NAIBO WANG (王乃博)

Innovation 4.0, #04-06, Institute of Data Science, NUS, Singapore, 117602

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Research Interests: Model-Centric Collaborative Machine Learning, Federated Learning, Cloud Computing, Big Data, Distributed System, Parallel Computing, Database.

EDUCATION

National University of Singapore (NUS) • Singapore   Aug 2020 – Present
Ph.D. Candidate • Data Science • CAP: 5.0/5.0

Zhejiang University (ZJU) • Hangzhou, China   Sept 2017 – June 2020
Master of Engineering • Computer Science and Technology • GPA: 4.0/4.0

Xidian University (XDU) • Xi'an, China   Aug 2013 – June 2017
Bachelor of Science • Computer Science and Technology • GPA: 3.6/4.0

RESEARCH EXPERIENCE

Model-Centric Collaborative Machine Learning – Institute of Data Science   August 2022 – Present
Advisor: Professor Ng See-Kiong, National University of Singapore, Singapore

- Building a platform which enables users to share, trade, and operate machine learning models, such as model ensemble, model fusion, model search and recommendation, etc.
- Providing a vision for the future work of Machine Learning and Artificial Intelligence.
- Concentrating on finding the relationship among different models.

Federated Learning System Design – System & Networking Research Lab 1   Aug 2019 – August 2022
Advisor: Professor Bingsheng He, National University of Singapore, Singapore

- Identified two important features for the applying federated learning on real cases, heterogeneity and autonomy, that are rarely considered in the existing federated learning systems.
- Compared and contradicted the current frameworks that support federated learning.
- Concentrated on standard pipeline to benchmark distinctive FL frameworks to evaluate the efficiency and accuracy.

Service Wrapper: A System for Converting Web Data into Web Services – CCNT Lab   Sept 2018 – Present
Advisors: Prof. Jianwei Yin, and Dr. Zhiling Luo, Zhejiang, China

- Constructed a *Service Wrapper* system (now renamed to *EasySpider*, which already has **8.7K+ Stars on Github**) to convert available data on web pages into web services. With *Service Wrapper*, a rookie user can design and generate a web crawler in just a few minutes without any prior knowledge of web/network spider.
- Responsible for all parts of the system, including system design, frontend/backend/chrome extension/Graphic User Interface, patent application, etc.

Feelings-aware RNN Model for User Churn Prediction – CCNT Lab   Dec 2017 – Oct 2018
Advisor: Professor Zhiling Luo, Zhejiang University, Zhejiang, China

- Proposed an RNN model, LaFee, in order to generate latent feelings while predicting user churn, which mitigates the challenge of lacking users' real feelings.
- Introduced BMM-UCP method to help models predict user churn with only behavioral data.
- Evaluated the model's performance on UNO dataset from NetEase.com. Proposed method outperforms baselines by applying the BMM-UCP and LaFee model on them, showing that LaFee is more suitable for long-term sequential learning.
- Contributed to the implementation of the model, training and evaluation with TensorFlow.

Parallel acceleration for Convolution Neural Network based on OpenCL   Oct 2016 – Jan 2017
System-on-a-chip design & research laboratory Advisor: Jianxian Zhang, Xidian University, Xi'an, China

- Completed the parallelization design of Convolutional Neural Network (CNN) based on OpenCL and verified the feasibility and correctness of the designed algorithm on heterogeneous parallel platforms.
- Proposed optimizations in OpenCL such as parallelism for a single convolution and multiple convolutions, data parallelism and batch processing.

- Benchmarked proposed parallel computation on Intel CPU, AMD GPU, and NVIDIA GPU. The proposed algorithm is 375 times faster than serial execution conditioned on similar training accuracy.
- Contributed to the implementation of the model, training and evaluation with C++. Submitted the work in form of undergraduate thesis for publication.

PUBLICATIONS

Published
- **Naibo Wang**, Wenjie Feng, Yuchen Deng, Moming Duan, Fusheng Liu, See-Kiong Ng (2023), Data-Free Diversity-Based Ensemble Selection For One-Shot Federated Learning, [J] Transactions on Machine Learning Research (TMLR 2023).
- **Naibo Wang**, Wenjie Feng, Jianwei Yin, See-Kiong Ng (2023), *EasySpider: A No-Code Visual System for Crawling the Web* [C], The ACM Web Conference 2023 (WWW 2023).
- Qinbin Li, Zeyi Wen, Zhaomin Wu, Sixu Hu, **Naibo Wang**, Yuan Li, Xu Liu, Bingsheng He (2021), *A survey on federated learning systems: vision, hype and reality for data privacy and protection* [T] IEEE Transactions on Knowledge and Data Engineering (TKDE).
- Meng Xi, Zhiling Luo, **Naibo Wang**, Jianrong Tao, Ying Li, Jianwei Yin (2020), *A Latent Feelings-aware RNN Model for User Churn Prediction with only Behaviour data.* [C] 2020 IEEE International Conference on Smart Data Services (SMDS), 26-35, **[Best Paper Award]**.
- Meng Xi, Ying Li, Yongna Wei, **Naibo Wang**, Yuyu Yiny, Zhiling Luo, Shuiguang Deng, Yihua Mao, Jianwei Yin (2019), *A Scenario-based Requirement Model for Crossover Healthcare Service.* [C] The 2019 IEEE World Congress on Services (SERVICES).

Submitted
- **Naibo Wang**, Xiya Lyu, Zitong Yang, Jianwei Yin, *Service Wrapper: A system for converting web data into web services*, IEEE Transactions on Network and Service Management.

