, X. Wu, *et al.*, "A survey of large language models in medicine: Progress, application, and challenge," *arXiv preprint arXiv:2311.05112*, 2023.

AWARDS AND ACHIEVEMENTS

- Dean's list in Year 1 and 2 at Imperial College London, 2020 & 2021.

OTHER EXPERIENCES

- Peer Tutor for Year 1 students at Imperial College London, 2022-2023.