Yilin PAN

LinkedIn: Yilin Pan
Email: yilin.pan@outlook.com
GitHub: YilinSpeechandNLP

Education

University of Sheffield, *Doctor of Engineering*, Computer Science 2019–2022 | Sheffield, UK

- Research interest: Pathological Speech Processing; Speech Recognition; Natural Language Processing
- Supervisor/Research Group: Heidi Christensen/Speech and Hearing Research Group
- Thesis: Linguistic- and Acoustic-based Automatic Dementia Detection using Deep Learning Methods
- Scholarship: 2020 Horizon Marie Skłodowska-Curie Actions (TAPAS)

Harbin Institute of Technology, *Master of Engineering*, Computer Science (ESI top 1%) 2015–2017 | China

- Research interest： Speaker Verification; Speech Processing
- Supervisor/Research Group: Tieran Zheng/Speech Processing Lab
- Thesis: I-vector based probabilistic linear discrimination analysis for speaker verification research
- Scholarship: First Level Scholarship (twice)

Northeastern University, *Bachelor of Engineering*, Computer Science（National key Uni.） 2011–2015 | China

- Research interest： Pedestrian Detection； Signal Processing
- Supervisor/Research Group: Hai Zhao/Embedded Technology Lab
- Thesis： Multi-pedestrian detection method based on HOG and improved ViBe from video data
- Scholarship: University Second-level Scholarship (twice); University third-level Scholarship (three times)

Work Experience

Dalian Maritime University, *Lecturer, Pathological Speech Processing* 2022.10–now | Dalian, China

- Research topic: Speech based dementia disease detection and longitudinal tracking

Philips, *Intern Researcher*, Pathological Speech Processing 2020.06–2020.09 | Eindhoven, Netherlands

- Research topic: Speech based dementia disease detection and longitudinal tracking

Iflytek, *Early Stage Researcher*, Natural Language Processing 2017.08–2017.10 | Beijing, China

- Research topic: Composition scoring and ancient poetry recommendation based on deep learning

Challenges

- **Alzheimer's Dementia Recognition through Spontaneous Speech** 2020.06–2020.10
  The work has been accepted by Interspeech 2020.
- **Alzheimer's Dementia Recognition through Spontaneous Speech only** 2021.02–2021.04
  The work has been accepted by Interspeech 2021 (joint winners).

Projects

- **I-vector/PLDA based Speaker Verification System** 2016.10–2017.05
  Kullback-Leibler divisive was adopted for regularizing the distribution of the i-vector for minimizing the distribution distance between the extracted i-vector and the Gaussian hypothesis, before using the regularised i-vector as the input of the PLDA. After regularisation, the verification accuracy on the NIST SRE 2008 dataset was improved by 2% with the i-vector/PLDA system. The work was accepted by IEEE Global SIP 2017.
- **Composition Score and Ancient Poetry Recommendation** 2017.08–2017.10
  Existing essay scoring systems generally only aim to score essays but cannot provide polishing that consider the content of the essay. To help students polish their essays, a deep learning model based on the attention mechanism was adopted to extract the topic of the essay and match it with a pre-stored library of ancient poems and quotes to make the recommendations. This project was carried out at the Iflytek, Beijing Research Institute.
- **Linguistic based Dementia Detection** 2018.10–2019.04
  According to research, the speech of people living with Alzheimer's Disease has deficits at both the word and the sentence level. Inspired by this phenomenon, we proposed an end-to-end hierarchical attention structure for extracting the linguistic information from transcripts at both the word and the sentence level. The work was accepted by Interspeech 2019.
- **Acoustic based Dementia Detection** 2019.03–2021.02
  - Time alignment information and confidence scores estimated by the ASR system were used to design the rhythm-related feature and extract the high-quality feature extraction. The work was accepted by Interspeech 2020.
  - The raw waveform was used as the input of an interpretable end-to-end system for Alzheimer's Disease detection. The work was accepted by Interspeech 2020.
- **Speech based Dementia Tracking** 2020.06–2020.10
  An individual's speech properties may change over time due to ageing, but changes may also occur as a consequence of cognitive decline. In response to this phenomenon, a theoretical analysis of the impact of age and illness on the patient's voice revealed the relationship between age and cognitive status. Then, multi-task regression models were proposed. The work was accepted by ICASSP 2021. This project was carried out at the Philips Research Center in the Netherlands.
- **Different Automatic Speech Recognition Paradigms for Dementia Detection** 2021.01–2021.04
  Acoustic features can be extracted directly from the audio recordings. However, linguistic features in fully automatic systems need to be extracted from transcripts generated by an ASR system. We explored two state-of-the-art ASR paradigms, Wav2vec2.0 (for transcription and feature extraction) and time-delay neural networks (TDNN), on the ADReSSo dataset containing recordings of people describing the Cookie Theft picture. The work was accepted by Interspeech 2021.
- **End-to-end Dementia Detection System Construction** 2021.05–2022.03
  BERT and wav2vec2.0 has been used for designing acoustic- and linguistic-based dementia detection systems. The research results will be submitted to IEEE/ACM Transactions on Audio Speech and Language Processing (to be submitted) and ICASSP2022 (the experiment has been finished).
- **Multi-modal Dementia Detection System Construction** 2021.04–2022.08
  The clinical diagnostic knowledge has been embedded into the Htsat, wav2vec2.0 and BERT systems for designing the acoustic- and linguistic-based dementia detection system. The research results will be submitted to Computer Speech&Language (the experiment has been finished).

