Yaoxuan (Seven) Zhu

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SUMMARY

As a PhD researcher with 5-year of hands-on experiences, I have gained knowledge and expertise in developing AI-based models integrated with multi-modalities fusion scenarios for an intelligent monitoring system to enable a sustainable and controllable machining process. As a goal-oriented, structured, and open-minded team worker with strong communication skills and the ability to analyze and solve complex problems, I am eager to embrace any challenges in my career. My Swedish is in B1-B2 level.

SKILLS

ML&DL: ML models, CNN, ViT, Image processing, Transfer learning, Domain adaptation, HPO, Feature engineering, Generative AI (GANs, Diffusion model); DSP(Audio & vibration): STFT, CWT, MFCC; Multi-modality fusion & sensing; Cloud: AWS, Databricks; MLOps tool: Docker, CI, CD; Web: Flask, Streamlit Programming: Python, MATLAB, C++, SQL; Supercomputing (NAISS): Alvis & Dardel PDC; Packages: Keras, Tensorflow, Pytorch, Librosa, Pandas, SciPy, NumPy, Seaborn, Git

EDUCATION

KTH - Royal Institute of Technology   Stockholm, Sweden
Ph.D. in Intelligent Manufacturing - Intelligent process monitoring system   11/2019 - 02/2025 Expected
M.Sc. in Production Engineering   09/2015 - 06/2018

Aalto University   Helsinki, Finland
M.Sc. in in Mechanical Engineering   09/2015 - 06/2018

Savonia University of Applied Science   Kuopio, Finland
B.Sc in Mechanical Engineering   08/2012 - 05/2015

EXPERIENCE

KTH - Royal Institute of Technology   Stockholm, Sweden

PhD researcher   11/2019 - Present

Research topic: The in-process intelligent monitoring system based on data-driven models and multi-modality fusion techniques: An application of surface quality prediction

- Supervised 4+ master students with their master thesis projects
- Part-time research work in Swedish ISO/TC 184/SC 4/WG 13 "Industrial Data Quality" team
- Was selected as the Jernkontorsfonden (100k SEK) & Karl Engvers scholarship (60k SEK) winner

Sandvik Coromant AB   Sandviken, Sweden

Project Engineer   08/2018 - 02/2019

The study on milling runout effect on insert tool life with machine learning models

- Goal: Developed machine learning models to predict the impact of milling runout on the insert tool life using vibration signal
- Responsible for end-to-end data collection, analysis, and model development
- Collected and preprocessed vibration signal data in both time and frequency domain, applied statistical techniques for feature extraction
- Built data pipeline based on feature engineering
- Implemented regression models (SVR, ANN, LR) to predict tool wear based on real-time extracted vibration signa features
- Identify patterns in vibration signals that correlated with increased tool wear and runout effects
- Publication: project report & oral presentation in Sandvik R&D center monthly research conference

Scania AB (Global industrial development center)   Stockholm, Sweden

Project Engineer   10/2017 - 06/2018

Improvement of compacted graphite iron in the drilling process with customized cutting fluids

- Cooperated with R&D team in Scania to design relevant experiment
- Conducted lab-based demo to verify how the phase ratio of customized cutting fluids impacts the performance of the machining process
- Supported its universal application in the production line based on research results
- Results: The identified ratio improves 5%-8% performance of machining process
- Oral presentation: in Global Industrial Development Center at Scania

International Consulting Network   Stockholm, Sweden

Team leader (6 team members)   06/2017 - 06/2018

Marketing & Strategy Consulting

- Consulted for international company (Forskning & Framsteg, Euroflourist) on EU market expansion issues
- Supported them to expand market sharing within the young generation
- Compiled new marketing strategy based on research and investigation
- Finalized and presented the report in ICON Global conference

PROJECTS

Generative AI for the model performance improvement: surface quality monitoring system (Leader)   01/2024 - 11/2024

