Erfan Loweimi

Contact Information

Centre for Medical Informatics (CMI), Usher Institute, University of Edinburgh
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Research Interests

✓ Conversational AI for Healthcare Applications
✓ End-to-end Speech Processing
✓ Multi-modal Language Processing
✓ Explainable and Trustworthy AI
✓ Multi-modal Information Retrieval

Academic Career

- Research Fellow in Machine Learning, University of Edinburgh (Aug 2024-)
  - Centre for Medical Informatics, Usher Institute
- Research Associate, University of Cambridge (Nov 2022 - Sep 2024)
  - Speech Research Group, Machine Intelligence Laboratory
- Research Associate, King's College London (July 2021 - Jan 2023)
  - Department of Engineering
- Research Associate, University of Edinburgh (July 2018 - June 2021)
  - Centre for Speech Technology Research (CSTR)

Education

Ph.D., School of Computer Science, University of Sheffield, 2018 (Thesis)
- Speech and Hearing Research Group (SPandH)
- Supervisors: Professor Jon Barker and Professor Thomas Hain

Selected Publications

Journal Papers

1. G. Wu, A. Haider, X. Tian, **E. Loweimi**, Ch-H.Chan, M. Qian, A. Muhammad, I. Spence, R. Cooper, W.W.Y. Ng, J. Kittler, M. Gales and H. Wang, "Multi-modal Video Search by Examples – A Video Quality Impact Analysis," IET Computer Vision, pp. 1–17, 2024, doi: 10.1049/cvi2.12303.

2. **E. Loweimi**, A. Carmantini, P. Bell, S. Renals and Z. Cvetkovic, "Phonetic Error Analysis Beyond Phone Error Rate," IEEE/ACM Transactions on Audio, Speech and Language Processing, vol. 31, pp. 3346-3361, 2023.

3. **E. Loweimi**, Z. Yue, P. Bell, S. Renals and Z. Cvetkovic, "Multi-stream Acoustic Modelling using Raw Real and Imaginary Parts of the Fourier Transform," IEEE/ACM Transactions on Audio, Speech and Language Processing, vol. 31, pp. 876-890, 2023.

4. Z. Yue*, **E. Loweimi***, J. Barker, H. Christensen and Z. Cvetkovic, "Acoustic Modelling from Raw Source and Filter Components for Dysarthric Speech Recognition," IEEE/ACM Transactions on Audio, Speech and Language Processing, vol. 30, pp. 2968-2980, 2022 (* Equal contribution).

Conference Papers

1. **E. Loweimi**, M. Qian, K. Knill and M. Gales, "On the Usefulness of Speaker Embeddings for Speaker Retrieval in the Wild: A Comparative Study of x-vector and ECAPA-TDNN Models," *INTERSPEECH*, 2024.

2. M. Qian, R. Ma, A. Liusie, **E. Loweimi**, K. Knill, and M. Gales, "Zero-shot Audio Topic Reranking using Large Language Models", *SLT*, 2024.

3. **E. Loweimi**, A. Carmantini, P. Bell, S. Renals, Z. Cvetkovic "Phonetic Error Analysis of Raw Waveform Acoustic Models with Parametric and Non-Parametric CNNs," *arXiv*, 2024.

4. Z. Yue*, **E. Loweimi*** and Z. Cvetkovic, "Dysarthric Speech Recognition, Detection and Classification using Raw Phase and Magnitude Spectra," *INTERSPEECH*, 2023 (* Equal contribution).

5. Z. Yue*, **E. Loweimi***, J. Barker, H. Christensen and Z. Cvetkovic, "Dysarthric Speech Recognition from Raw Waveform with Parametric CNNs," *INTERSPEECH*, 2022 (* Equal contribution).

6. N. Shao, **E. Loweimi** and X. Li, "RCT: Random Consistency Training for Semi-supervised Sound Event Detection," *INTERSPEECH*, 2022.

