Jiayi Chen

177 Yellowstone DR APT 308, Charlottesville, VA 22903, United States

jc4td@virginia.edu | (+1) 434-234-7342

Education

University of Virginia	**United States**
Ph.D. Candidate in *Computer Science* (GPA 4.0/4.0)	08/2018 – 12/2023(Expected)
Xi'an Jiaotong University	**China**
M.S. in *Pattern Recognition & Intelligent System* and *Control Science & Engineering*	09/2015 – 06/2018
Xi'an Jiaotong University	**China**
B. E. in *Automation Engineering*	09/2011 – 06/2015
Special Class for the Gifted Young of China	09/2009 – 06/2011

Research Interests

2018 – Present: **Graph** Mining, **Multimodal** Machine Learning (Vision, Language, Audio, Graph, and Spatio-temporal data), **Few-shot** Learning, **Meta** Learning, **Federated** Learning, **Disentangled** Representation Learning, **AutoML**

2015 – 2018: Computer Vision, Robotics, Image Processing

Technical Skills

Programming Languages: **Python** (6+ years), C++, Matlab, SQL, HTML, Java

Tools & Platforms: **PyTorch** (5+ years), **Tensorflow**, **Jax**, Flax, Haiku, OpenAI Gym, Robotic Operating System

Deep Neural Networks: Transformers, Viz Transformers, Graphormers, Large Language Models, Graph Neural Networks, Deep Generative Models (VAEs, GANs, etc.), Encoder-Decoder, Reinforcement Learning models

Selected Publications (Since 2020)

[1] **Jiayi Chen**, Mia Shu, Guangzhi Xiong, Aidong Zhang. "HiDenMST: toward hierarchical disentanglement of interactive behaviors for multimodal spatio-temporal data with incompleteness". Under review, 2023.

[2] **Jiayi Chen**, Hanjun Dai, Bo Dai, Aidong Zhang, Wei Wei. "On multimodal few-shot learning for visually-rich document entity retrieval". Under review, 2023.

[3] **Jiayi Chen**, Mia Shu, Aidong Zhang. "Causality-aware missing-value imputation and future prediction for multivariate time-series". Under review, 2022.

[4] **Jiayi Chen**, Aidong Zhang. "FedMSplit: correlation-adaptive federated multitask learning across multimodal split networks". The *28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (KDD), 2022. (research track)

[5] **Jiayi Chen**, Aidong Zhang. "Adaptive topological transduction for hybrid few-shot learning". *Proceedings of the International World Wide Web Conference* (WWW), 2022. (research track)

[6] **Jiayi Chen**, Aidong Zhang. "HetMAML: task-heterogeneous model-agnostic meta-learning for few-shot learning across modalities". *ACM International Conference on Information and Knowledge Management* (CIKM), 2021. (full paper)

[7] **Jiayi Chen**, Aidong Zhang. "HGMF: heterogeneous graph-based fusion for multimodal data with incompleteness". The *26th ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (KDD), 2020. (research track)

Work Experiences

Google LLC	**Mountain View, CA**
Software Engineer Intern (PhD), Cloud *Document AI* & Google *Brain* Teams	06/2022 – 09/2022

- Worked on a **research project** "**Few-shot** multimodal entity retrieval from visually rich documents that consists of *text, layout structure* and *image* modalities". The task aims to *localize* and *recognize* novel-category entities from new document types given only a few labelled documents. I used **meta-learning** on the basic of a Large Multimodal **Transformer** Model encoder to obtain domain-invariant knowledge for the downstream task, which can fast adapt to novel task distributions.
- Implemented a meta-learning **library** that covers i) an efficient and balanced task loader; ii) several popular meta-training approaches and a **proposed** method that outperforms baselines; iii) a bi-level and nested parallel meta-training framework that runs on **TPU** topology; iv) visualization and evaluation metrics (*tools*: **Jax**, **Tensorflow**, **Flax**).
- Tested and documented the designed framework, and ran extensive Xmanager experiments.
- *Accomplishment*: a written **paper** submitted to ACL'23 conference (currently under review)

Research & Project Experiences

On Multi-modality Understanding for Semi-/Unsupervised, Few-shot, or Generative Tasks   05/2019 – Present
- Proposed a graph-factorized **Gaussian Process VAE** to **disentangle** the underlying dynamic systems of partially observed **spatio-temporal dynamics** between multiple subjects; and then robustly **generate** imputed data or future data based on learned dientangled representations.
- Proposed a heterogeneous hypernode **graph** for the **multi-task** multimodal alignment task.
- Proposed a context-aware **meta-learning** approach for fast knowledge distillation from multimodal **few-shot tasks** with hetergeneous domain shifts and modality types.
- Proposed a dynamic graph-based **federated learning** approach for **privacy-preserving personalized task adaptation** with hetergeneous domain shifts and modality types.

