Yinzhu Jin

yj3cz@virginia.edu · (434)328-9748 · 85 Engineers Way, Charlottesville, VA

Research Summary

Ph.D. candidate in Computer Science at the University of Virginia, advised by P. Thomas Fletcher, specializing in explainable AI, generative modeling, and medical image analysis. My work focuses on developing interpretable deep learning models and innovative generative frameworks, with a focus on biomedical applications.

Education

University of Virginia, Charlottesville, USA 2020 – present

Ph.D in Computer Science

University of Virginia, Charlottesville, USA 2019 – 2022

Master of Computer Science (En Route)

Beihang University, Beijing, China 2014 – 2019

B.Eng. in Computer Science and Technology

Publication

- **Feature Attribution for Deep Learning Models through Total Variance Decomposition.**
  Yinzhu Jin, Shen Zhu, P. Thomas Fletcher.
  Medical Imaging with Deep Learning, 2025.
  Introduces a statistically grounded method for feature attribution by decomposing model decision variance, enhancing interpretability in deep learning models.
- **Point-Based Shape Representation Generation with a Correspondence-Preserving Diffusion Model.**
  Shen Zhu, Yinzhu Jin, P. Thomas Fletcher.
  Medical Imaging with Deep Learning, 2025.
  Presents a diffusion model that generates point-based shape representations while preserving anatomical correspondences, addressing limitations in traditional deep learning methods.
- **Counterfactual Explanations in the Space of Diffeomorphisms.**
  Yinzhu Jin, Nivetha Jayakumar, Nian Wu, Baba C. Vemuri, Miaomiao Zhang, P. Thomas Fletcher.
  Under review, 2025.
  Proposes a method to generate counterfactual explanations with diffusion models in diffeomorphism space, ensuring anatomically plausible transformations.
- **Likely Interpolants in Generative Models.**
  Under review, 2025.
  Frederik Möbius Rygaard, Shen Zhu, Yinzhu Jin, Søren Hauberg, P. Thomas Fletcher
  Developes a general-purpose interpolation method for generative models that computes geodesic-like curves aligned with data distributions.
- **MedIL: Implicit Latent Spaces for Generating Heterogeneous Medical Images at Arbitrary Resolutions.**
  Tyler Spears, Shen Zhu, Yinzhu Jin, Aman Shrivastava, P. Thomas Fletcher.
  Deep Generative Models Workshop @ MICCAI, 2025.
  Introduces MedIL, an autoencoder utilizing implicit neural representations to generate medical images at arbitrary resolutions, preserving fine anatomical details without resampling.
- **RealDeal: Enhancing Realism and Details in Brain Image Generation via Image-to-Image Diffusion Models.**
  Shen Zhu, Yinzhu Jin, Tyler Spears, Ifrah Zawar, P. Thomas Fletcher.
  Deep Generative Models Workshop @ MICCAI, 2025.
  Proposes an image-to-image diffusion model to enhance the anatomical details and texture fidelity of brain MRIs generated by latent diffusion models.
- **Learning Group Actions on Latent Representations.**
  Yinzhu Jin, Aman Shrivastava, P. Thomas Fletcher.
  Advances in Neural Information Processing Systems, 2024.

Proposes learning group actions directly in the latent space of autoencoders, enhancing the model's ability to capture real-world symmetries and transformations.

- **Implications of data topology for deep generative models.**
  Yinzhu Jin, Rory McDaniel, N. Joseph Tatro, Michael J. Catanzaro, Abraham D. Smith, Paul Bendich, Matthew B. Dwyer, P. Thomas Fletcher.
  Frontiers in Computer Science, 2024.
  Demonstrates that deep generative models struggle with data distributions possessing non-trivial topologies, highlighting limitations in data generation and interpolation.
- **Measuring Feature Dependency of Neural Networks by Collapsing Feature Dimensions in The Data Manifold.**
  Yinzhu Jin, Matthew B. Dwyer, P. Thomas Fletcher.
  IEEE International Symposium on Biomedical Imaging, 2024. (Oral)
  Introduces a technique to assess neural network feature dependency by collapsing specific feature dimensions on the data manifold and observing performance degradation.
- **Feature gradient flow for interpreting deep neural networks in head and neck cancer prediction.**
  Yinzhu Jin, Jonathan C. Garneau, P. Thomas Fletcher.
  IEEE International Symposium on Biomedical Imaging, 2022.
  Presents 'feature gradient flow,' a method that aligns interpretable features with model gradient flows to elucidate decision-making in cancer prediction models.

Ongoing Projects

- **Improved Style Transfer for 4D Data using Gaussian Splatter**
  Working on a framework to perform style transfer on 4D data (3D plus time) using motion tracking on Gaussian splatters.
- **Limitation of embedding based generative model evaluation metrics**
  Working on demonstrating the inherent limitations of embedding based evaluation metrics.

Services

Reviewer:

- (Ongoing) Advances in Neural Information Processing Systems, 2025.
- Medical Image Computing and Computer-Assisted Intervention, 2025.
- International Symposium on Biomedical Imaging (TPC reviewer), 2024.
- International Symposium on Biomedical Imaging, 2023.
- International Symposium on Biomedical Imaging, 2022.

Teaching:

- **Geometry of Data.** Teaching Assistant. *University of Virginia, Fall 2022.*
- **Foundation of Data Analysis.** Teaching Assistant. *University of Virginia, Spring 2022.*
- **Geometry of Data.** Teaching Assistant. *University of Virginia, Fall 2021.*
- **Foundation of Data Analysis.** Teaching Assistant. *University of Virginia, Spring 2021.*

Volunteer:

- **ACM Capital Region Celebration of Women in Computing (CAPWIC).** Guide people to the event venue. *University of Virginia, April 2024.*
- **AHS Science Fair.** Judged student science projects as part of the Charlottesville Community Science Fair event. *Albemarle High School, February 2024.*

Skills

- Main interests: Explainable AI, Medical Image Analysis, Generative Modeling, Computer Vision.
- Programming Languages: Python, Java, C, LaTeX, MATLAB, Verilog.
- Have experiences in: NLP (including LLM), 3D Gaussian splatting.
- Languages: English - Fluent, Mandarin - Native speaker, Korean - Native speaker, Japanese - Fluent.