GUANGYU SUN

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EDUCATION

University of Central Florida *Aug. 2022 - Now*
Ph.D. student in Computer Science.

University of Rochester *Aug. 2020 - May. 2022*
Master of Science in Computer Science. GPA: 3.96/4.0

University of Missouri-Columbia *Aug. 2017 - May. 2019*
Bachelor of Science in Computer Science. GPA: 3.65/4.0

Shandong University *Sep. 2015 - Jun. 2017*
Bachelor of Engineering in Computer Science and Technology. GPA: 4.13/5.0

RESEARCH INTERESTS

Federated leaning, Multi-modality learning, Self-supervised learning, Few-shot learning, Video processing, ...

PUBLICATIONS

Conquering the Communication Constraints to Enable Large Pre-Trained Models in Federated Learning
Guangyu Sun, Matias Mendieta, Taojiannan Yang, Chen Chen *arXiv*

Anomaly Crossing: A New Method for Video Anomaly Detection as Cross-domain Few-shot Learning
Guangyu Sun*, Zhang Liu*, Lianggong Wen, Jing Shi, Chenliang Xu. (* joint 1st authors) *arXiv*

Deep Learning Detection of Inaccurate Smart Electricity Meters: A Case Study
Ming Liu*, Dongpeng Liu*, **Guangyu Sun**, Yi Zhao, Duolin Wang, Fangxing Liu, Xiang Fang, Qing He, Dong Xu. (* joint 1st authors) *IEEE Industrial Electronics Magazine (Volume: 14, Issue: 4, Dec. 2020)*

Assessing Environmental Oil Spill Based on Fluorescence Images of Water Samples and Deep Learning
Dongpeng Liu*, Ming Liu*, **Guangyu Sun**, Zhiqian Zhou, Duolin Wang, Fei He, Jiaxin Li, Jiacheng Xie, Ryan Gettler, Eric Brunson, Jeffery Steevens, Dong Xu. (* joint 1st authors)
Journal of Environmental Informatics (Accepted)

RESEARCH EXPERIENCE

Center for Research in Computer Vision (CRCV), University of Central Florida *Aug. 2022 - Now*
ORC Fellow

- **Conquering the Communication Constraints to Enable Large Pre-Trained Models in Federated Learning**
  Large pre-trained models are not commonly used in federated learning due to large communication costs. To tackle the communication challenge and enable the large pre-trained models in federated learning, we...
  - Introduced a new federated learning framework, FedPEFT, to enable large pre-trained models and meanwhile address the communication challenge in federated learning.
  - Presented a systemic study of FedPEFT with various fine-tuning methods under heterogeneous data distributions, client availability ratios, and increasing degrees of domain gap relative to the pre-trained representations on various datasets.
  - Analyzed the robustness of FedPEFT among low-data regimes, different privacy operations, and an ablation study with different pre-trained backbones.

University of Rochester *Aug. 2020 - May 2022*
Research Assistant

- **Anomaly Crossing: New Horizons for Video Anomaly Detection as Cross-domain Few-shot Learning**
  Negative samples are neglected in existing anomaly detection methods. To leverage these abnormal samples, we propose a new method to formulate the anomaly detection task as a cross-domain few-shot learning task. In this project, we...
  - Devised a new pipeline Anomaly Crossing applying self-supervised learning and contextual modeling as a baseline.
  - Achieved state-of-the-art on DoTA and UCF-Crime datasets.
  - (Under collaboration with Corning Inc.)

- **Anomaly Anticipation via Tracking-ViVit**
  Current typical transformer-based methods use patches as the tokens. Considering the position and feature of the objects provide crucial information for anomaly anticipation, we...
  - Built a spatio-temporal vision transformer leveraging tracklet for anomaly anticipation.
  - Explored the impacts of object tokens and tracklets in anomaly anticipation.
  - (Under collaboration with Corning Inc.)
- **Weakly Supervised Action Localization via Temporal Query Network and Differentiable Average Pooling**
  An event with a more salient boundary is intuitively easier to be classified. Under such an assumption, we...
  - Applied Temporal Query Network to predict the event boundaries.
  - Devised a novel differentiable average pooling layer to train the network in an end-to-end fashion.

Digital Biology Laboratory (DBL), University of Missouri-Columbia *Feb. 2018 - May 2020*
Undergraduate Research Assistant

- **Detection of Inaccurate Smart Electricity Meters Based on Deep Learning: A Case Study**
  Detecting inaccurate smart meters and targeting them for replacement can save significant resources. In this project, we...
  - Preprocessed and analyzed the electricity-usage time series, stratified data to master-meter and sub-meter.
  - Built an LSTM for master-meter error prediction and a two-stream (1D-CNN+VGG16) model for sub-meter malfunction classification.
  - Integrated recurrence plot into VGG16 as additional phase information, improved classification accuracy by around 40%.
- **Assessing Environmental Oil Spill Based on Fluorescence Images of Water Samples and Deep Learning**
  Measuring oil concentration in the aquatic environment is important for determining the potential exposure, risk, or injury for oil spill response and natural resource damage assessment. In this project, we...
  - Analysed the significance of features to handle our high-similarity and low-frequency image dataset (OilSS).
  - Implemented a binning method to calculate the confidence interval for estimations of ResNet and XGBoost.
  - Designed an enhanced histogram information extraction block with Attention (HAB) and integrated it with ResNet. This auxiliary block improved model classification accuracy on both OilSS and CAFAR-10.
  - (Under collaboration with U.S. Geological Survey.)

WORK EXPERIENCE

Pythonic Inc, Milwaukee, WI *Jun. 2022 - Aug. 2022*
Research Intern
- Deployed a multi-modal model, LayoutLMv3, for document understanding tasks.
- Proposed efficient fine-tuning methods, multi-modal prompt tuning, and adapters, to accelerate the training and perform better when handling new data with domain gaps.

University of Rochester, Rochester, NY *Aug. 2021 - Dec. 2021*
Teaching Assistant
- Head TA for CSC 244/444: Knowledge Representation and Reasoning in AI.

Automat Solutions, Fremont, CA *Sep. 2020 - Now*
Machine Learning Engineer Intern (Remote)
- Designed and implemented electrolyte material generation model for optimal targets using the Bayesian Optimization and Reinforcement Learning model (DDPG)
- Designed and implemented the database for generated recipes and experimental results.

AWARD

- 2^{nd} place in TigerHacks2019 Developer Category