Jiahuan Pei

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I am a researcher at Dutch national research institute <u>CWI</u>, working on <u>generative dialogue systems in extended reality (XR) spaces</u>. Formerly, I was an applied scientist at Amazon's A9 team, working on core NLP/IR in Amazon product search. I have pursued my Ph.D. with the <u>IRLab</u> at University of Amsterdam, supervised by Prof. dr. Maarten de Rijke and Prof. dr. Pengjie Ren. My interest includes natural language processing (dialogue systems, word embedding, parsing, summarization) and information retrieval (query understanding, recommender system, matching algorithm embedding).

Education

Oct. 2017 – Dec. 2022	**Ph.D., University of Amsterdam,** Science of Informatics. Thesis title: *Collaborative agents for task-oriented dialogue systems.* [link] Supervisor: Prof. dr. Maarten de Rijke
Sept. 2014 – Jul. 2017	**M.Sc., Dalian University of Technology,** Computer Applied Technology. Thesis title: *Research on Chinese word semantic similarity computation.* [link] Supervisor: Prof. dr. Degen Huang
Sept. 2010 – Jul. 2014	**B.Sc., Dalian Maritime University,** Software Engineering (Major), International Economics and Trade (Minor). Thesis title: *Chinese functional maximal-length noun phrase recognition.* [link] Supervisor: Assoc. Prof. Yiwu Xie

Skills & Certificate

Knowledge	Machine Learning, Deep Learning, Natural Language Processing, Information Retrieval.
Coding	Python, Pytorch, Tensorflow, Theano, Java, C, C++, C#, Ruby, PHP, HTML, JavaScript, SQL, LaTeX, AWS (Athena, Sagemaker, S3, Stepfunctions).
Languages	Mandarin Chinese (First language), English (CET-6), Japanese (JLPT-N2).
Teaching	TLC-module Training (Teaching and Learning Centre, University of Amsterdam).

Experience

April. 2023 – Now	**Researcher,** CWI, Amsterdam, Netherlands. My role is to explore generative dialogue agents in extended reality (XR), which cooperates with multiple partners in the EU-supported project. This work combines the fields of artificial intelligence, natural language processing, and immersive technologies to create interactive and engaging conversational experiences in virtual and augmented reality environments. Within the realm of XR, we explore innovative ways to enhance human-computer interactions by enabling natural and realistic conversations with virtual entities. By leveraging the power of generative dialogue systems, you aim to develop intelligent agents capable of understanding and responding to user input in a dynamic and contextually appropriate manner.

Experience (continued)

Dec. 2021 – Mar. 2023   **Applied Scientist,** Amazon, Berlin, Germany.
My role is to explore practical NLP/IR problems related to customer obsession with Amazon search and propose scientifically grounded solutions. The main responsibilities include: Refining and revising the project plan to learn matcher embeddings for improving Amazon's product search engine; Creating datasets for training and evaluating machine learning models for this task; Evaluating the models, analyzing their performance, and reporting the findings to the wider team.

Mar. 2021 – May 2021   **Applied Scientist Intern,** Amazon, Berlin, Germany.
My role is to explore stochastic Transformers architecture and enhance it with uncertainty estimation with Monte Carlo method.
Mentor: Dr. Cheng Wang

Mar. 2020 – Jun. 2020   **Applied Scientist Intern,** Amazon Alexa AI, Aachen, Germany.
My role is to develop a lightweight adaptive Transformers model for natural language understanding in Alexa, which is able to remain more than 95% of the effectiveness while using less than 50% of the computational cost.
Mentor: Dr. Daniil Sorokin

Teaching

Sep. 2018 – Oct. 2020   **Teaching Assistant,** Bachelor's IR course, University of Amsterdam.
My role is to design the final search engine project, prepare pipeline code, grade, and answer students' questions.

Nov. 2018 – Jan. 2019   **Teaching Assistant,** Master's IR course, University of Amsterdam.
My role is to supervise two groups of students to wrap up their research projects, which includes weekly meetings, model implementation and paper writing.

Sep. 2018 – Dec. 2022   **Thesis Supervisor,** University of Amsterdam.
I have supervised 2 master students and 1 bachelor student for their thesis. My role is to help with weekly discussions, model design, result analysis and thesis writing.

Sep. 2018 – Now   **Research Supervisor,** University of Amsterdam and Shandong University.
I have supervised 2 Ph.D. students and 2 master students for their research papers. My role is to help with weekly discussions, model design, result analysis and paper writing.

Activities

2021 – 2022   **Campus intern ambassador,** Amazon Campus Intern Ambassador Program 2021/22.