7. Z. Yue*, **E. Loweimi*** and Z. Cvetkovic, "Raw Source and Filter Modelling for Dysarthric Speech Recognition," *ICASSP*, 2022 (* Equal contribution).

8. Z. Yue, **E. Loweimi**, Z. Cvetkovic, H. Christensen and J. Barker, "Multimodal Acoustic-Articulatory Feature Fusion for Dysarthric Speech Recognition," *ICASSP*, 2022.

9. **E. Loweimi**, P. Bell and S. Renals, "Speech Acoustic Modelling using Raw Source and Filter Components," *INTERSPEECH*, 2021.

10. S. Zhang, **E. Loweimi**, P. Bell and S. Renals, "Stochastic Attention Head Removal: A Simple and Effective Method for Improving Transformer Based ASR Models," *INTERSPEECH*, 2021.

11. **E. Loweimi**, Z. Cvetkovic, P. Bell and S. Renals, "Speech Acoustic Modelling from Raw Phase Spectrum," *ICASSP*, 2021.

12. S. Zhang, C-T. Do, R. Doddipatla, **E. Loweimi**, P. Bell and S. Renals, "Train your classifier first: Cascade Neural Networks Training from Upper Layers to Lower Layers," *ICASSP*, 2021.

13. **E. Loweimi**, P. Bell and S. Renals, "Raw Sign and Magnitude Spectra for Multi-head Acoustic Modelling," *INTERSPEECH*, 2020.

14. **E. Loweimi**, P. Bell and S. Renals, "On the Robustness and Training Dynamics of Raw Waveform Models," *INTERSPEECH*, 2020.

15. S. Zhang, **E. Loweimi**, P. Bell, S. Renals, "When Can Self-Attention Be Replaced by Feed Forward Layers?," *SLT*, 2020.

16. J. Fainberg, O. Klejch, **E. Loweimi**, P. Bell, S. Renals, "Acoustic Model Adaptation from Raw Waveforms with SincNet," *ASRU*, 2019.

17. **E. Loweimi**, P. Bell and S. Renals, "On Learning Interpretable CNNs with Parametric Modulated Kernel-based Filters," *INTERSPEECH*, 2019.

18. S. Zhang, **E. Loweimi**, Y. Xu, P. Bell, S. Renals "Trainable Dynamic Subsampling for End-to-End Speech Recognition," *INTERSPEECH*, 2019.

19. M.A. Jalal, **E. Loweimi**, R. Moore and T. Hain, "Learning Temporal Clusters Using Capsule Routing for Speech Emotion Recognition," *INTERSPEECH*, 2019.

