Geng Xinyu

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RESEARCH INTERESTS

Deep Learning, Computer Vision, Capsule Network, Multimodal Transformer.....

EDUCATION

Harbin Institute of Technology, Shenzhen, China — Sep, 2022 — Jan, 2025
Master's Degree in Electronic Information — Cumulative GPA: 3.365/4.0 — Rank: 12/82
Main Courses: Artificial neural network and control (96/100 A+), Machine learning (90/100 A), System identification (96/100 A+), Matrix analysis (84/100 A-), Numerical analysis (84/100 A-).

University of Electronic Science and Technology of China, Chengdu, China — Sep, 2018 — Jun, 2022
Bachelor's Degree in Automation — Cumulative GPA: 3.61/4.0
Main Courses: Linear Algebra, C Programming Language, Principle of Automatic Control, Modern Control Theory, Artificial Intelligence, Microcomputer principle and interface technology.

PUBLICATIONS

[C1] **X Geng**, J Wang, J Gong, et al. OrthCaps: An Orthogonal CapsNet with Sparse Attention Routing and Pruning[C]. 2024 IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR). (Accpeted)

[C2] **X Geng**, J Wang, J Xu, et al. ParseCaps: An Interpretable Parsing Capsule Network for Medical Image Classification[C]. 2024 In Advances in Neural Information Processing Systems (NeurIPS). (Under review)

[C3] J Wang, **X Geng**, J Xu. Nonlinear Kalman Filtering based on Self-Attention Mechanism and Lattice Trajectory Piecewise Linear Approximation[C]. 2024 IEEE Conference on Decision and Control (CDC). (Under review)

[C4] J Tian, X Li, Z Ji, **X Geng**, et al. Sub-hundred-femtosecond atmospheric radio-frequency transfer with frequency comb using fast optical phase compensation[C]. 2021 IEEE 21st International Conference on Communication Technology (ICCT). (Accpeted)

RESEARCH EXPERIENCE

Orthogonal Capsule Network and Its Application in Imaging — Shenzhen, China
Core Member — Sup 2022 — Dec 2023

- Developed a novel capsule network that reduces redundant capsules through pruning.
- Incorporated orthogonality into sparse attention routing to maintain pruning benefits during back propagation.
- Achieved state-of-the-art performance with significantly fewer parameters.
- Wrote a paper accpeted by CVPR 2024 (C1).

Interpretable Capsule Network and Its Application in Medical Imaging — Shenzhen, China
Core Member — Sup 2023 — Now

- Proposed sparse axial attention routing and analytical convolutional capsule layer to align with a parse tree structure.
- Introduced conceptual capsule layer and corresponding loss function to enhance the interpretability of capsule networks.
- Wrote a paper and submitted it to NeurIPS 2024 (C2)

Nonlinear Kalman Filtering based on Self-Attention Mechanism and Piecewise Linear Approximation Shenzhen, China
Core Member — Apr 2023 — Now

- Integrated neural networks with control systems by combining traditional control methods and neural network techniques.
- Utilized attention blocks to estimate Kalman gain, enhancing the accuracy and performance of control algorithms.
- Wrote a paper and submitted it to CDC 2024 (C3)

PROJECTS

Chinese Academy of Sciences college students innovative training program — Chengdu, China
Student Researcher — Jan 2020 — Jan 2021

- Studied underwater laser technology and conducted experiments.

- Participated in a paper (C4).

Columbia University Summer Study Abroad Program New York, USA
Exchange Student Jul 2019 — Aug 2019

- Completed courses, passed the examination and obtained the certificate.
- This experience cultivated my ability to study and live independently in a foreign country.

AWARDS

- Special academic scholarship from Harbin Institute of Technology 2023
- Third-class admission scholarship from Harbin Institute of Technology 2022
- School Scholarship from University of Electronic Science and Technology of China 2018-2021
- Third prize of "Challenge Cup" National College Students' Technology Works Competition 2020
- Third prize of "Chuangyouth" National College Student Entrepreneurship Competition 2020

SKILLS

- **Programming:** Python (PyTorch, Tensorflow), MATLAB, LATEX
- **Language:** Chinese (naive), English (CET-4: 615, CET-6: 563)