Xiaowei(Lydia) Chen

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Electrical and Computer Engineering
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I specialize in the investigation of first-person vision, with a particular focus on indoor localization leveraging wearable devices. My work emphasizes developing and refining geometric algorithms for camera pose estimation, seamlessly incorporating advanced deep-learning techniques. As an educator, I guide undergraduates in Electric Circuits and Signal Analysis while fostering the growth of graduate students in image processing research.

Research Interests

- **Computer Vision:** camera pose estimation, object recognition, scene understanding
- **Wearable Computing:** wearable cameras, smart glasses
- **First Person Vision:** perspective, healthcare
- **Machine Learning:** deep learning, transfer learning

Education

2019 - Present	**Ph.D. Candidate, Oklahoma State University, GPA: 4.0/4.0** **Electrical & Computer Engineering**, USA. Dissertation Topic: Indoor Localization and Wayfinding for First-Person Vision
2017 - 2019	**M.Sc. Monroe College, Computer Science**, USA.
2005 - 2009	**B.En. Xi'an Jiaotong University, Computer Science and Technology**, China.

Research Experience

2019 - Present **Research Assistant**, Visual Computing and Image Processing Lab,
Oklahoma State University. **Advisor**: Dr. Guoliang Fan
Dissertation Topic: *Indoor Localization and Wayfinding for First-Person Vision*.

- **Probabilistic PnL for Indoor Layout and Camera Pose Estimation**
  - Learn the weighted 2D-3D line correspondences by integrating a probabilistic PnL layer into the RoomNet framework.
  - Consider the 2D-3D line correspondences related to IOCs and line corresponding weights as learned intermediate variables.
  - Design the optimized data sampling algorithm to converge the loss function.
  - Develop the train and test room image dataset by classifying, annotating, and generating features from Matterport3.
  - Design the experiments for results comparing with state-of-art methods.

- **Computer Vision Algorithm Research for Indoor Camera Pose Estimation**
  - Proposed a new Perspective-n-Lines (PnL) algorithm to estimate 6DoF indoor camera pose with room layouts and image out corners (IOCs).
  - Investigated utilizing room layouts and image edge corners to optimize the PnL algorithm.
  - Introduced Non-dominated Sorting Genetic Algorithms II (NSGA-II) for scenarios with limited available information.
  - Collected and preprocessed real image data from the existing dataset to extract specific information.
  - Evaluated the proposed algorithms with the simulated test data and the real image data.

- **Transfer Learning-based Smart Homecare Assistive Technology**
  - Present a homecare prompting assistance system based on recent transfer learning and AI technologies.
  - Implement location classification, object detection, and NLP-based intention understanding models.
  - Design the Android-phone-based system to be fully customizable and adaptable for the specific care recipient.
  - Develop strategies for providing precise audio-visual (AV) prompts in a hint-and-confirm style.
  - Design system evaluation strategies involving 10-25 college adults and older adults.

- **Indoor Wayfinding with Data Fusion from Room Layout and IMU**
  - Combine data from room layout and inertial measurement unit (IMU) through data fusion algorithms for improved accuracy.
  - Overcome limitations of individual data sources by leveraging complementary information.
  - Try to utilize the object information to optimize the results from data fusion.
  - Try to adapt to various indoor environments, including complex structures and multi-floor buildings.

- **Room Layout Estimation based on PnL with Transformer**
  - Research an efficient network with a novel transformer architecture to model PnL geometry relations.
  - Emphasize the analysis and processing of monocular room layout images.
  - Overcome limitations of traditional room layout estimation methods by incorporating context awareness.

Publications and Communications

Peer-reviewed Articles

5. **Chen, X.** and Fan, G., **2023**. Indoor Camera Pose Estimation from Room Layouts and Image Outer Corners. IEEE Transactions on Multimedia.

4. Roberts, E., Fan, G. and **Chen, X.**, **2022**. Development of Assistive Technology for Instrumental Activities of Daily Living for Dementia Homecare Environments. Alzheimer's & Dementia, 18, e068099.

3. **Chen, X.** and Fan, G., **2022**. Egocentric Indoor Localization from Coplanar Two-Line Room Layouts. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW) (pp. 1549-1559).

2. **Chen, X.** and Fan, G., **2021**. Egocentric Indoor Localization from Room Layouts and Image Outer Corners. In Proceedings of the IEEE/CVF International Conference on Computer Vision Workshops (ICCVW) (pp. 3456-3465).

1. Roberts, E., Fan, G. and **Chen, X.**, **2021**. In-Lab Development of a Mobile Interface for Cognitive Assistive Technology to Support Instrumental Activities of Daily Living in Dementia Homecare. Journal of Aging and Environment, pp.1-15.

