RUCHAO FAN

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EDUCATION

- **Beijing University of Posts and Telecommunications (BUPT)** **Beijing, China**
  Master of Science, Information and Communication Engineering *June 2019(Expected)*
- **Beijing University of Posts and Telecommunications (BUPT)** **Beijing, China**
  Bachelor of Engineering, Communication Engineering *June 2016*

RESEARCH INTERESTS

- Automatic speech recognition, speech processing, machine learning

PROJECTS

Sogou Micro Smart Recorder C1 *January 2019 - April 2019*
- Improved the training of bidirectional speech-transformer as offline model for Recorder C1.
- Developed the test process for speech-transformer, obtaining all kinds of errors(wer, sub, del and ins).

A pytorch-book in Chinese [URL] *November 2017 - August 2018*
- A book of pytorch tutorials with fun projects including computer vision, natural language processing and speech recognition. I took charge of speech recognition and part of NLP.

RESEARCH/INDUSTRIAL EXPERIENCE

Sogou Inc. - Voice Interaction Technology Center **Beijing, China**
Research Intern *April 2018 - Present*
- Streaming attention-based model for real-time speech recognition
  - Explored methods to stream LSTM-attention-based model(LAS). Proposed an Adaptive Monotonic Chunk-wise Attention and combined with a LC-BLSTM encoder to achieve streaming decoding.
  - Exploring methods to stream self-attention-based model(speech-transformer).
  - Developing a streaming decoder for attention-based model.
- Distributed training of end-to-end models
  - Implemented blockwise model update and filtering(BMUF) algorithm for synchronous gradient descent with pytorch.
  - Developed a distributed training process with BMUF to train the large scale data of speech.
- Attention-based model for speech recognition
  - Improved the training of LAS with different label smoothing methods and pre-trained layers for both encoder and decoder.
  - Implemented most of decoding tricks of attention-based model with batch beam search, including integrated with language model, length penalty, coverage penalty, stop emit probability and temperature regulation.
  - Implemented the discriminative training (MMI and MWER) of attention-based model and compared their performance.

BUPT - Pattern Recognition and Intelligent System Lab **Beijing, China**
Research Assistant *September 2016 - Present*

- Connection temporal classification (CTC) on phoneme recognition [URL]
  - Developed an experimental sequence recognition system of CTC architecture with kaldi and pytorch.
  - Proposed a Full-Mel Spectrum feature for speech recognition.
  - Explored the role of shallow CNN and its parameter design principle under CTC architecture.
- Traditional speech recognition
  - Feature transform algorithm: Improved supervised locality preserving projection(LPP) algorithm to better fit the non-linear relationship between speech features.
  - Frequency warping for speaker adaptation: Proposed a two factor frequency warping algorithm with weighted fusion of the glottis resonant and the third formant to better decrease the influence of variance between speakers.

CONFERENCE PUBLICATIONS

- **Ruchao Fan**, Pan Zhou,Wei Chen, Jia Jia, and Gang Liu, "An online attention-based model for speech recognition," arXiv preprint arXiv:1811.05247, 2018.
- **Ruchao Fan** and Gang Liu, "CNN-based audio front end processing on speech recognition," in 2018 International Conference on Audio, Language and Image Processing (ICALIP). IEEE, 2018, pp. 349–354.
- Gang Liu, Haobin Chen, and **Ruchao Fan**, "Frequency warping based on two factor weighted fusion," in 2017 4th International Conference on Systems and Informatics (ICSAI). IEEE, 2017, pp. 1082–1086.
- Gang Liu, Boce Chu, and **Ruchao Fan**, "Multi-parameter frequency warping based on lda," in 2017 13th International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD). IEEE, 2017, pp. 2710–2714.
- Gang Liu, Boce Chu, and **Ruchao Fan**, "An improved locality preserving projection for feature transform in speech recognition," in 2017 International Conference on Machine Learning and Cybernetics (ICMLC). IEEE, 2017, vol. 1, pp. 77–82.

SKILLS

- Computer Language: Python, Shell, C/C++
- Open-source Framework: Pytorch, Kaldi, Tensorflow

AWARDS & HONORS

Academic Honors

- Undergraduate National Inspirational Scholarship(2013,2014,2015)
- Graduate Academic Scholarship(2016,2017,2018)
- Huawei Enterprise Scholarship(2017)
- A first-year graduate fellowship for ECE Ph.D. program at UCLA(2019)

Competition Awards

- 1st Prize in Beijing Mathematics Competition(Fall 2013)
- 1st Prize in National Electronic Design Competition TI Invitational Tournament(Fall 2014)
- Honorable Mention in Mathematical Contest in Modeling(Spring 2015)
- 3rd Prize in Beijing Electronic Design Contest(Fall 2015)