Hemlata Tak

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Goal

I hold a PhD in Speaker Recognition and Audio Deepfake Detection. I'm interested in solving complex problems using graph neural networks, deep learning and signal processing. I am a flexible and quick learner with a keen interest in technical advancement. A team player and can work in every challenging situation. Dedicated individual with the ability to work on problems and clearly communicate technical concepts.

Personal Information

DOB	September 22, 1992
Google Scholar	scholar.google.co.in/citations?user=u2DMQxsAAAAJ&hl=en
Github	github.com/TakHemlata

Education

Oct. 2019 - May 2023	**Doctor of Philosophy (Phd) in speaker recognition and audio deepfake detection** Sorbonne universite, Paris, France.
2016 - 2018	**M.Tech, Information Communication Technology**. Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT), Gandhinagar. - CPI 8.34/10
2011 - 2015	**B.Tech., Electronics and Communication Engineering (ECE)** Sir Padampat Singhania University, Udaipur -CPI 8.157/10

Journal:

1. Madhu R. Kamble, **Hemlata Tak**, Hemant A. Patil, " Amplitude and Frequency Modulation-Based Features for Detection of Replay Spoof Speech," in ***Speech Communication***, 2020.
2. Tomi Kinnunen, Kong Aik Lee, **Hemlata Tak**, Nicholas Evans and Andreas Nautsch, "t-EER: Parameter-Free Tandem Evaluation of Countermeasures and Biometric Comparators," *under revision in* ***IEEE Transactions on Pattern Analysis and Machine Intelligence***, 2023.

International Conference Publications

1. Sung Hwan Mun*, Hye-jin Shim*, **Hemlata tak***, Xin Wang, et. al, "Towards single integrated spoofing-aware speaker verification embeddings," Accepted in ***INTERSPEECH*** 2023.
2. Michele Panariello, Wanying Ge, **Hemlata Tak**, Massimiliano Todisco and Nicholas Evans, "Malafide: A novel adversarial convolutive noise attack against deepfake and spoofing detection systems," Accepted in ***INTERSPEECH*** 2023.
3. Wanying Ge, **Hemlata Tak**, Massimiliano Todisco and Nicholas Evans, "Can spoofing countermeasure and speaker verification systems be jointly optimised ?," Accepted in ***ICASSP*** 2023.
4. Wanying Ge*, **Hemlata Tak***, Massimiliano Todisco and Nicholas Evans, "On the potential of jointly-optimised solutions to spoofing attack detection and automatic speaker verification," in Proc. ***IberSPEECH*** 2022 (**Best paper award**).
5. Jee-weon Jung*, **Hemlata Tak***, et. al, "SASV 2022: The First Spoofing-Aware Speaker Verification Challenge," in Proc. ***INTERSPEECH*** 2022.

6. **Hemlata Tak**, Massimiliano Todisco, Xin Wang, Jee-weon Jung, Junichi Yamagishi, and Nicholas Evans, "Automatic speaker verification spoofing and deepfake detection using wav2vec 2.0 and data augmentation," *in Proc.* ***Speaker Language Recognition Workshop***, June 28th-July 1st, 2022, Beijing, China.

7. Hye-jin Shim*, **Hemlata Tak***, Nicholas Evans, et. al, "Baseline Systems for the First Spoofing-Aware Speaker Verification Challenge: Score and Embedding Fusion," *in Proc.* ***Speaker Language Recognition Workshop***, June 28th-July 1st, 2022, Beijing, China.

8. **Hemlata Tak**, Madhu Kamble, Jose Patino, Massimiliano Todisco, and Nicholas Evans, "RawBoost: A Raw Data Boosting and Augmentation Method applied to Automatic Speaker Verification Anti-Spoofing," *in Proc.* ***ICASSP***, May 2022.

9. Jee-weon Jung, Hee-Soo Heo, **Hemlata Tak**, Hye-jin Shim,Joon Son Chung, Bong-Jin Lee, Ha-Jin Yu, Nicholas Evans, "AASIST: Audio Anti-Spoofing using Integrated Spectro-Temporal Graph Attention Networks," ***Accepted*** *in* ***ICASSP***, May 2022.

