Xiaoyu (Lesley) Zhu

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EDUCATION

Carnegie Mellon University − School of Computer Science Pittsburgh, PA
Master of Science in Artificial Intelligence and Innovation May 2021 CGPA: 3.93/4.00

Beijing Jiaotong University / Rochester Institute of Technology Beijing, China
Bachelor of Science in Management Information Systems (SUMMA CUM LAUDE) May 2019
National Scholarship & Commencement Speaker & Outstanding Alumni GPA: 94.6/100 Ranking: 1/110

PRE-PRINTS & PUBLICATIONS

Zhu, X., Liang, J., Hauptmann, A. (2020). *MSNet*: *A Multilevel Instance Segmentation Network for Natural Disaster Damage Assessment in Aerial Videos*. 2021 Winter Conference on Applications of Computer Vision (*WACV*-21).

Zhu, X., Chen, J., Zeng, X., Liang, J., Li, C., Liu, S., Behpour, S., Xu, M. (2020). *Weakly Supervised 3D Semantic Segmentation Based on Cross-Image Consensus and Inter-Voxel Affinity Relations.* 2021 IEEE Conference on Computer Vision and Pattern Recognition (*CVPR-21*). (under review).

Zhu, X., Zeng, X., Li, C., Liu, S., Ban, X., Xu, M. (2020). *Unsupervised 3D Semantic Segmentation Based on Multi-Level Self-Supervision.* Nature Machine Intelligence. (in preparation).

Zhu, X., Yu, Y., Wu, D., Zhang, H. (2018). *The Effects of Impulse Purchase Behavior on Post-Purchase Satisfaction in E-Marketplace: Relationship between Online Search Session and Consumer Review Sentiments*. The 12th China Summer Workshop on Information Management (*CSWIM*-18). (Oral).

RESEARCH EXPERIENCE

Research Assistant at Carnegie Mellon University Aug. 2019 – Present
Advisor: Prof. Alexander Hauptmann, Prof. Min Xu

Project 1. Multilevel Instance Segmentation for Natural Disaster Damage Assessment in Aerial Videos

- Presented the first natural disaster building damage assessment dataset, namely ISBDA, using aerial drone videos. It provided the first quantitative benchmark for assessing damage assessment in aerial videos.
- Proposed a novel neural model termed Hierarchical Region Proposal Network (HRPN), which explores the hierarchical spatial relationship among different objects, and thus significantly improving the model performance.
- Proposed an unsupervised score refinement model named Score Refinement Network (SRN) based on inter-frame consistency to tackle the challenges of detections using drone videos.
- Related first-authored paper is accepted to *WACV-21* (with strong accept rating).

Project 2. View-Invariant Geolocation Estimation of Social Media Images

- Presented the largest cross-view social media geo-localization dataset with precise GPS.
- Proposed a hierarchical multi-class classification framework for coarse image matching to improve the model efficiency.
- Proposed a view-invariant learning module to extract local descriptors for precise image matching.

Project 3. Weakly Supervised 3D Semantic Segmentation for 3D Biomedical Images (COVID-19)

- Proposed the first 3D volumetric segmentation model based on image-level supervision.
- Proposed an inner-image consensus learning module to tackle the challenges brought by CAM and imaging limits.
- Proposed an inter-voxel affinity learning module to predict segmentation with accurate boundaries of complex 3D structures with only image-level labels available.
- Related first-authored paper is submitted to *CVPR-21*.

Project 4. Unsupervised 3D Semantic Segmentation for 3D Biomedical Images (COVID-19)

- Proposed an unsupervised deep learning framework for 3D volumetric segmentation by utilizing multi-level self-supervision.
- Proposed a deep clustering method based on Partition Confidence Maximization to generate pseudo class labels.
- Proposed a 3D Grad-CAM network which utilizes the pseudo class labels to generate initial segmentation seeds.
- Proposed a voxel affinity learning network which utilizes the initial segmentation seeds to predict segmentation with accurate boundaries.

- Related first-authored paper will be submitted to *Nature Machine Intelligence*.

Project 5. Efficient Representation Learning for 3D Biomedical Images (COVID-19)
- Proposed a novel volumetric primitive assembling approach for 3D biomedical image segmentation.
- Proposed a novel representation learning approach which formulates the segmentation problem as predicting contour of instance through instance center classification and dense distance regression in a sphere coordinate.

Project 6. Image Reconstruction for 3D Biomedical Images (COVID-19)
- Proposed a novel image reconstruction method to efficiently represent images in 3D latent space from raw 2D projections.
- Proposed an effective method to reconstruct 3D objects and predict segmentation with differentiable geometric operations.

