

Xingyu Chen

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Google scholar

Education

University of Technology Sydney PhD at the Centre for Audio, Acoustics and Vibration	Jul 2024 - Jan 2028
Australian National University Mphil in Audio & Acoustic Signal processing Group	Aug 2022 - Jun 2024
Australian National University B.Eng.(Honors), Mechatronics system	Feb 2017 - Jun 2021

Skills

- **Programming:** Python, Matlab **Frameworks:** PyTorch, TensorFlow
- **Concepts:** Deep learning: Physics-informed Neural Network, Spherical CNN, FSMN; HRTF: Interpolation
Sound field analysis: Spherical harmonics decomposition; Speech enhancement: Complex masking

Research Experience

Australian National University Aug 2022 - May 2024
Mphil in Audio & Acoustic Signal Processing Group, Supervisor: [Prasanga Samarasinghe](#)

- **Monaural Speech Enhancement on Drone**
 - As the drone-mounted microphone is close to the noise sources (i.e. motors and propellers), the SNR of speech is low.
 - Proposed a frequency domain bottleneck adapter embedded within a pre-trained FRCRN model, facilitating transfer learning to adapt to various drone types efficiently.
 - It offers a more efficient alternative to full fine-tuning models for various drone types.
- **Head-Related Transfer Function Interpolation with a Spherical CNN**
 - Proposed an upsampling network based on the spherical CNN for HRTF interpolation, capitalizing on the inherent geometric properties of HRTF that are not utilized by conventional CNNs.
 - Kernel functions expressed in the SH domain capture the spatial features of HRTF.
 - Achieved higher accuracy and model efficiency with significantly fewer parameters than conventional CNN approaches.
- **Physics-informed neural network for sound field analysis**
 - Estimating the sound field around a rigid sphere poses challenges due to the limited sampling of the sphere.
 - Proposed a network based on PINN that integrates physical constraints.

Incorporated constraints derived from the Helmholtz equation and the zero radial velocity condition of the rigid sphere.
 - Effectively alleviates ill-conditioning problems associated with the truncation errors of spherical harmonic decomposition.

The Chinese University of Hong Kong, Shenzhen Sep 2021 - Mar 2022
Research Assistant, Mentor: [Junfeng Wu](#)

- **Extended Kalman filter-based State estimation**
 - Analyzed performance limitations of EKF, noting that complexity scales quadratically with the dimension of the state vector.
 - Proposed a method for approximating the covariance matrix transmission and updating process on the Lie group.
 - Verified on the inertial navigation dataset, the result exceeds filter-based SLAM methods(Quaternion-based; Invariant EKF).

Publication (in chronological order)

1. Lai, W. T., Birnie, L., **Chen, X.**, Bastine, A., Abhayapala, T., & Samarasinghe, P. (2024). Source Localization by Multidimensional Steered Response Power Mapping with Sparse Bayesian Learning
2. **Chen, X.**, Bi, H., Lai, W. T., & Ma, F. (2024). Monaural speech enhancement on drone via Adapter based transfer learning. *arXiv preprint arXiv:2405.10022*.
3. **Chen, X.**, Ma, F., Zhang, Y., Bastine, A., & Samarasinghe, P. N. (2023). Head-Related Transfer Function Interpolation with a Spherical CNN. *arXiv preprint arXiv:2309.08290*.
4. Ma, F., Abhayapala, T. D., Samarasinghe, P. N., & **Chen, X.** (2023). Physics Informed Neural Network for Head-Related Transfer Function Upsampling. *arXiv preprint arXiv:2307.14650*.
5. **Chen, X.**, Ma, F., Bastine, A., Samarasinghe, P., & Sun, H. (2023). Sound Field Estimation around a Rigid Sphere with Physics-informed Neural Network. *Asia-Pacific Signal and Information Processing Association (APSIPA)*
6. Li, X., Jiang, H., **Chen, X.**, Kong, H., Wu, J. (2022). Closed-Form Error Propagation on SEN(3) Group for Invariant EKF With Applications to VINS. *IEEE Robotics and Automation Letters*, 7(4), 10705-10712

Other Experience

Teaching Assistant: ENGN4213-Digital Systems and Microprocessors @ANU

- Clarified concepts related to embedded microprocessor systems.
- Supervised hands-on hardware lab, including the recording with MEMS Mic and STFT on STM32.

Students Mentored:

- Jasper Delbridge CS undergraduate @ANU Bird Detection and Localisation using EigenMike (Spherical Mic array)