10. **Hemlata Tak**, Jee-weon jung, Jose Patino, Madhu Kamble, Massimiliano Todisco, and Nicholas Evans, "End-to-End Spectro-Temporal Graph Attention Networks for Speaker Verification Anti-Spoofing and Speech Deepfake Detection," *in Proc.* ***INTERSPEECH Satellite Workshop of the ASVspoof 2021 Challenge***, September 2021.

11. **Hemlata Tak**, Jee-weon jung, Jose Patino,Massimiliano Todisco, and Nicholas Evans, "Graph Attention Network for Anti-Spoofing," *in Proc.* ***INTERSPEECH***, September 2021.

12. Oubada Chouchane, Baptiste Brossier, Jorge Esteban Gamboa Gamboa, Thomas Lardy, **Hemlata Tak**, Orhan Ermis, et. al, "Privacy-preserving voice anti-spoofing using secure multi-party computation," *in Proc.* ***INTERSPEECH***, September 2021.

13. **Hemlata Tak**, Jose Patino, Massimiliano Todisco, Andreas Nautsch, Nicholas Evans and Anthony Larcher, "End-to-end anti-spoofing using RawNet2," *in IEEE* ***ICASSP***, Toronto, Ontario, Canada, 2021.

14. **Hemlata Tak**, Jose Patino, Andreas Nautsch, Nicholas Evans and Massimiliano Todisco, "Spoofing Attack Detection using the Non-linear Fusion of Sub-band Classifiers," *in* ***INTERSPEECH***, Beijing, October 2020.

15. **Hemlata Tak**, Jose Patino, Andreas Nautsch, Nicholas Evans and Massimiliano Todisco, "An explainability study of the constant Q cepstral coefficient spoofing countermeasure for automatic speaker verification," *in* ***Speaker Odyssey Workshop***, Tokyo, Japan, Nov. 2-5, 2020.

16. **Hemlata Tak**, Hemant A. Patil, "Novel Linear Frequency Residual Cepstral Feature For Replay Attack Detection," *in* ***INTERSPEECH***, Hyderabad, India, September 2-6, 2018.

17. Madhu R. Kamble, **Hemlata Tak**, Hemant A. Patil, "Effectiveness of Speech Demodulation-Based Features for Replay Detection," *in* ***INTERSPEECH***, Hyderabad, India, September 2-6, 2018.

18. Madhu R. Kamble, **Hemlata Tak**, Maddala V. Siva Krishna, and Hemant A. Patil, "Novel Demodulation-Based Features using Classifier-level Fusion of GMM and CNN for Replay Detection," *in International Symposium on Chinese Spoken Language Processing* ***(ISCSLP)***, Taipei, Taiwan, 2018.

19. Madhu R. Kamble, Maddala V. Siva Krishna, **Hemlata Tak**, and Hemant A. Patil,"Comparison of Frame and Utterance-level Classifiers for Replay Attack Detection," *accepted in* ***APSIPA ASC*** 2019.

Professional Experience

Aug, 2022- Nov. 2022 | **Applied Scientist II, Intern**
Amazon, Seattle, WA, USA

Worked on semi-supervised and self-supervised speaker recognition project during the internship and push the limits of semi-supervised speaker recognition performance to state-of-the-art performance for standard benchmarks.

Sep, 2018- Sep, 2019 | **Machine Learning Engineer**
Meeami Technologies, Hitech city, Hyderabad

Worked on Speaker Recognition using Signal Processing and Deep Learning approaches (DNN, CNN, RNN and 2D-CRNN)

Developed text-dependent speaker recognition system using deep neural network approach.

Teaching Experience

April, 2022 - Aug, 2022	**Teaching Assistant** "Speech Processing " (To 1st year Master's students EURECOM, France)
Aug, 2016 - 2016-Dec	**Teaching Assistant** "Calculus" (To 1st year B.Tech students DA-IICT, Gandhinagar)