Major Publications

[1] **Pan, Yilin**, T. Zheng, and C. Chen, "I-vector kullback-leibler divisive normalization for plda speaker verification", in *2017 IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, 2017, pp. 56–60.

[2] **Pan, Yilin**, B. Mirheidari, M. Reuber, A. Venneri, D. Blackburn, and H. Christensen, "Automatic hierarchical attention neural network for detecting AD.", in *INTERSPEECH*, 2019, pp. 4105–4109.

[3] **Pan, Yilin**, B. Mirheidari, M. Reuber, A. Venneri, D. Blackburn, and H. Christensen, "Improving detection of Alzheimer' s Disease using automatic speech recognition to identify high-quality segments for more robust feature extraction", in *INTERSPEECH*, 2020, pp. 4961–4965.

[4] **Pan, Yilin**, B. Mirheidari, Z. Tu, R. O' Malley, T. Walker, A. Venneri, M. Reuber, D. Blackburn, and H. Christensen, "Acoustic feature extraction with interpretable deep neural network for neurodegenerative related disorder classification", in *INTERSPEECH*, 2020, pp. 4806–4810.

[5] **Pan, Yilin**, V. S. Nallanthighal, D. Blackburn, H. Christensen, and A. Härmä, "Multi-task estimation of age and cognitive decline from speech", in *ICASSP 2021-2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, IEEE, 2021, pp. 7258–7262.

[6] **Pan, Yilin***, Mirheidari, Bahman*, J. M. Harris, J. C. Thompson, M. Jones, J. S. Snowden, D. Blackburn, and H. Christensen, "Exploring using the outputs of different automatic speech recognition paradigms for acoustic- and bert-based Alzheimer' s dementia detection through spontaneous speech", in *INTERSPEECH*, 2021 (*co-author), pp. 3810–3814.

[7] N. Cummins, **Pan, Yilin**, Z. Ren, J. Fritsch, V. S. Nallanthighal, H. Christensen, D. Blackburn, B. W. Schuller, M. Magimai-Doss, H. Strik, *et al.*, "A comparison of acoustic and linguistics methodologies for Alzheimer' s dementia recognition", in *INTERSPEECH*, 2020, pp. 2182–2186.

[8] B. Mirheidari, **Pan, Yilin**, D. Blackburn, R. O'Malley, and H. Christensen, "Identifying cognitive impairment using sentence representation vectors", in *INTERSPEECH*, 2021, pp. 2941–2945.

[9] **Pan, Yilin**, M. Lu, Y. Shi, and H. Zhang, "A path signature approach for speech-based dementia detection", *IEEE Signal Processing Letters*, 2023.

[10] **Pan, Yilin**, B. Mirheidari, D. Blackburn, and H. Christensen, "Tsac-att: A self-supervised speech-based dementia detection system", *IEEE/ACM Transactions on Audio, Speech and Language Processing*, Under Review.

[11] **Pan, Yilin**, Y. Shi, Y. Zhang, and M. Lu, "Extracting the hierarchical information with swin transformer and bert-based system for speech-based dementia detection", *Applied Intelligence*, Under Review.

Google Scholar Personal Web Page: https://scholar.google.com/citations?user=Yrzc2wgAAAAJ&hl=zh-CN