- - Responsible for data generation, model development, and model deployment & optimization
- - Designed and applied deep generative model - continuous conditional Generative Adversarial Networks (cCGANs) to to synthesize realistic training data (scalogram & Mel-spectrogram)
- - Utilized the generated synthetic data to augment the training set, enabling the predictive model to generalize better across diverse machining conditions
- - Integrated the generative models with Pre-trained CNN models to improve their performance (accuracy and generalization) in predicting surface quality
- Tools & Skills: Conditional GANs (FC-layers, 1D, 2D-based), cCGAN, Domain adaptation, Data augmentation

A vision transformer-based approach for the in-process monitoring system with multi-sensor fusion (Leader) 06/2023 - 05/2024

- - Modified and fine-tuned the ViT model with different attention mechanisms
- -Tested its prediction performance combined with multiple attention mechanisms under unique multi-modality information fusion scenarios in case study in the surface quality monitoring system
- Tools & Skills: Vision transformer(ViT), Attention mechanism, Multi-modality fusion, Distribution learning
- Publication: "A vision transformer-based transfer learning approach: surface roughness monitoring and prediction with multi-sensor fusion techniques" (Under review), Journal of Engineering Applications of Artificial Intelligence

Deep transfer-learning approach for in-process surface quality monitoring (Leader)   02/2022 - 02/2023

- - Implemented a transfer learning approach, leveraging pre-trained convolutional neural networks (CNNs) to predict surface quality from audio data
- - Tuned hyperparameters and optimized model architecture for accuracy and performance
- - Compared prediction performance among proposed models (VGG16, VGG19, ResNet50V2, InceptionResNetV2) driven by define performance metrics
- Tools & Skills: Domain adaptation, Bayesian optimization, Hyperparameters tuning, Signal processing, Pre-trained CNNs
- Publication: "Surface quality prediction in-situ monitoring system: a deep transfer learning-based regression approach with audible signal" (Published), Journal of Manufacturing Letter

The feature engineering-based in-process surface quality monitoring (Leader)   10/2022 - 01/2023

- - Quantitively compared and validated the effect of audio feature extraction scenarios (automated features & statistical features) on model performance for surface quality prediction
- Tools & Skills: Automated feature engineering, Pre-trained CNNs, Transfer learning, Audio signal processing
- Publication: "Surface roughness monitoring and prediction based on audible sound signal with the comparison of statistical and automatic feature extraction methods in turning process" (Published), Euspen's 24th International Conference & Exhibition, Ireland, selected as 1/20 speakers out of 200+ authors

ROKOST - Robust and cost-effective hard turning of transmission components (Vinnova project - 3.5M SEK) 02/2019 - 04/2021

- - Led tasks of improving the process efficiency from perspective of tool wear predictive prediction and surface quality of machined transmission components in the monitoring system.
- - Designed, established, deployed and optimized data-driven models (conventional ML regression models and ensemble learning models) for quality prediction of cutting tool and surface
- - Post-processed audio and vibration signal with multi-processing methods: TDA, PSD, SSA and WPT
- - Extracted signal pattern from multi-sensors based on statistical feature extraction methods
- - Compared and verified how each signal processing method impacts performance of deployed models in terms of tool wear and surface roughness prediction
- - Cooperated with industrial parters (Volvo truck, Sandvik, Swerim AB) to arrange the testbed for final case study
- Results: Trained and deployed models provide reliable performances for predictive surface quality control (95%+ Accuracy, 0.98+ R2)
- Tools & Skills: Regression-based ML models, Feature engineering, Signal processing, Automatic hyperparameter tuning (GP-HPO), Bayesian Optimization
- Publications: "Data-driven approaches for surface quality monitoring and prediction based on heterogeneous multi-channel signal fusion in hard part machining" (Accepted), Journal of Engineering applications of artificial intelligence.
- Presentation (selected as the oral speak on behalf of project team): "Data Augmentation based Surface Quality Monitoring with Machine Learning Models", Conference: The Swedish Manufacturing R&D Clusters Annual Conference - Digital Manufacturing, 2023, [Video recording, ROKOST project link](#)