# Jinge Wang

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## Education

**West Virginia University** *WV, U.S.*

Ph.D. in Computer Science *08/2016 - 05/2023*

- *Advisor:* Prof. Xin Li and Prof. Shuo Wang
- *Courses:* Advanced Analysis-Algorithms, Pattern Recognition, Advanced Data Mining, Application of Neural Networks, Empirical Methods in SENG/CS, Advanced Networking Concepts

Master of Science in Statistics *08/2013 - 12/2015*

- *Courses:* SAS Programming, Statistical Methods, Data Analysis, Design of Experiments, Applied Regression Analysis, Categorical Data Analysis

Bachelor of Management in Accounting Anhui University of Finance and Economics Anhui, China 09/2007 - 07/2011

## Experience

**Polygan Heath Analytics** *Remote*

Data Scientist *10/2024 - present*

- *Keywords:* Python, LLM, AI, ML, RWD
- *Primary Work:* Develop AI-driven and Real-World Data (RWD) solutions aimed at advancing healthcare and clinical research.

**West Virginia University** *Morgantown, WV*

Post Doctoral Fellow *10/2023 - 9/2024*

- *Keywords:* Python, R, ChatGPT, LLM, AI
- *Primary Work:* Study on the integration of artificial intelligence and bioinformatics.

**HaoHan Technologies, LLC** *Clarksville, MD*

Data Analyst Internship *05/2023 – 10/2023*

- *Keywords:* SAS, R, MS Access, SQL, Data Modeling, Regression, Explanatory Analysis.
- *Primary Work:* Involved in the project of analyzing county-level public mental health Medicaid data.

**West Virginia University** *Morgantown, WV*

Graduate Research Assistant *01/2018 - 05/2023*

- *Keywords:* Python, Matlab, Pytorch, Tensorflow, Matplotlib, Pandas, Scikit-learn, Scipy, Numpy, Ubuntu Linux, Git.
- *Primary Work:* Worked on image processing and deep learning, including data processing, neural network design and manipulation, statistical analysis, result visualization, and neural network interpretability.

## Projects

**Dermoscopic Images Classified by GPT-4v** *2024 - 2024*

- *Keywords:* LLM, GPT-4v, RAG, few-shot learning
- *Primary Work:* Boosting GPT-4V's Accuracy in Dermoscopic Classification with Few-Shot Learning.
    - Diagnose melanoma through GPT4 API, cooperating with few-shot learning and RAG.
    - Developed an algorithm using similarity to pick the reference, which helps to improve the diagnosis accuracy by 25%
    - *"Boosting GPT-4V's Accuracy in Dermoscopic Classification with Few-Shot Learning."* (**Wang** *et al. 2024*).

**Scientific Figures Interpreted by Chatbots** *2023 - 2024*

- *Keywords:* LLM, Chatbots, Prompt Engineering
- *Primary Work:* Systematically evaluated the capability of GPT-4V to interpret scientific figures.
    - Tested GPT-4V in reading scientific figures with cancer study use cases.
    - Established quantitative metrics to evaluate the model's image reading ability.
    - *"Scientific figures interpreted by ChatGPT: strengths in plot recognition and limits in color perception."* (**Wang** *et al. 2024*).

**Critical Period Analysis** *2022 - 2023*

- *Keywords:* Face and Facial landmarks detection, Foveation Imaging, Grad-CAM, Knowledge Distillation, Attention Transfer
- *Primary Work:* Discover the computational properties and mechanisms of critical periods for face recognition
    - Conducted a series of in silico experiments with DNNs to systematically investigate the face learning process
    - Identified a critical period during training the DNN. Provided a computational account that explained the properties of critical periods. Demonstrated an alternative approach to recover the model outside the critical period partially.
    - *"A critical period for developing face recognition."* (**Wang** *et al. 2024*).

### Face Identity Coding
*2021 - 2022*

- **Keywords:** ANOVA, SVM, GAN, Neural Network Manipulation
- **Primary Work:** Provide a computational model for understanding the neural mechanisms underlying face recognition.
  - Established a DNN model to simulate the primate hierarchical visual pathway and compared the neural activity patterns in the DNN with the activity patterns in the brains of macaque monkeys during a face recognition task.
  - Proved that DNN was able to replicate the neural coding strategies used by the primate brain to represent face identity.
  - *"Face identity coding in the deep neural network and primate brain."* (**Wang** et al. 2022).

### FMRI Signal Reconstruction
*2020 - 2021*

- **Keywords:** FMRI, Brain Signal Reconstruction, VAE-GAN
- **Primary Work:** Establish a model to reconstruct visual stimuli with FMRI signal
  - Use VAE-GAN to reconstruct the face images from preprocessed FMRI signal.
  - The validated generative model used as the prototype for reconstruction with single-unit recording data.

### Feature-based Encoding of Face Identity
*2020 - 2021*

- **Keywords:** Face encoding, Feature extraction, VGG-Face, t-SNE
- **Primary Work:** Provide a computational model for a neuroscience study.
  - Extracted features from complex natural face images using DNNs and projecting them onto the feature space constructed by DNN feature reduction.
  - Assisted the neuroscience researcher to reveal a novel face code in the human brain that neurons encode visually similar identities.
  - *"Feature-based encoding of face identity by single neurons in the human amygdala and hippocampus"* (Cao, **Wang** et al. 2024).