Toward Emotional Chatbot: Natural Language Generation via Conditional Generative Models   11/2018 – 03/2019
- *Keywords*: NLP, Natural Language Generation, Reinforcement Learning, GANs, VAEs, Sequential Data Generation
- Generated sentences whose semantics or attributes (e.g., emotional tones) can be controlled; **adversarially** trained the sequential data generator with conditional GAN and VAE, while using **reinforcement learning (RL)** to promote the authenticity of generated data.

Knowledge-guided Neural Style Transfer of 3D Scene Models   03/2017 – 02/2018
- *Keywords*: Computer Vision, Neural Style Transfer
- Studied human knowledge-guided **neural style transfer**, focusing on improving the illusion of space in generated images by simulating how artists harness skills to understand and reproduce a 3D scene (e.g., geometric structures, lighting and shallow); also studied 3D non-photorealistic rendering based on the neural style transfer paradigm.
- Proposed an illumination-guided deep alignment method using CNN, Lighting Path Expression, and PatchMatch.
- Created a 2D-3D dataset, including 3D models rendered by multiple types of lighting (by Maya), 2D photos annotated by lighting and segmentation (by Photoshop and Matlab), and a hand-drawn stylistic material for testing (CorelPainter).

Deep Reinforcement Learning for Modeling Human-like Car-Following Behavior (*course project*)   Fall 2020
- *Keywords*: Deep Reinforcement Learning
- Built an **actor-critic reinforcement learning** framework to learn an optimal car-following behavior from empirical data; implemented deep deterministic policy gradient algorithm to learn the continuous-control policy network.

Vision-guided Drone Autonomous Navigation & Search-and-rescue System   01/2016 – 12/2016
- *Keywords*: Robot Manipulation, Robot Perception, 3D Computer Vision, C++, Robotic Operating System
- Developed a real-time **vision**-based module on drone system for **object detection** and **3D localization**, computing the 3D poses of objects from 2D images using real-time camera gimbal, Homography and 3D Geometry (*tools*: **C++**).
- Developed an autonomous **tracking-and-landing** module for landing on a moving vehicle, and developed a platform to manage the interaction between multiple threads of sensors and controllers (*tools*: **Python, Linux, ROS**).
- Achieved safe autonomous navigation during the mission and ≤10cm landing accuracy.
- Won the **4th** place from 130+ international teams in "2016 DJI Developer Challenge", NY, USA (*as a team of three*).

Efficient Human Action Recognition based on Video Compression Domain   12/2014 – 05/2015
- *Keywords*: Compressed Video, Human Action Recognition, Video, Spatiotemporal Dynamics, C++
- Extracted motion vectors (MV) from MPEG-4 video bitstreams; proposed an MV-based method to **fast** detect Spatial-Temporal Interest Points from video bitstream instead of from the decoded video; formed action features using BoW and GMM; trained traditional classifiers like SVM (*tools:* **Matlab, C++, OpenCV, ffmpeg, Linux**).

Relevant Courses

Machine Learning and Computer Vision (A+), Natural Language Processing (A+), Reinforcement Learning (A+), Database Systems (A), Graph Mining (A+), Statistical Learning and Graphical Models (A), Computer Graphics (A+), Software Artifacts (A), Autonomous Mobile Robot (A+), Data Structures and Algorithms (A+), Computer Network (A), etc.

Selected Awards

4th place in world **Top10** in "2016 **International** Contest of DJI Drone Developer Challenge" (*Top 3%, Rank: 4/130*)
2nd prize in "2016 China **National** Graduate Contest on Smart-City Technology and Creative Design"
1st prize in "2015 China **National** Contest on Traffic-Scene Image Processing"
Others: 2022 KDD Student Award; 2018 Outstanding Master's Thesis Award; 2016 Industrial Scholarship (*Top 3%*)