Zhenyu Ren

@ Mail: renzy2022@mail.sustech.edu.cn | ⦿ Github: https://github.com/rzy0901 | 🌐 Website: https://renzhenyu.site

EDUCATION

Southern University of Science and Technology (SUSTech)   Shenzhen, China
*B.Sc. in Communication Engineering; **GPA: 3.69/4.00; Weighted Score: 88.07***   *Sep 2018 − Jun 2022*
*M.Sc. in Electronic Science and Technology; **GPA: 3.44/4.00; Weighted Score: 88.52***   *Sep 2022 − Jun 2025*

Supervised by Prof. Rui Wang (Editor of IEEE WCL, IEEE OJ-COMS), focusing on **sensing channel modeling and experimental millimeter-wave system for wireless simulation-to-reality gesture recognition.**

EXPERIENCE

Huawei Technology, Wireless Technology (WT) Laboratory   Shenzhen, China
Research Intern   *June 2021 − June 2022*

- Supervised by Dr. Tony Han Xiao (Chair of IEEE 802.11bf WLAN Sensing TIG, Founding industry chair of ISAC-ETI), focusing on **the wireless communication and sensing technology.**
- Developed a Wi-Fi based indoor near filed imaging system base on AD9361 board and digital-controlled rail (all driven by MATLAB via my programming), which also served as my bachelor thesis: Slides and Report in Chinese.
- Contributed to the "Channel Models for WLAN Sensing Systems" for IEEE 802.11bf standard (doc.: IEEE 802.11-21/0782r5): Link.

PUBLICATIONS

Ren, Zhenyu, Guoliang Li, Chenqing Ji, Chao Yu, Shuai Wang, and Rui Wang. "CASTER: A Computer-Vision-Assisted Wireless Channel Simulator for Gesture Recognition." arXiv preprint arXiv:2311.07169 (2023). **(Revise and Resubmit, IEEE Open Journal of the Communications Society).**

Arxiv | GitHub | Project Page *(**Includes** 3 **demo videos. It is highly recommended to watch these for a quick understanding of my paper. If the page loads slowly within China, you can try accessing** http://lasso.eee.sustech.edu.cn/caster/ **instead.**)*

Key Contributions:

* Developed a computer-vision-assisted wireless channel simulator for gesture recognition, named CASTER, to address the data collection issue for wireless sensing.
* Introduced a Simulation-to-Reality transfer learning approach for wireless gesture recognition, and contributed to the creation of high-fidelity simulated and experimental spectrogram datasets encompassing five distinct gesture categories.
* Implemented real-time gesture recognition based on millimeter-wave passive sensing and communication systems.

Reviewer's comments:

* "Using computer vision to create a wireless channel simulator for gesture recognition is innovative. This method addresses the challenge of efficiently generating training datasets for wireless gesture recognition systems, which significantly contributes to the field. While the concept of gesture recognition itself is not new, integrating computer vision techniques to improve wireless channel simulation represents a novel approach that adds value to the existing body of research. This combination of technologies and gesture recognition applications makes the paper's content novel enough to warrant publication."

PATENTS

Zhenyu Ren, Wanli Chen, Rui Wang, Chao Yu, "Wireless Channel Simulation Method, Device, Computer Equipment, and Storage Medium", Patent Application No.: 2023110356420, Southern University of Science and Technology, Application Date: 2023.08.16 (Chinese Invention Patent).

Skills

Programming Languages: C/C++, Python, MATLAB, Java

Technologies: PyTorch, Linux/Ubuntu, Git/GitHub, OpenCV, UHD/USRP, 60GHz Sivers, WinProp C++ API (Ray tracing software), Linux 802.11n CSI Tool, Mediapipe/ZED-SDK (Human/Hand keypoint extractor)

Writing: LaTeX, Markdown, Website (HTML, CSS, JavaScript)

English: IELTS 6.5 (Test date: *Jan 2024*)

Courses: EE5046 Modern Signal Processing, Fall 2022 (Grade: A-, Rank: 1/90); CS205 C/C++ Programming, Spring 2020 (Grade: A, Top 2 with over 90 points in final exam); EEE5070 Effective Presentations in Electronic Engineering, Fall 2022 (Grade: A+, Rank: 2/20). Besides, I have taken courses related to wireless communication, digital signal processing, microwave technology, antenna design, as well as mathematical courses such as mathematical analysis, linear algebra, probability theory, and stochastic processes...

Awards & Achievements

Second Prize in the 17th "Challenge Cup" Guangdong University Student Extracurricular Academic Science and Technology Works Competition.

Guangdong University Students' Science and Technology Innovation Cultivation Special Fund ("Climbing Plan" Special Fund), Funding: 20,000 RMB.

2022 Excellent Graduate of Undergraduate for exceptional performance in the SUSTech.

2022 Distinguished Undergraduate Thesis of the SUSTech.

Southern University of Science and Technology Outstanding Student Third-Class Scholarship (2018~2019, 2020~2021).

First Prize in the 2020 National College Student Mathematics Modeling Competition.

Projects

CASTER | Arxiv | GitHub | Project Page
- An open-source platform for wireless channel simulation, human/hand pose extraction, gesture spectrogram generation, and real-time gesture recognition based on millimeter-wave passive sensing and communication systems.
  * Submodules mediapipe_spectrogram and testZED: Developed algorithms for keypoint extraction from video streams and used a primitive-based channel model to generate simulated data, addressing the data collection issue in wireless sensing.
  * Submodule CASTER_classification: Implemented a Simulation-to-Reality transfer learning strategy using ResNet18 and adversarial discriminative domain adaptation (ADDA) for wireless gesture recognition. This approach improved real-world dataset accuracy from 83.0% to 96.5%.
  * Submodule RxRealTime_GUI: Implemented real-time gesture recognition based on millimeter-wave passive sensing and communication systems, based on USRP and 60GHz Sivers phased array.

Some other projects:

(1) testWinprop: Radio Ray-tracing by Winprop C++ API (7 Stars); (2) My-solutions-to-DSP-LAB: MATLAB for Digital Signal Processing Labs (16 stars, 1 fork); (3) CS205_Matrix: C++ Matrix computation library (6 stars, 2 forks); (4) Personal Website: Math notes and technical blogs (example post: Notebook for Applied Stochastic Processes and Wireless Channel Trouble-Shooting).

Extracurricular Activities

Reviewer for IEEE ICMLCN 2024, IEEE ICC 2024. TPC reviewer for ICC 2024 Workshop - NGATFWN.

Teaching Assistant for EE313 Wireless Communication.

References

Prof. Rui Wang, Associate Professor, Department of Electronic and Electrical Engineering (EEE), Southern University of Science and Technology, Email: wang.r@sustech.edu.cn.

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