Menglu Li

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in LinkedIn | ⬡ GitHub | Google Scholar

RESEARCH INSTERESTS

Modeling, analysis and design of speech anti-spoofing systems using machine learning and signal processing. Topics of focus include multi-modal learning, multimedia processing, statistical modeling, generative AI, and Internet of Things (IoT) applications.

EDUCATION

- **Toronto Metropolitan University** *Jan. 2021 - Jun. 2025 (Expected)*
  Ph.D - Electrical and Computer Engineering Toronto, Canada
  ◦ Advisor: Prof. Xiao-Ping Zhang, and Prof. Lian Zhao
  ◦ GPA: 4.33/4.33

- **Toronto Metropolitan University** *Sep. 2019 - Dec. 2020*
  M.Eng - Electrical and Computer Engineering Toronto, Canada
  ◦ GPA: 4.26/4.33

- **University of Toronto** *Sep. 2014 - Jun. 2019*
  B.ASc. - Computer Engineering Toronto, Canada
  ◦ 4th-year GPA: 3.88/4.00

PUBLICATIONS C=CONFERENCE, J=JOURNAL, U=UNDER REVIEW

[C.1] **M. Li** and X.-P. Zhang, "**Interpretable temporal class activation representation for audio spoofing detection**", *Interspeech 2024*, pp. 1120-1124. Sep. 2024. (Oral Presentation)

[C.2] **M. Li** and X.-P. Zhang, "**Robust audio anti-spoofing system based on low-frequency sub-band information**", *2023 IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, New Paltz, NY, USA, 2023 pp. 1-5. (Poster Presentation)

[C.3] **M. Li** Y. Ahmadiadli, and X.-P. Zhang, "**Robust deepfake audio detection via bi-level optimization**", *2023 IEEE 25th International Workshop on Multimedia Signal Processing (MMSP)*, Poitiers, France, 2023, pp. 1-6. (Poster Presentation)

[C.4] **M. Li**, Y. Ahmadiadli, and X.-P. Zhang, "**A comparative study on physical and perceptual features for Deepfake Audio Detection**", *Proceedings of the 1st International Workshop on Deepfake Detection for Audio Multimedia*, Lisboa, Portugal, 2022, pp. 34-41. (Oral Presentation)

[J.1] H. Jebamikyous, **M. Li**, Y. Suhas, and R. Kashef, "**Leveraging machine learning and blockchain in e-commerce and beyond: Benefits, models, and application**", *Discover Artificial Intelligence*, Vol. 3, Issue 1, 2023.

[J.2] **M. Li**, R. Kashef, and A. Ibrahim, "**Multi-level clustering-based outlier's detection (MCOD) using self-organizing maps**", *Big Data and Cognitive Computing*, Vol. 4, Issue 4, pp. 24, 2020.

[J.3] A. Ibrahim, R. Kashef, **M. Li**, E. Valencia, and E. Huang, "**Bitcoin Network Mechanics: Forecasting the BTC closing price using vector auto-regression models based on endogenous and exogenous feature variables**", *Journal of Risk and Financial Management*, Vol. 13, Issue 9, pp. 189, 2020.

[U.1] **M. Li**, Y. Ahmadiadli, and X.-P. Zhang, "**Audio Anti-Spoofing Detection: A Survey**". Manuscript under second round review in *ACM Computing Surveys*.

HONORS & AWARDS

• Ontario Graduate Scholarship *(one of the 4 international student recipients @ TMU each year)*	2023, 2024
• IEEE ComSoc FNS Project Competition Award - Bronze Medal *($600)*	*Sep, 2023*
• Travel Grant from WASPAA *($1500)*	2022
• Toronto Metropolitan Graduate Scholarship *($15000)*	2022
• Travel Grant from ACM MM *($2000)*	2022
• Toronto Metropolitan International Student Scholarship *($7000 each year)*	2021, 2022
• Dean's List, University of Toronto	2019
• University of Toronto, Edward S. Rogers Scholarship	2015

RESEARCH PROJECTS

- **Deepfake Speech Detection [Audio Processing, Deep Learning]** *Jan. 2022 - Present*
  Research Assistant (with Prof. Xiao-Ping Zhang, Prof. Lian Zhao)
  ∘ Generated and processed synthesized speech data across 5+ languages by fine-tuning over 10 generative models, ensuring diverse and representative datasets.
  ∘ Conducted a comprehensive analysis of 16 handcrafted physical, perceptual features and deep embeddings using statistical methods to identify key indicators of deepfake speech.
  ∘ Developed an interpretable detection model with a temporal attention mechanism, allowing visualizable interpretation of results while improving detection accuracy by 11%.
  ∘ Addressed partially deepfake speech issues by leveraging temporal consistency, fine-tuning wav2vec2 features to increase detection accuracy by 4% over the published SOTA model.