### Weed Detection
*2019 - 2020*

- **Keywords:** GUI, Image Processing (k-means, mean-shift), Data Collection (infrared/hyperspectral camera)
- **Primary Work:** Develop an automatic tool for weed detection.
  - Developed a Matlab application with image processing algorithms such as K-means, mean-shift, etc. Created a user-friendly GUI for the *application with Matlab.*
  - Collected more data and then improved the quality of detection with a two-stage CNN approach under the PyTorch platform.
  - *"Morning Glory Flower Detection in Aerial Images Using Semi-Supervised Segmentation with Gaussian Mixture Models."* (Valicharla, **Wang** et al. 2024)

## Publications

- **Jinge Wang**, Zachary Zinn, Dong Xu, and Gangqing Hu. "Limitations and risks of custom GPTs in dermatology. Comment on 'ReconGPT: A novel artificial intelligence tool and its potential use in post-Mohs reconstructive decision-making'" Journal of the American Academy of Dermatology (2024).
- **Jinge Wang**, and Gangqing Hu. "Boosting GPT-4V's accuracy in dermoscopic classification with few-shot learning. Comment on 'can ChatGPT vision diagnose melanoma? An exploratory diagnostic accuracy study'" Journal of the American Academy of Dermatology (2024).
- Zifeng Feng, Gangqing Hu, Bingxin Li, and **Jinge Wang**. "Unleashing the Power of ChatGPT in Finance Research: Opportunities and Challenges." Under review.
- **Jinge Wang**, Zien Cheng, Qiuming Yao, Li Liu, Dong Xu, and Gangqing Hu. "Bioinformatics and Biomedical Informatics with ChatGPT: Year One Review." Quantitative Biology (2024).
- Runnan Cao, **Jinge Wang**, Chujun Lin, Emanuela De Falco, Alina Peter, Hernan G. Rey, Peter Brunner, Jon T Willie, Ueli Rutishauser, Xin Li, Nicholas J. Brandmeir, and Shuo Wang "Feature-based encoding of face identity by single neurons in the human amygdala and hippocampus" Under review.
- **Jinge Wang**, Qing Ye, Li Liu, Xin Li, Nancy Lan Guo, and Gangqing Hu. "Scientific Figures Interpreted by ChatGPT: Strengths in Plot Recognition, Limits in Color Perception and Quantitative Analysis." NPJ Precision Oncology 8.1 (2024): 84.
- Valicharla, Sruthi Keerthi, **Jinge Wang**, Xin Li, Srikanth Gururajan, Roghaiyeh Karimzadeh, and Yong-Lak Park. "Morning Glory Flower Detection in Aerial Images Using Semi-Supervised Segmentation with Gaussian Mixture Models." AgriEngineering 6.1 (2024): 555-573.
- **Jinge Wang**, Runnan Cao, Puneeth Chakravarthula, Xin Li, and Shuo Wang. "A critical period for developing face recognition" Patterns 5.2 (2024).
- Runnan Cao, **Jinge Wang**, Peter Brunner, Jon T Willie, Xin Li, Ueli Rutishauser, Nicholas J Brandmeir, and Shuo Wang "Neural mechanisms of face familiarity and learning in the human amygdala and hippocampus." Cell reports 43.1 (2024).
- **Jinge Wang**, Runnan Cao, Nicholas J. Brandmeir, Xin Li, and Shuo Wang. "Face identity coding in the deep neural network and primate brain." Communications Biology 5, no. 1 (2022): 1-16.
- Dario Fuoli, Zhiwu Huang, Shuhang Gu, Radu Timofte, Arnau Raventos, Aryan Esfandiari, Salah Karout, Xuan Xu, Xin Li, Xin Xiong, **Jinge Wang**, Pablo Navarrete Michelini , Wenhao Zhang, Dongyang Zhang, Hanwei Zhu, Dan Xia, Haoyu Chen, Jinjin Gu, Zhi Zhang, Tongtong Zhao, Shanshan Zhao, Kazutoshi Akita, Norimichi Ukita, Hrishikesh P S, Densen Puthussery, and Jiji C V. "AIM 2020 challenge on video extreme super-resolution: methods and results.(2020)." Proceedings of the 16th European Conference on Computer Vision, Glasgow, Scotland. 2020.
- Xu, Xuan, Xin Xiong, **Jinge Wang**, and Xin Li. "Deformable kernel convolutional network for video extreme super-resolution." Computer Vision–ECCV 2020 Workshops: Glasgow, UK, August 23–28, 2020, Proceedings, Part IV 16. Springer International Publishing, 2020.

## Skills

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| **Programming** | LLM, ChatGPT, Python (Pandas, PyTorch, NumPy, Scikit-learn. etc.), Matlab, R, SAS |
| **Miscellaneous** | Linux, LaTeX, Microsoft Office, Git |

# Achievements

- Oral and poster presentations at TRCCC 2024
- ECCV 2020 AIM: Advances in Image Manipulation workshop and challenges Runner-Up Award
- SAS Certified Base Programmer for SAS 9
- SAS Certified Advanced Programmer for SAS 9
- **Certificate**: Prompt Engineering for ChatGPT - Vanderbilt University
- **Certificate**: Python Essentials for MLOps - Duke University
- **Certificate**: Supervised Machine Learning: Regression and Classification - DeepLearning.AI, Stanford University
- **Certificate**: Introduction to Large Language Models - Google Cloud
- **Certificate**: Introduction to Healthcare - Stanford University