PhD Thesis Project

PhD Thesis	**"End-to-end modelling using graph attention networks for audio deepfake detection"** I have done my PhD thesis in the voice biometrics area in Automatic Speaker Verification. My PhD thesis focuses on developing novel detection algorithms which are designed to perform reliably in the face of the highest quality unseen attacks. The thesis presents several state-of-the-art end-to-end detection models that use deep learning and graph neural networks (GNNs). One of my contributions is the end-to-end spectro-temporal graph attention network called RawGAT-ST, which operates directly on raw waveform inputs. We also proposed an integrated spectro-temporal graph attention network named AASIST, which leverages the relationship between heterogeneous spectral and temporal graphs to integrate different types of nodes/edges with varying feature characteristics or cues. By using GNN-based countermeasures that exploit information from both domains simultaneously, our models improved detection performance for more sophisticated spoofing attacks and achieved state-of-the-art deepfake detection performance on the standard reproducible benchmarks. To enhance generalization and domain-robustness, we introduced a new data augmentation technique called RawBoost, which improves detection performance under wild conditions. (`https://www.eurecom.fr/publication/7273`)

Skills

Area of Interest:	Graph neural network, Deep Learning, Speaker recognition Audio deepfake detection, Anti-spoofing, Signal processing.
Programming:	python, pytorch, pytorch-lightning, pandas, numpy, scikit-learn, matlab
Data engineering:	acoustic feature extraction, data analysis
Soft skills:	Teamwork, Leadership, Time management

Awards and Achievements

1. I will be offering a tutorial on "Advances in audio anti-spoofing and deepfake detection using graph neural networks and self-supervised learning" at **INTERSPEECH 2023** Conference, Dublin, Ireland. (`https://interspeech2023.org/tutorials/`)
2. Received travel grant of upto **800 USD** from **Young Female Researchers in Speech Science and Technology 2018** to present the papers at Conference of the International Speech Communication Association (INTERSPEECH) ", at **Hyderabad, India** during September 2-6, 2018 was awarded.

Conferences and Workshops Attended

International Conferences

- **IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)**, Rhodes, Greece, 2023.
- Conference of the International Speech Communication Association **INTERSPEECH**, at **Incheon, Korea**, during Sep. 18- 22, 2022.
- **Speaker and Language Recognition Workshop (Speaker Odyssey)**, at Beijing, China, during June 28th- July 1st, 2022.
- **IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)**, Singapore, May 22-28, 2022.

- Conference of the International Speech Communication Association **INTERSPEECH**, at **Brno, Czech Republic**, during Aug. 29- Sep. 3, 2021.

- **IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)**, Toronto, Canada, 2021.

- **Speaker and Language Recognition Workshop (Speaker Odyssey)**, at Tokyo, Japan, during Nov 02-05, 2020.

- Conference of the International Speech Communication Association **INTERSPEECH**, at **Beijing, China**, during Oct. 25- 29, 2020.

- Conference of the International Speech Communication Association **INTERSPEECH**, at **Hyderabad, India** during September 2-6, 2018.

Workshops

- Automatic Speaker Verification and Spoofing Countermeasures **(ASVspoof)** Challenge 2021, an official **INTERSPEECH 2021** satellite event.
- Summer School on Speech Signal Processing (S4P) on "Speaker Recognition and Diarization", at **DA-IICT, Gandhinagar** during July 5-10, 2019.
- Summer School on Speech Signal Processing (S4P) on "Speech Production", at **DA-IICT, Gandhinagar** during September 9-11, 2018.
- Workshop for "Young Female Researchers in Speech Science and Technology 2018", at **IIIT, Hyderabad**, September 1, 2018.
- Summer School on Speech Signal Processing (S4P) on "Speaker and Language Recognition", at **DA-IICT, Gandhinagar** during July 8-12, 2017.

Professional Service

- **Co-organizer** of "**ASVspoof5 Challenge**"-(`www.asvspoof.org`).
- **Main organizer** of "**A Spoofing Aware Speaker Verification (SASV) 2022 Challenge**" (`https://sasv-challenge.github.io/`) (Special session held at **INTERSPEECH 2022**, Incheon, Korea.)
- Reviewer for ICASSP, INTERSPEECH, IEEE T-SALP Journal, Computer Science and Language (CSL), EURASIP Journal on Audio, Speech, and Music Processing, Speech Communication Elsevier journal.

Active Professional Membership

- International Speech Communication Association (ISCA)
- IEEE Signal Processing Society (SPS)
- IEEE Student Membership

Declaration

The above information is correct to the best of my knowledge.

Hemlata Tak
July 18, 2023