Hao Huang

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EDUCATION

M.E. Chemical Machine Tianjin, CN | Now
Tianjin University
Exchange Student. Mechanical Engineering Ottawa, ON, CA | Jan 2020
Carleton University
B.E. Processing Equipment and Control Engineering (3.63/4.0, rank 4/49) Tianjin, CN | Jun 2020
Tianjin University

RESEARCH INTEREST

Generally I am interested in **probabilistic graph model** and **the AI application in industrial scenarios**. Currently, I am exploring:

- Machine learning for combinatorial problems, e.g., Bayesian network structure Learning.
- Root cause analysis and anomaly detection in time-series data, e.g., the fault diagnosis of chemical process.
- Surface defect equipment based on machine vision, e.g., the fatigue crack identification.

RESEARCH EXPERIENCE

TIANJIN UNIVERSITY | Bayesian Network Structure Learning Algorithm design | Jan 2021 - Now

- To improve the accuracy of Bayesian network (BN) structure Learning, we explored a new BN structure learning framework which enabled algorithm to learning from other algorithms, named L2C (Learn to Construct).
- It was proved that our L2C algorithm had the most accurate and robust performance among up-to-date algorithms. And its 'learning ability' was also analyzed and discussed.
- I am going to submit the manuscript of this work as first author soon.

TIANJIN UNIVERSITY | Chemical Process Fault Diagnosis | Jun 2020 - Jan 2021

- To solve some of the difficult-to-diagnose faults caused by long-term changes in the chemical process, we used a Transformer model to tackle the fault diagnosis of the chemical process.
- The average error rate of the dataset of the Tennessee-Eastman process was reduced by 50%. In addition, the model had outstanding performance on real industrial data of the fluorine chemical R-22 reaction process.
- This work is under review by *IEEE Transactions on Industrial Informatics (2022 Impact Facotr = 10.215)*.

CARLETON UNIVERSITY | Graduation Design | Sept 2019 - Jan 2020

- To analyze the reliability of reactor pressure vessel, a finite element model of its sealing system was built. Based on simulation results, I used Bayesian network to model fault modes and evaluate the reliability.
- I published this work on *Processes (2022 Impact Factor = 2.847)* as the first author.
- I was funded by Excellent Undergraduate Program of CSC (Chinese Scholarship Council).

UNIVERSITY OF CALIFORNIA, BERKELEY | Research Assistant (RA) | Mar 2019 - May 2019

- Preparation and characterization of organic-inorganic hybrid perovskites which have proved to be promising semiconductor materials for photovoltaic applications. Supervisor: Prof. Peidong Yang.
- After 8 weeks of lab research, I gave a poster presentation at College of Chemistry, UCB.

TIANJIN UNIVERSITY | Innovation and Entrepreneurship Project | May 2017 - May 2019

- To improve the efficiency and accuracy of thermal fatigue tests, our group designed two types of extensometer calibrator.
- We applied two patents: A multiaxial extensometer calibrator based on angle micrometer. Chen Xu (Tutor), **Huang Hao** et al., (patent No. 2019210898103). A multiaxial extensometer calibrator based on angle sensor. Chen Xu, Wang Yating, **Huang Hao**, et al., (patent No. 2019210898071).

PROJECTS

BNSL Python

BNSL is a Bayesian Network Structure Learning Python Library. In this project, various algorithms are presented, e.g., simulation annealing, PC algorithm, K2 algorithm, genetic algorithm. I am trying to add more BN structure learning algorithms into it.

POINTER NETWORK Python, TensorFlow

Pointer network is a neural architecture used to learn approximate solutions to several NP-hard problems. In this project, pointer network has given excellent solutions to TSP problem. I am trying to generalize it to BN structure learning problem and other combinatorial optimization problems.

SKILLS

English: CET-6 (567), TOEFL iBT (97/120)
Coding: Python, C++, Bash, SQL
Machine Learning: Scikit-learn, TensorFlow, Pytorch
Others: ANSYS (APDL), Fluent, Git, Docker, LaTeX

HONORS

Selected into Excellent Undergraduate Program of China Scholarship Council;
University-level three-good student;
Tianjin University first-class scholarship;
Ding Xuhuai chemical engineering scholarship;
LG-Bohai scholarship.

PUBLICATIONS AND PATENTS

1. **Hao Huang**, Caiming Liu, Yuanyuan Dong, Xiaoran Wei, Zhe Zhang, Xu Chen, Kai Song*, RPV Sealing Reliability Estimating Using a New Inconsistent Knowledge Fused Bayesian Network and Weighted Loss Function, Processes (2022 Impact Factor = 2.847), accepted, 2022.
2. Yifan Tong, Kun Zhou, Xintong Li, Xiaoran Wei, **Hao Huang**, and Kai Song*, A Transformer-based Fault Detection and Diagnosis Method and its Application on Fluorochemical Engineering Process, IEEE Transactions on Industrial Informatics (2022 Impact Facotr = 10.215), under review.
3. **Hao Huang**, Kai Song*, Learn to Construct: A New Bayesian Network Structure Learning Algorithm.
4. Chen Xu, **Huang Hao**, Wang Yating, Zhang Xiaojun, Zhu Junxuan, A multiaxial extensometer calibrator based on angle micrometer, patent No. 2019210898103.
5. Chen Xu, Wang Yating, **Huang Hao**, Zhu Junxuan, Zhang Xiaojun, A multiaxial extensometer calibrator based on angle sensor, patent No. 2019210898071.

OTHERS

I like palying basketball very much.
I have praticipated amateur coding competition weekly since 2022, but still long road to go. (now I rank top 5.0% in leetcode.cn)