Research Assistant at Rochester Institute of Technology Aug. 2017 – Dec. 2017
Advisor: Prof. Han Zhang (Georgia Institute of Technology), Prof. Yang Yu (Rochester Institute of Technology)
- Quantified customers' impulse degrees by calculating clicks and search time and comparing them against benchmarks.
- Detected product reviews' mood polarity using NLTK and classification algorithms such as Naïve Bayes, MNB, Linear SVC and Logistic Regression.
- Obtained product reviews' emotion intensity using NRC Emotion Lexicon and normalization algorithms.
- Identified product reviews' main topics and consumers top complaints using LDA and word2vec**.**
- Concluded that the more impulsive customers tend to have stronger negative emotions on fitting problems for jewelry and women's clothing purchases.
- Related first-authored paper is accepted to *CSWIM-18* as oral paper.

PROFESSIONAL EXPERIENCE

Shenzhen PT Information Technology Ltd. (AI and Manufacturing Unicorn) Shenzhen, China
Research Intern Dec. 2017 – June 2019

Project 1. Intelligent Video Analysis for Railway Safeguard
- Detected risks caused by engineer drivers' hazardous behavior and sent reminders in real-time; used MOG2 to calculate foreground contour area to predict the sleep or awake status; used KCF and geometric relationships between moving track and work zone edge to detect leaving illegally; used YCrCb model to calculate facial areas to predict if the driver is playing with a mobile.
- Implemented association analysis Apriori and FP-Growth for 6C railway systems.

Project 2. Real-Time Ultrasonic Signal Processing for Rail Flaw Detection
- Detected and recognized rail flaws based on K-Nearest Neighbor and Convolutional Neural Network.
- Used k-medoids and feature-based image registration to align detection car tracks and conduct life cycle analysis of individual flaws to support maintenance decisions.

Project 3. Prognostics and Health Management in Manufacturing
- Designed and built IOT distributed system with Hadoop and Docker to handle high volume manufacturing data.
- Developed a risk monitoring and forecasting information system using SQL, Pandas, Numpy and MongoDB.
- Detected surface flaws of aluminum materials based on Inception v3.

China Mobile Co. Ltd. Anhui Branch Anhui, China
Data Analysis Intern July 2017 – Aug. 2017
- Supported promotion decisions by analyzing and visualizing marketing data using Excel and Tableau.
- Proposed a plan to enhance user experience by analyzing China Mobile app review sentiments using Naïve Bayes.

Information Center of Beijing Jiaotong University Beijing, China
Tech Lead of Student Group Nov. 2015 – June 2017
- Detected DDoS attacks by analyzing daily traffic flows using SVM, KNN and Naïve Bayes classification.
- Designed and implemented a new network structure with the concept of SDN and "Users Triggering Flow."

AWARDS
- Winner of NIST Automated Streams Analysis for Public Safety Challenge ($30k prize), 2020
- Outstanding Alumni of Beijing Jiaotong University & Rochester Institute of Technology, 2020

- Cohort Commencement Speaker, 2019
- Highest Honor of Rochester Institute of Technology, 2019
- National Scholarship of China, 2017
- First Class Scholarship of Beijing Jiaotong University, 2015-2019
- Merit Student of Beijing Jiaotong University, 2015-2019
- Dean's List of Rochester Institute of Technology, 2015-2019
- Global Scholar of Rochester Institute of Technology, 2017

SELECTED MEDIA

- Carnegie Mellon University News. *Amateur Drone Videos Could Aid in Natural Disaster Damage Assessment*. August 28, 2020.
- Carnegie Mellon University News. *AMD Provides Computing Resources To Support CBD's COVID-19 Research* (Major contributor of the COVID-19 research project). September 21, 2020.
- Science Daily. *Amateur Drone Videos Could Aid in Natural Disaster Damage Assessment*. August 28, 2020.
- CBS. *CMU: Amateur Drone Videos Posted To Social Media Could Be Used To Assess Storm Damage*. August 29, 2020.
- Microsoft News. *CMU: Amateur Drone Videos Posted To Social Media Could Be Used To Assess Storm Damage*. August 31, 2020.
- Yahoo News. *CMU Developing Program To Assess Hurricane Damage*. August 29, 2020.
- AZO Robotics. *New AI System Helps Detect Damage Caused to Buildings by Hurricanes*. August 31, 2020.
- Rochester Institute of Technology News. *Outstanding Alumni of RIT Detected Natural Disaster Damages Using AI Techniques*. September 15, 2020
- Beijing Jiaotong University News. *Outstanding Alumni of BJTU Developed AI Techniques for Damage Assessment*. August 31, 2020.

TALKS & ACADEMIC SERVICE

- Invited Talk: Automatic Damage Assessment Using Social Media Drone Videos. At *AI for Social Good Symposium*, Carnegie Mellon University.
- Research Presentation: MSNet: A Multilevel Instance Segmentation Network for Natural Disaster Damage Assessment in Aerial Videos. Live presentation for hundreds of Chinese college students.
- Research Presentation: MSNet: A Multilevel Instance Segmentation Network for Natural Disaster Damage Assessment in Aerial Videos. Live presentation for multiple Chinese companies.
- Reviewer of *RECOMB/BMC/ICIBM/CSWIM*.