

姚 遠 教授

YUAN YAO, PROFESSOR



- 浙江大學 學士，民國九十年
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- 香港科技大學 博士，民國九十八年
- B.S. Zhejiang University, China, 2001
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- Ph.D. Hong Kong University of Science and Technology, Hong Kong, 2009

主要研究領域

本實驗室的研究領域主要在於通過人工智慧方法、數據分析及電腦輔助工程解決化工製程相關問題，以期優化操作、提升品質、增強安全，協助化工產業達成智慧化生產。具體包括以下幾個方面：

■ 製程資料分析

製程資料分析又稱製程化學計量學，是一個高度學科交叉的研究領域。其通過機器學習（包括深度學習）、多變數統計、訊號處理等資料驅動方法，解決化工製程中所面臨的問題。

- 製程監控，包括故障檢測、故障診斷、故障根因分析等
- 軟儀表技術，對不易及時量測的關鍵製程變數或產品品質變數進行預測
- 智慧化控制系統，結合資料分析、人工智慧和程序控制，優化製程操作

■ 非破壞性檢測資料分析

透過機器學習和多變數統計方法，分析非破壞性檢測之熱成像或超音波訊號，進行高分子複料、藝術品、文化遺產或其他材料之缺陷檢測

■ 電腦輔助工程模擬

透過電腦模擬，對加工製程、反應或產品進行分析和設計

Main Research Interests

The research in my group is presently focused on The research in my group is presently focused on the following topics:

■ Process data analytics

Process data analytics, also called process chemometrics, is a highly interdisciplinary research field that uses data-driven methods, including artificial intelligence (machine learning), multivariate statistics, signal processing, etc., to solve problems faced by chemical industries.

- Process monitoring, including fault detection, fault diagnosis, root cause diagnosis, etc.
- Soft sensor techniques for online estimation of key performance indicators
- Intelligent process control systems integrating advanced control with artificial intelligence and process data analysis

■ Nondestructive testing data analysis

Thermographic data analysis, ultrasonic data analysis, etc. for defect detection and structure evaluation of materials including polymer composites, artworks, cultural heritages, and so on

■ Computer-aided engineering simulations

Utilizing computer software to simulate manufacturing processes, chemical reactions, or product performance

代表作 (Selected Publications)

- Ching-Mei Wen, Stefano Sfarra, Gianfranco Gargiulo, **Yuan Yao*** (2020). Thermographic data analysis for defect detection by imposing spatial connectivity and sparsity constraints in principal component thermography. *IEEE Transactions on Industrial Informatics*, DOI: 10.1109/TII.2020.3010273.
- Yi Liu, Chao Yang, Mingtao Zhang, Yun Dai, **Yuan Yao*** (2020). Development of adversarial transfer learning soft sensor for multi-grade processes. *Industrial & Engineering Chemistry Research*, 59(37), 16330-16345.
- Jin-Yi Wu, Stefano Sfarra, **Yuan Yao*** (2018). Sparse principal component thermography for subsurface defect detection in composite products. *IEEE Transactions on Industrial Informatics*, 14(12), 5594-5600.
- Han-Sheng Chen, Zhengbing Yan, **Yuan Yao***, Tsai-Bang Huang, Yi-Sern Wong (2018). Systematic procedure for Granger-causality-based root cause diagnosis of chemical process faults. *Industrial & Engineering Chemistry Research*, 57, 9500-9512.
- Yi Liu, Chao Yang, Zengliang Gao, **Yuan Yao*** (2018). Ensemble deep kernel learning with application to quality prediction in industrial polymerization processes. *Chemometrics and Intelligent Laboratory Systems*, 174, 15-21.