2020 – 2021   **Reviewer and PC member,** Journals (TOIS, IPM, TOIT), conferences (ACL, SIGIR, AAAI, WWW, IJCAI, EMNLP, CIKM, WSDM, COLING, EACL).

2019 – 2020   **Soos talk chair,** IRLab, University of Amsterdam.

Sept. 2015 – Mar. 2016   **Research grant application:** Sentence similarity computation based on deep Learning. My role is the lead author in application for National Natural Science Foundation of China (No. 61672127).

May. 2014 – Sept. 2015   **Research grant participation:** English functional noun phrases identification. My role is research assistant, taking charge of model design and implementation in National Social Science Foundation of China (No.15BYY175).

Awards

2016   ▌ **National scholarship for outstanding master students**, top 1%.

▌ **Excellent graduate student in Dalian city**, top 5%.

▌ **Outstanding master's thesis award**, top 5%.

2011–2014   ▌ **Outstanding student scholarship for bachelor students**, top 3%.

Talks

April. 2023   ▌ Generative AI towards scientific discovery, invited talk, Microsoft Research AI4Science, Amsterdam, Netherlands. [slides].

▌ Learning embeddings to represent information retrieval systems, conference talk, Amazon Machine Learning Conference (AMLC), Berlin, Germany.

July. 2022   ▌ Frontiers of collaborative task-oriented dialogue systems, invited talk, University College London (UCL), London, United Kingdom. [slides].

Apr. 2022   ▌ Transformer uncertainty estimation with hierarchical stochastic attention, invited talk, Search Engine Amsterdam (SEA), Amsterdam, Netherlands. [link].

Apr. 2021   ▌ A cooperative memory network for personalized task-oriented dialogue systems with incomplete user profiles, conference talk, WWW' 21, Ljubljana, Slovenia. [slides]. [vedio].

Sept. 2020   ▌ Retrospective and prospective mixture-of-generators for task-oriented dialogue response generation, conference talk, ECAI' 20, Santiago de Compostela, Spain. [slides]. [video].

Jun. 2020   ▌ Adaptive Transformers for efficient natural language understanding, invited talk, Amazon, Germany.

Aug. 2019   ▌ SEntNet: Source-aware recurrent entity network for dialogue response selection, conference talk, IJCAI' 19 SCAI Workshop, Macao, China. [slides].

Dec. 2016   ▌ Combining word embedding and semantic lexicon for Chinese word similarity computation, conference talk, NLPCC' 16, Kunming, China. [slides].

Jun. 2016   ▌ DUT-NLP-CH @ NTCIR-12 temporalia temporal intent disambiguation subtask, conference talk, NTCIR' 16, Tokyo, Japan. [slides].

Publications

Conference Papers

1   **Pei**, **Jiahuan**, Danushka Bollegala, and Omar Zaidan. "Learning Embeddings to Represent Information Retrieval Systems". In: *AMLC 2022 Deep Metric Learning and Semantic Similarity Search Workshop*. 2022.

2   **Pei**, **Jiahuan**, Cheng Wang, and György Szarvas. "Transformer Uncertainty Estimation with Hierarchical Stochastic Attentions". In: *Proceedings of AAAI Conference on Artificial Intelligence, AAAI 2022, **CCF A**)*. 2022. 🔗 URL: `https://arxiv.org/pdf/2112.13776.pdf`.

3   Yan, Guojun, **Jiahuan Pei**, Pengjie Ren, Zhaochun Ren, and Maarten de Rijke. "ReMeDi: Resources for Multi-domain, Multi-service, Medical Dialogues". In: International ACM SIGIR Conference on Research and Development in Information Retrieval (SIGIR'22, **CCF A**). 2022.

4   **Pei**, **Jiahuan**, Pengjie Ren, and Maarten de Rijke. "A Cooperative Memory Network for Personalized Task-oriented Dialogue Systems with Incomplete User Profiles". In: *Proceedings of The Web Conference 2021 (WWW '21, **CCF A**)*. 2021. 🔗 URL: `https://arxiv.org/pdf/2102.08322.pdf`.

5   **Pei**, **Jiahuan**, Pengjie Ren, Christof Monz, and Maarten de Rijke. "Retrospective and Prospective Mixture-of-Generators for Task-oriented Dialogue Response Generation". In: *Proceedings of the 24th European Conference on Artificial Intelligence (ECAI' 20, **CCF B**)*. Nov. 2019. 🔗 URL: `https://arxiv.org/pdf/1911.08151.pdf`.