20. **E. Loweimi**, P. Bell and S. Renals, "On the Usefulness of Statistical Normalisation of Bottleneck Features for Speech Recognition," *ICASSP*, 2019.
21. S. Zhang, **E. Loweimi**, P. Bell, S. Renals,"Windowed Attention Mechanisms for Speech Recognition," *ICASSP*, 2019.
22. **E. Loweimi**, J. Barker and T. Hain, "On the Usefulness of the Speech Phase Spectrum for Pitch Extraction," *INTERSPEECH*, 2018.
23. **E. Loweimi**, J. Barker and T. Hain, "Exploring the use of Group Delay for Generalised VTS based Noise Compensation," *ICASSP*, 2018.
24. **E. Loweimi**, J. Barker and T. Hain, "Channel Compensation in the Generalised Vector Taylor Series Approach to Robust ASR," *INTERSPEECH*, 2017.
25. **E. Loweimi**, J. Barker, O. Saz Torralba and T. Hain, "Robust Source-Filter Separation of Speech Signal in the Phase Domain," *INTERSPEECH*, 2017.
26. **E. Loweimi**, J. Barker and T. Hain, "Statistical Normalisation of Phase-based Feature Representation for Robust Speech Recognition," *ICASSP*, 2017.
27. **E. Loweimi**, J. Barker and T. Hain, "Use of Generalised Nonlinearity in VTS Noise Compensation for Robust Speech Recognition," *INTERSPEECH*, 2016.
28. **E. Loweimi**, J. Barker and T. Hain, "Source-filter Separation of Speech Signal in the Phase Domain," *INTERSPEECH*, 2015.
29. **E. Loweimi**, S.M. Ahadi and T. Drugman, "A New Phase-based Feature Representation for Robust Speech Recognition," *ICASSP*, 2013.
30. **E. Loweimi**, M. Doulaty, J. Barker and T. Hain, "Long-term statistical Feature Extraction from Speech Signal and its Application in Emotion Recognition," Statistical Language and Speech Processing (*SLSP*), 2015.
31. **E. Loweimi**, S.M. Ahadi, T. Drugman and S. Loveymi, "On the Importance of Pre-emphasis and Window Shape in Phase-based Speech Recognition," Lecture Notes in Computer Science, vol. 7911 LNAI, 2013.
32. **E. Loweimi**, S.M. Ahadi and H. Sheikhzadeh, "Phase-only Speech Reconstruction Using Very Short Frames," *INTERSPEECH*, 2011.
33. **E. Loweimi** and S.M. Ahadi, "A New Group Delay-based Feature for Robust Speech Recognition," *ICME*, 2011.
34. **E. Loweimi**, S.M. Ahadi and S. Loveymi, "On the Importance of Phase and Magnitude Spectra in Speech Enhancement," *ICEE*, 2011.
35. **E. Loweimi** and S.M. Ahadi, "Objective Evaluation of Magnitude and Phase only Spectrum-based Reconstruction of the Speech Signal," *ISCCSP*, 2010.

UNDER REVIEW **Journal Papers**

1. **E. Loweimi**, M. Qian, K. Knill, M. Gales "Speaker Retrieval in the Wild: Challenges, Effectiveness and Robustness," *Submitted to IEEE/ACM Transactions on Audio, Speech and Language Processing, 2nd review round.*
2. **E. Loweimi***, Z. Yue*, Z. Cvetkovic, J. Barker, H. Christensen "Deep Scattering Spectrum for Dysarthric Speech Recognition, Detection and Classification," *Submitted to IEEE Journal of Selected Topics in Signal Processing (* Equal contribution).*
3. Z. Yue, **E. Loweimi**, Z. Cvetkovic, J. Barker, H. Christensen "Raw Acoustic-articulatory Multimodal Dysarthric Speech Recognition," *Submitted to Computer Speech & Language (CSL) Journal.*

Awards

- Outstanding Reviewer Award, ICASSP, 2022
- Research Communicator of the Year Award, University of Sheffield, 2017
- ISCA Student Travel Grant, INTERSPEECH, 2017
- Faculty PhD Scholarship (2013-2017), Faculty of Engineering, University of Sheffield

Teaching Experience

Teaching Assistant

- Postgraduate
  - Machine Learning and Adaptive Intelligence — 2 Semesters
  - Speech Technology — 2 Semesters
  - Speech Processing — 2 Semesters
- Undergraduate
  - Data-driven Computing — 2 Semesters
  - Electronics II — 2 Semesters

Selected Oral Presentations

Tutorial Talks

- **E. Loweimi** and S. Loveymi, "Recent Advances in Interpreting and Understanding DNNs", Machine Vision & Image Processing (MVIP) Conference, 2022, Iran.
- Internal Tutorial
  - Contrastive Learning, Deep Scattering Spectrum, Transformers, Overparameterisation in DNNs (three sessions), Raw Waveform Acoustic Modelling (four sessions), Capsule Neural Networks, Information Bottleneck, Kernel methods in ASR

