CAI, XIAO

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RESEARCH INTERESTS RUL prediction, Prior knowledge integration

EDUCATION

City University of Hong Kong **GPA: 4.1/4.3** 2022.09-Now
- Ph.D. degree in systems engineering, expected June 2026 Hong Kong

Xi'an Jiaotong University **GPA: 3.7/4.0** **Rank: 20/285** 2019.09-2022.06
- M.S. degree in mechanical engineering Xi'an

Xi'an Jiaotong University **GPA: 3.8/4.3** **Rank: 12/212** 2015.09-2019.06
- B.S. degree in mechanical engineering Xi'an

RESEARCH EXPERIENCE

Aero-engine remaining useful life prediction considering prior knowledge
- Proposed a knowledge-embedded spatial-temporal graph convolutional networks prediction method
- Integrated system structure knowledge and sensor position information as geographic knowledge

Cutting tool remaining useful life prediction
- Proposed a RUL prediction method for two-phase degrading systems
- Integrated online monitoring multi-sensor signals and offline state observations to predict RUL

Wind turbine condition monitoring and remaining useful life prediction
- Established a model-data-fusion remaining useful life prediction method with multi-sensor fusion
- Monitored 1000 wind turbines and accurately predicted 3 wind turbines failure

Software development for axle fault diagnosis and remaining useful life prediction
- Established a self-data-driven remaining useful life prediction method for axle gears and bearings
- Responsible for algorithm optimization and software development

PATENTS & PUBLICATIONS

Patents
- Li, N., **Cai, X.**, Lei, Y., Han, T., Wang, B. A Remaining Useful Life Prediction Method for Machine Tools Based on Informative Sensors Selection and Fusion Algorithm. CN111143990A, 2020-05-12.
- Lei, Y., **Cai, X.**, Li, N., Xu, P., Liu, X., Zhao, J. A Baseline-speed Transformation Algorithm for Wind Turbine. CN112855467A, 2021-05-28.
- Lei, Y., Xu, P., Li, N., **Cai, X.**, Liu, X., Zhao, J. A Self-Data-Driven Remaining Useful Life Prediction Method for Rolling Bearing. CN112949204A, 2021-06-11.

Publications
- **Cai, X.**, Li, N., & Xie, M. (2024). RUL prediction for two-phase degrading systems considering physical damage observations. Reliability Engineering & System Safety, 244, 109926. DOI: https://doi.org/10.1016/j.ress.2024.109926
- Li, N., Xu, P., Lei, Y., **Cai, X.**, & Kong, D. (2022). A self-data-driven method for remaining useful life prediction of wind turbines considering continuously varying speeds. Mechanical Systems and Signal Processing, 165, 108315. DOI: https://doi.org/10.1016/j.ymssp.2021.108315

- Lei, Y., Xu, X., **Cai, X.**, Li, N., Kong, D., & Zhang, Y. (2021). Research on Data Quality Assurance for Health Condition Monitoring of Machinery. Journal of Mechanical Engineering, 2021,57(4): 1-9. DOI: https://doi.org/10.3901/JME.2021.04.001
- Li, N., **Cai, X.**, Lei, Y., Xu, P., Wang, W., & Wang, B. (2021). A Model-data-fusion Remaining Useful Life Prediction Method with Multi-sensor Fusion for Machinery. Journal of Mechanical Engineering, 2021, 57(20): 29-37,46. DOI: https://doi.org/10.3901/JME.2021.20.029
- Li, N., Gebraeel, N., Lei, Y., Fang, X., **Cai, X.**, & Yan, T. (2021). Remaining useful life prediction based on a multi-sensor data fusion model. Reliability Engineering & System Safety, 208, 107249. DOI: https://doi.org/10.1016/j.ress.2020.107249
- Li, N., Lei, Y., Gebraeel, N., Wang, Z., **Cai, X.**, Xu, P., & Wang, B. (2020). Multi-sensor data-driven remaining useful life prediction of semi-observable systems. IEEE Transactions on Industrial Electronics, 68(11), 11482-11491. DOI: https://doi.org/10.1109/TIE.2020.3038069

HONORS & AWARDS

Contest

- 2017 China Undergraduate Mathematical Contest in Modeling: First-grade award in Shaanxi venue
- 2020 China Postgraduate Mathematical Contest in Modeling: Second-grade award nationally

Scholarship

- National Scholarship (Top 0.2%)
- National Encouragement Scholarship
- Special Prize Scholarship (2 times)
- Outstanding Freshman Scholarship (Grade 1)
- The SiYuan Scholarship (placed first)
- SKF Scholarship

Award

- Excellent Graduation Thesis (Top 1%)
- Excellent Student Award (2 times)
- Excellent Student Cadre Award
- Outstanding Graduates Award
- Excellent Postgraduate Award
- Excellent Postgraduate Cadre Award
- Outstanding Postgraduates Award
- Advanced Class Award (as monitor)

SKILLS

Language

- IELTS: 7.0 (Listening: 6.5 / Reading: 7.5 / Writing: 7.0 / Speaking: 6.0)
- College English Test Band 4 (CET-4) Certificate
- College English Test Band 6 (CET-6) Certificate

Software

- MATLAB, Python, C, Markdown
- Autodesk CAD, Autodesk Inventor, SolidWorks
- Arduino IDE
- Word, Excel, PowerPoint, Visio