Guru Prasaath Pushparaj

R&D Engineer - Predictive Maintenance & Machine Learning

Profile

A Mechatronics Engineer with a Master's degree from University of Siegen, with specialization in Condition Monitoring, Reliability Engineering, Structural Health Monitoring and Machine Learning for engineering systems. Experienced in Vibration based fault detection, spectral analysis, Anomaly detection and predictive maintenance for rotating machinery. Developed deep learning surrogate models for FEM simulations, GAN based synthetic data generation for degradation modeling and end to end ML pipelines. Skilled in Python, C, C++, PyTorch, MATLAB, and Numerical modeling.

Skills

- Python, C, C++, MATLAB
- PyTorch, Deep Learning, GANs, CNNs, Autoencoders, Regression Models, Anomaly Detection, MLOps, Time-Series Modeling
- Vibration Analysis, Fault Diagnosis, Spectral Analysis (FFT), Degradation Modeling, Remaining Useful Life (RUL) Estimation, Modal Analysis, Reliability Engineering
- Time-Series Analysis, Feature Extraction, Filtering, Envelope Analysis
- FEM, ANSYS, Abaqus, MATLAB/Simulink, Numerical Modeling, SolidWorks
- NumPy, Pandas, Scikit-learn, Excel, Power BI
- MS Office, Linux, LaTeX, Git, Github, Docker, Kubernetes

Contact details

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Languages

- **English** - Level B2
- **German (Deutsch)** - Level B1
- **Tamil** - Native

Experience

Research Assistant (Structural Health Monitoring) at *Uni-Siegen, Germany.* **2025.01–Pres.**
◇ Chair of Structural Health Monitoring [$dept\_SHM\_uni\_siegen.de$]

Master Thesis Student - R&D at *IMS Gear SE & Co.KGaA - Advance Development Team (R&D) at Donaueschingen.* **2025.03–2025.08**
◇ Master thesis on development of deep learning surrogate models for FEM simulation workflows.

Graduate Engineer Trainee (GET) at *TEXMO Industries - Product Development Team (R&D) Coimbatore.* **2021.07–2022.01.**
◇ Redesigned the hydraulic components for a Pressure Booster pump, improving reliability and performance.
◇ Developed design concepts for a Dewatering pump on functional performance.
◇ Troubleshooted issues in an existing 6-inch submersible pump-set.

Projects

Development of Deep Learning Models for Predicting Load Parameters of Specific Gear Designs to Boost Finite-Element-Method (FEM) Simulation Workflows. **2025.03–2025.09.**
◇ Built Deep Learning-based surrogate models to accelerate FEM gear-meshing simulations and predict critical load parameters like root stress and contact pressure.
◇ Implemented and compared MLP, Deep Ensembles, Autoencoders, and CNN Autoencoders for regression performance.
◇ Achieved high-accuracy load parameter prediction using gradient-boosted deep ensembles for gear failure analysis.

Synthetic Data Generation for the Extension of Degradation Index from failure Tests for missing data. **2024.05–2024.07.**
◇ Implemented GAN models to generate realistic degradation trajectories and extend missing failure data for predictive maintenance.
◇ Performed exploratory analysis of component degradation signals to extend degradation indices and RUL trajectories.
◇ Identified suitable failure thresholds and generated synthetic time-series data from component replacement to hypothetical failure.

Damage Detection on Bearings by Vibration-Based Condition Monitoring. **2023.12–2024.01.**
◇ Analyzed vibration signals using multiple signal-processing techniques to identify indicators of bearing damage.
◇ Data acquisition from accelerometer and prepared vibration datasets for condition monitoring analysis.
◇ Detected bearing fault types through spectral analysis and presented diagnostic results.

Education

Master of Science (M.Sc). Mechatronics. *University of Siegen, Germany.* **2022.10–2025.10**
◇ CGPA - 1.7 (1 is the best, Master thesis - 1.3).

Bachelor of Engineering (B.E). Mechanical Engineering. *Coimbatore Institute of Technology, India.* **2016–2020**
◇ Thesis - "Numerical Analysis of Simultaneous Heat and Mass Transfer of an Absorber in a VAR System ".
◇ CGPA - 9.26/10, Silver Medalist.