Research Talks

- Speaker Retrieval in the Wild: Challenges, Effectiveness, Robustness
  - BBC Broadcasting House, London, UK, 2024
  - University of Cambridge, Cambridge, UK, 2024
- Speech Acoustic Modelling from Raw Signal Representations
  - Edinburgh Napier University, Edinburgh, UK, 2022
- CSTR Talk, University of Edinburgh (Internal)
  - Phonetic Error Analysis beyond Phone Error Rater, 2023
  - On the Robustness and Training Dynamics of Raw Waveform Models, 2021
  - Raw Sign and Magnitude Spectra for Multi-head Acoustic Modelling, 2020
  - Understanding and Interpreting DNNs for Speech Recognition, 2019
  - Speech Phase Spectrum: Love It or Leave It?, 2018
- DNN Statistical Interpretation and Normalisation for ASR
  - Qatar Computing Research Institute (QCRI), Doha, Qatar, 2019
- Channel Compensation in the Generalised VTS Approach to Robust ASR
  - UKSpeech, Cambridge, UK, 2017 — INTERSPEECH, Sweden, 2017
- Source-filter Separation of Speech Signal in the Phase Domain
  - UKSpeech 2015, Norwich, UK, 2015

Other Talks

- Genie in the mike! The Science of Talking (with) Machines
  - A Pint of Science Festival, Sheffield, UK. 15, May, 2017; Teaser
- Signal Processing is Dead(?)! Long Live DNN!

- Machine Intelligence for Natural Interfaces (MINI) workshop, Sheffield, 2016

- Deep Learning, The End of History and The Last Computer Scientist
  - A Pint of Science Festival, Sheffield, 2016
- Ethics in Data Modelling; Love it or Leave it?
  - Research Ethics and Integrity module, University of Sheffield, 2014

Roles

- Senior Area Chair (Speech Recognition), INTERSPEECH 2025
- Meta Reviewer (Speech Recognition), ICASSP 2025
- Area Chair (Speech Recognition), INTERSPEECH 2024
- Meta Reviewer (Speech Analysis), ICASSP 2024
- UK and Ireland Speech (UKIS) Steering Committee Member (2024-)
- UK and Ireland Speech (UKIS) Conference Co-organiser, Cambridge, UK, 2024
- Area Chair (Speech and Multimodality), EMNLP 2023
- Area Chair (Speech Recognition), INTERSPEECH 2023
- Meta Reviewer (Speech Analysis), ICASSP 2023
- Associate Member of IEEE's Speech & Language Processing Technical Committee (SLTC) (2023-2025)
- Cambridge Engineering Dep. Speech Group Seminars Co-organiser 2023-2024
- Reviewer (INTERSPEECH, ICASSP, ASRU, SLT, Speech Communication, ITASLP)
- Scientific Committee Member of ICASSP 2023 AMHAT Workshop
- Publication Chair in Spoken Language Technology Workshop (SLT) 2022
- Session Chair (INTERSPEECH 2023, SLT 2022, ICASSP 2022, etc.)
- Co-supervising one PhD student, University of Edinburgh (2018-2021)
- Primary supervisor of four MSc students, University of Edinburgh (2019-2021)
- Examiner of more than 15 MSc dissertations, University of Edinburgh (2019-2021)
- UKSpeech 2016 Co-organiser, Sheffield, UK, 2016
- Speech and Hearing Research Group (SPandH) Seminar Co-organiser 2015-2017

Skills

Computer: Python, PyTorch, Kaldi, Shell scripting, Linux, Docker, Latex, Office

Language: English (Fluent), Arabic (Native), Persian (Native)

Memberships

ISCA Member IEEE Member IEEE SPS Member

References

✓ Mark Gales, Professor in Information Engineering
- University of Cambridge, Cambridge, UK E-mail: mjfg@eng.cam.ac.uk

✓ Zoran Cvetkovic, Professor in Signal Processing
- King's College London, London, UK E-mail: zoran.cvetkovic@kcl.ac.uk

✓ Peter Bell, Professor in Speech Technology
- University of Edinburgh, Edinburgh, UK E-mail: peter.bell@ed.ac.uk