Articles in submission

- **Chen, X.**, Fan, G., Roberts, E., and Howell, S.J. A Transfer Learning-based Smart Homecare Assistive Technology to Support Activities of Daily Living for People with Mild Dementia. Submitted to The 23rd IEEE International Conference on BioInformatics and BioEngineering.

Articles in preparation

- Chen, X. and Fan, G. End-to-End Probabilistic Perspective-n-Line for Room Layouts and Camera Pose Estimation.
- Chen, X. and Fan, G. Room Layout Estimation based on Perspective-n-Line with Geometry-Aware Transformer.

Conference Presentation

- A Transfer Learning-based Homecare Prompting Assistance System for Supporting Everyday Activities in People with Mild Dementia | The IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI), Pittsburgh, PA | October 2023
- A Transfer Learning-based Smart Homecare Assistive Technology to Support Activities of Daily Living for People with Mild Dementia | IMC2023: 2023 International Mechatronics Conference and Exposition, Oklahoma City, OK | September 2023
- Egocentric Indoor Localization from Coplanar Two-Line Room Layouts. | Computer Vision and Pattern Recognition Conference Workshop (CVPRW), New Orleans, LA | June 2022
- Egocentric Indoor Localization from Room Layouts and Image Outer Corners." | International Conference on Computer Vision Conference Workshop (ICCVW), Virtual | October 2021

Professional Experience

2015 - 2017 **Senior Software Testing Engineer**
C.C.H International Group Inc., Zhengzhou

- Wrote interface test cases according to all the possible situations.
- Tested the system interface and API by coding and executing the unit test scripts.
- Analyzed all the online problems and proposed solutions.

2011 - 2014 **Senior Software Testing Engineer**
ZTEICT Technology Co., Ltd., Shenzhen

- Verified the user requirements and tested the websites, Apps, systems, and APIs.
- Tested all the equipment and devices from different suppliers.
- Implemented performance testing and analyzed the performance bottleneck.
- Assisted the systems and websites online and positioned the online problems.
- Wrote and maintained all the documents, including test cases, system installation, and configuration.

2009 - 2011 **Website Testing Manager**
Linekong Technology Co., Ltd.,Beijing

- Supervised group members to enact related testing projects and test cases.
- Set up the testing environment.
- Applied different testing methods to conduct system functional testing.
- Implemented the performance testing.
- Implement the security testing, such as SQL injection, OS Command Injection, XSS, and CSRF.

Honors and Awards

- NSF Student Travel Award 2023
- Robberson Research and Creative Activity Grant 2023
- OSU Research FNDN Chair Scholarship 2022 - 2023
- Graduate 3MT (Three Minute Thesis) Competition Finalist 2022
- Dr. Yarlagadda Grad Fellowship Scholarship 2021 - 2022
- Leo J. Peters & Josie Mosely Peters Scholarship 2020

Teaching and Mentoring

University - Course, Semester (enrollment)

- **Teaching Assistant** Signal Analysis OSU - ECEN 3513, Sp2021 (35), Sp2022 (37), Sp2023 (50), Fa2023 (50).
  - Assist with theory instruction and office hours.
  - Grade the homework and exams.
- **Teaching Assistant** Fundamentals of Electrical Circuits OSU - ECEN 2714, Fa2021 (71), Fa2022 (72).

  - Serve as an assistant instructor for laboratory sections.
  - Assist with theory instruction.
  - Schedule lab supplies instrumental in equipment and utensils selection for lab classes.
- **Mentor** Songyuan Zheng, Steven Howell Jr, Andrew James Dolan, Sicheng Liang

Scholarly Activities

- Journal Reviewer: Multimedia Tools and Applications
- Panel Reviewer: IEEE International Conference on Multimedia and Expo 2023
- Panel Reviewer: IEEE International Conference on Multimedia and Expo 2022

Outreach Activities

- October 3, 2023. Graduate 3MT (Three Minute Thesis) Competition
- September 23, 2023. Lead4Success Premiere Program
- February 5, 2023. CEAT's 1st Annual Graduate Research Symposium
- October 12, 2022. Graduate 3MT (Three Minute Thesis) Competition

Leadership and Organizations

- Instrumental Activities of Daily Life (IADL) Assistance Program Team Leader

Skills

Programming Skills

Python	Java	Matlab
SQL	JS	Html

Frameworks & Library

PyTorch	TensorFlow	OpenCV
Keras	scikit-image	

App Development

Android Studio

Quantitative Methodologies

Linear Programming	Nonlinear Optimization	Data Augmentation

Computer Vision Techniques

Image Classification	Image Compression	Image Enhancement
Image Segmentation	Object Detection	Pose Estimation

Operating system

Mac OS X	Linux	Windows

Languages

Chinese (native)	English (fluent)