- **Customer Rating Distribution Analysis [Statistics, Data Science]** *Jun 2021 - Dec 2022*
  Research Assistant (with Prof. Xiao-Ping Zhang)
  ∘ Collected and preprocessed customer rating data from hotel and movie reviews using NumPy and Pandas for efficient data handling and cleaning.
  ∘ Uncovered a statistical relationship between the mean and variance of rating distributions using linear programming, demonstrating that customer ratings can be modeled as a finite discrete distribution.
  ∘ Performed rigorous hypothesis testing to reveal patterns in user preferences and rating behaviors, informing customer satisfaction analyses.

- **Unsupervised Learning Model for Outlier Detection [Machine Learning]** *Jan 2020 - Dec 2020*
  Research Assistant (with Dr. Rasha Kashef)
  ∘ Trained five clustering-based outlier detection models as benchmarks across six datasets with varying sizes and outlier densities to assess detection efficacy.
  ∘ Developed a multi-level, clustering-based outlier detection algorithm, dynamically adapting to dataset characteristics and improving detection rates by up to 20% over baseline models.
  ∘ Demonstrated the robustness of the algorithm by applying it across diverse domains, showcasing adaptability in fields such as finance, healthcare, and e-commerce for early anomaly detection.

TEACHING

Teaching Assistant

• COE 328	Digital Systems	*Fall 2022-2024 & Summer 2023, 2024*
• COE 628	Operating System	*Winter 2020-2024*
• CEN 100	Introduction to Engineering	*Fall 2022, 2023*
• COE 528	Object Oriented Eng Analysis and Design	*Summer 2022*
• ELE 888	Intelligent Systems	*Winter 2021*
• COE 318	Software System	*Fall 2019-2021*

Tutorials

- Multimedia Deepfake Detection in *IEEE International Conference on Multimedia and Expo (ICME)* *July, 2024*
  Co-organized with You (Neil) Zhang, Luchuan Song, Xiao-Ping Zhang, Chenliang Xu, Zhiyao Duan

Instructor

- Easy Education - Software Tools and System Programming *Winter 2021, 2022 & Summer 2021*
  ∘ Delivered two-hour weekly lectures on C programming and shell scripting, covering foundational programming concepts and hands-on coding exercises.
  ∘ Provided personalized feedback and support to students, fostering a collaborative learning environment through Q&A office hours.
  ∘ Taught over 250 students, achieving a 95% positive feedback rate and emphasizing effective teaching strategies and student engagement.

Student Mentored

• Majd Alber	ECE, M.Eng student	Speech Deepfake Detection
• Ramtin Asgarianamiri	ECE, M.Eng student	Speech Deepfake Detection

ACADEMIC SERVICES

Conference Chairing

- Session Chair - IEEE International Conference on Multimedia and Expo (ICME) *July, 2024*
- Project / Local Arrangement Co-Chair - IEEE Toronto Leaders of Tomorrow Workshop *June, 2024*

Reviewer

- Neurocomputing
- China Communications
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
- IEEE Signal Processing Letters (SPL)
- Computers and Security

Volunteer

- Secretary at IEEE Toronto ComSoc Chapter *Mar, 2024 - Present*
- IEEE ICME 2024 Student Volunteer *July, 2024*
- ACM MM 2022 Student Volunteer *Oct, 2022*
- IEEE ICASSP 2021 Student Volunteer *Jun, 2021*

SKILLS

- **Programming Languages:** Python, C, SQL, JAVA, Matlab, Latex, VHDL
- **Frameworks:** Scikit, Pytorch, HuggingFace, Spipy, Matplotlib, Seaborn, NLTK, TensorFlow, Keras, OpenCV
- **Platforms:** GIT, MySQL, Jupyter Notebook, Visual Studio Code
- **Languages:** English (Fluent), Mandarin Chinese (Native), Cantonese Chinese (Fluent)