PATENTS

- **Wang, N**., Xiya, L.V., Yang, Z., Wang, T. and Yin, J., Zhejiang University ZJU, 2022. A service packaging method based on web page segmentation and search algorithm. U.S. Patent Application 17/614,978. (Published).
- **Naibo Wang**, Jianwei Yin, Zitong Yang, Tao Wang, Zhaohui Wu (2022), CN111797340B, ZL 2020 1 0526593.0, A service wrapper system for customizing extraction processes (Granted).
- Zhiling Luo, **Naibo Wang**, Xiya Lv, Zitong Yang, Jianwei Yin (2022), CN110222251B, ZL 2019 1 0447448.0, A service wrapper method based on web page segmentation and searching algorithms (Granted).

REVIEW EXPERIENCE

- Invited to serve as a reviewer for TKDE 2023 at April 2023.
- Invited to serve as a reviewer for TKDE 2023 at Jan 2023.
- Invited to serve as a reviewer for TKDE 2022 at Nov 2022.

WORK EXPERIENCE

Server Administrator Institute of Data Science, National University of Singapore, Singapore   Oct 2022 - Now
Supervised by: Prof. Ng See-Kiong and Sam Yeong

- Worked as part-time server administrator to manage and maintain GPU servers at IDS, NUS.
- To monitor usage of servers, identify unused processes that occupy GPU memories, contact users to clear unused processes, manually clear unused processes periodically in servers, and all other actions to keep the servers in good health.
- Designed a very useful tool for all users to check the status of GPU and who is using it with their email addresses with just "ids" command; automatically check the zombie processes and kill them; make users to send anonymous emails to users who is overusing GPUs, etc.

Research Assistant (GAP) National University of Singapore, Singapore   Dec 2021
Project: Cryptocurrency Trade Market/Platform • Coworker: Yuan Li, Supervised by Shengliang Lu and He Bingsheng

- Worked as full-time software engineer to build a Cryptocurrency Trade Market/Platform.
- Responsible for building the full frontend and part of the backend of the system with multiple languages and frameworks.

- Designed the database structure, participated in requirement design and deployed the platform on secure and stable servers.

Research Assistant National University of Singapore, Singapore   Sep 2019 - Dec 2019

Project: Development of Federated Learning (FL) Systems (Benchmark)

- Worked as full-time researcher for the School of Computing, National University of Singapore.
- Composed literature review, system building, evaluation and implementation.
- Composed paper on Federated Learning Systems, which enable the collaborative training of machine learning models among different organizations under the privacy restrictions.

Software Development Engineer Xidian University, Xi'an, China   Jan 2016 - May 2018

Project: Development of Three-Thinking Website

- Worked as part-time software engineer for the School of Computer Science, Xidian University
- Developed an information hub *Three-Thinking* for students in Xidian University to allow them to access academic information. The website provides information including GPA, ranking, grade certificates, appointment of official transcript, enrollment statements, etc.
- Assisted professors with online grading for students' graduation projects, and teachers to recruit good students by posting announcements on the website.
- Individually responsible for all development on back-end system, front-end design, UI design and testing.

Other Projects

- [Commandline-config](), got 2K+ stars on Github, which is a library for users to write (experiment in research) configurations in Python Dict or JSON format, while can read parameters from the command line to modify values and use dot . to read and write config.
- [Bilibili-XMLSubtitle-to-ASS](), which is a tool for users to convert Danmu (弹幕) subtitles downloaded from Bilibili to local .ass files which can be identified by local players such as potplayer.
- Other example projects including the *Crab Verification Code Service System*, *International Student Information Management System*, *High Resolution Ground-to-ground Observation Service Grid System (In ZJU)*, etc.

HONORS AND AWARDS

- **Graduate Star (2017)**

  Awarded along with 10 students from the whole grade (about 5000 students).
- **National Scholarship (2016)**

  Top 1% among competitors, awarded by the Ministry of Education of PRC.
- **Graduate of Merit (2018)**

  Top 15% among competitors, Awarded by Zhejiang University.
- **Honor for Graduate Student (2018)**

  Top 30% among competitors, Awarded by Zhejiang University.
- **Outstanding Graduate Student Leader (2018)**

  Top 2% among competitors, Awarded by Zhejiang University.
- **Excellent Student and First-class Scholarship (2014, 2015)**

  Top 10% among competitors, Awarded by Xidian University.
- **Excellent Student Leader (2015)**

  Top 1% among competitors, Awarded by Xidian University.
- **Recognition Award in the CCSP contest (2016)**

  Top 10% among competitors, Awarded by China Computer Federation (CCF).
- **First prize in the ACM contest (2015)**

  Top 10% among competitors, Awarded by Xidian University.
- **Internet Plus Contest Second Prize (2016)**

  Top 30% among competitors, Awarded by Xidian University.

- **Excellent team and leader in summer social practice (2015)**

  Top 5% among competitors, Awarded by Xidian University.

Technical Skills

- Programming languages: Python, C, C++, Java, Android, PHP, HTML, CSS, JavaScript, C#, .net Framework, VHDL, MATLAB, ActionScript, Linux Shell, R.
- Frameworks: Machine Learning Related (PyTorch, TensorFlow, Keras/Scikit-Learn, etc), Frontend Related(Vue.js, ESlint, Webpack,etc), Backend Related (MySQL, MongoDB, ElectronJS, Django, etc), OPS related (Linux, Docker, Nginx, etc), etc.
- Language: Mandarin (Native Speaker), English (Proficient, TOEFL 103, GRE 327+4.0), Henan Dialect (Native Speaker).