6   **Pei**, **Jiahuan**, Pengjie Ren, and Maarten de Rijke. "A Modular Task-oriented Dialogue System Using a Neural Mixture-of-Experts". In: *Proceedings of the 42nd International ACM SIGIR Workshop on Conversational Interaction Systems (SIGIR'19 WCIS Workshop)*. July 2019. 🔗 URL: http://arxiv.org/abs/1907.05346.

7   **Pei**, **Jiahuan**, Arent Stienstra, Julia Kiseleva, and Maarten de Rijke. "SEntNet: Source-aware Recurrent Entity Network for Dialogue Response Selection". In: *Proceedings of the 28th International Joint Conference on Artificial Intelligence Workshop on Search-Oriented Conversational AI (IJCAI' 19 SCAI Workshop)*. June 2019. 🔗 URL: http://arxiv.org/abs/1906.06788.

8   Ma, Jianjun, Mulangma Zhu, Degen Huang, and **Jiahuan Pei**. "Recognition of Syntactic Relationship between Clauses Using CRFs". In: *International Journal of Advanced Intelligence*. Vol. 10. Dec. 2018, pp. 1–14.

9   **Pei**, **Jiahuan**, Cong Zhang, Degen Huang, and Jianjun Ma. "Combining Word Embedding and Semantic Lexicon for Chinese Word Similarity Computation". In: *Natural Language Understanding and Intelligent Applications (NLPCC'16, CCF C)*. Dec. 2016, pp. 766–777. 🔗 URL: https://doi.org/10.1007/978-3-319-50496-4_69.

10   **Pei**, **Jiahuan**, Degen Huang, Jianjun Ma, Dingxin Song, and Leyuan Sang. "DUT-NLP-CH @ NTCIR-12 Temporalia Temporal Intent Disambiguation Subtask". In: *Proceedings of the 12th NTCIR Conference on Evaluation of Information Access Technologies (NTCIR' 16)*. June 2016. 🔗 URL: https://research.nii.ac.jp/ntcir/workshop/OnlineProceedings12/pdf/ntcir/TEMPORALIA/06-NTCIR12-TEMPORALIA-PeiJ.pdf.

Journal Articles

1   Ma, Jianjun, **Jiahuan Pei**, Degen Huang, and Dingxin Song. "Syntactic parsing of clause constituents for statistical machine translation". In: *International Journal of Computational Science and Engineering (IJCSE'18, JCR-Q3)* 17.1 (Sept. 2018), pp. 126–132. 🔗 URL: https://doi.org/10.1504/IJCSE.2016.10004598.

2   Huang, Degen, **Jiahuan Pei**, Cong Zhang, Kaiyu Huang, and Jianjun Ma. "Incorporating Prior Knowledge into Word Embedding for Chinese Word Similarity Measurement". In: *ACM Transactions on Asian and Low-Resource Language Information Processing (TALLIP' 18, SCI, JCR-Q2, IF=1.413)* 17.3 (Apr. 2018). 🔗 URL: https://doi.org/10.1145/3182622.

3   Zhang, Cong, **Jiahuan Pei**, Kaiyu Huang, Degen Huang, and Zhangzhi Yin. "Semantic graph optimization algorithm based chinesemicroblog opinion summarization". In: *Journal Of Shandong University (Natural Science)* 52.7 (2017), pp. 59–65. 🔗 URL: http://lxbwk.njournal.sdu.edu.cn/CN/10.6040/j.issn.1671-9352.1.2016.PC2.

4   Ma, Jianjun, **Jiahuan Pei**, and Degen Huang. "Identification of English Functional Noun Phrases by CRFs and the Semantic Information". In: *Journal of Chinese Information Processing (CCF B, Chinese Journal)* 30 (Sept. 2016), pp. 59–66. 🔗 URL: http://jcip.cipsc.org.cn/CN/Y2016/V30/I6/59.

Ongoing Work

1   Deng, Wentao, **Jiahuan Pei**, and Pengjie Ren. "Intent-calibrated Self-training for Answer Selection in Open-domain Dialogues". TACL (Conditionally Accepted). 2023.

2   Liu, Yuanxing, **Jiahuan Pei**, Ming Li, Weinan Zhang, Wanxiang Che, and Maarten de Rijke. "Augmentation with Neighboring Information for Conversational Recommendation". (Ongoing). 2023.

3   **Pei**, **Jiahuan**, Guojun Yan, Pengjie Ren, and Maarten de Rijke. "Mixture-of-languages Routing for Multilingual Dialogues". TOIS (Submitted). 2023.

4   Wang, Benyou, Qianqian Xie, **Jiahuan Pei**, Prayag Tiwari, Zhao Li, et al. "Pre-trained Language Models in Biomedical Domain: A Systematic Survey". 2023. 🔗 URL: https://arxiv.org/pdf/2110.05006.pdf.