

DHEERAJ SHARAN SINGH

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PROFESSIONAL SUMMARY

Accomplished Senior Staff Data Scientist with a proven track record at GE Digital, specializing in software product development, machine/deep learning, and project management. Spearheaded the entire lifecycle of AI-driven software development and launching of an AI-driven product, showcasing expertise in technical leadership. Apart from leading a software and data science team, I have led multiple proof of concept and pilot implementation of new products demonstrating a blend of technical acumen and visionary leadership.

SKILLS

- Computer vision, GEN AI
 - Statistical Analysis
 - Python programming
 - Technical Leadership
 - Machine/Deep Learning Expertise
 - Project Management
 - Predictive Analytics
 - Software Development
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EXPERIENCE

■ **SENIOR STAFF DATA SCIENTIST at GE Vernova** **May 2019- present**

Computer Vision product development and launched in market:

Incubated and transformed a computer vision product named Autonomous Inspection, which automates plant inspections through camera and mobile devices.

- **Led the cross-disciplinary team** of data scientists, front-end, back-end and cloud engineers in developing and productionizing a AI product with a scalable cloud architecture. The product is launched in Market in '23. Led the solution testing and **implementation on a greenfield site in Germany**.
 - The product includes, **multiple CNN models** for detecting industrial assets and corresponding defects. The models include object detection, semantic segmentation, and key point detection modules.
 - Worked with **two major oil and gas customers** to validate, refine and showcase our **corrosion module**.
 - Design and implemented the **cloud architecture of end-to-end product**, including data flow, data processing and data presentation on UI dashboard.
 - Invented and implemented an advanced camera health monitoring solution using image processing techniques to detect and address issues like unwanted camera motions, blur, focus problems, and zoom changes. Applied the solution to surveillance cameras. A **patent** on this technology is filed and under review.
 - **Set up a lab** with varied RGB and IR camera configurations, forming an IoT-like network Cameras connect to
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an edge server via a network switch for real-time photo collection. The edge server processes data, forwarding crucial information to the cloud, facilitating solution evaluation before customer deployment.

Key technologies used: Computer Vision models for object detection, Image segmentation, AWS, Sagemaker, On-prem data transfer, CI/CD pipeline, ML Ops, Classical Image processing

Key skills used: Team Technical leadership, AI Model training, AI product Architecture Design and Implementation, Project budgeting, Stakeholder communications, Lab development and testing, cyber security.

GEN AI Pocs

- Explored and **implemented a RAG** using multiple inspection databases for generating summaries, analysis, and actionable insights from historical inspection **databases**. As a part of POC Conducted performance evaluations of **different LLMs** for recommending the best-fit models for industrial use cases.
- Develop a **LLM-based tool** to create **request for proposal document** for sourcing. Here, the solution explores multiple pdf files corresponding to the part number, extract key information required for generating RFP(Request for proposal) document. The extracted information can be from text, tables and figures. **AWS textract** was used to extract information from multi-modal sources and combined information is sent to **GPT4** for creating RFP document.

Key technologies used: GPT4, Claude, Llama, Database, SQL, Textract, OCR

■ STAFF DATA SCIENTIST at GE Digital/Power

January 2016 - April 2019

Boiler tube leak solution development:

- **Led an engineering team** to deliver a software product (Add on to GE APM), using **predictive analytics** for estimating the **remaining lifespan** of a vital power plant subsystem. Successfully implemented on **three customers**.
- Employed a **physics-based model** coupled with an ongoing **machine learning** technique, employing a **Bayesian approach** to continually learn unknown parameters.
- Successfully **integrated the analytics into a user interface (UI)** as a practical solution currently utilized by customers.

Key technologies used: Monte-Carlo simulation, Physics-based modelling, Bayesian learning, remaining life prediction, confidence interval.

CNN model for compressor blade defects:

- Explore **business value and problem formulation** for automating compressor blade defect detection using Deep learning model.
- **Trained a convolutional neural network**-based solution for identifying mechanical irregularities (such as cracks, dents, bends, and missing tips) in compressor blade images captured by handheld cameras.
- Tested the model on unseen field data and **demonstrated value** of the outcome to stakeholders.

Key technologies used: Convolution neural network, DB Scan clustering, Data imbalance and loss function modification, Image segmentation, Fully convolutional network, Mask R CNN

Multivariate Time-Series Anomaly Detection:

- Developed **semi-supervised anomaly detection** for machines using hybrid techniques (data + physics).
- Used **Principal component analysis, neural network(Autoencoder) and similarity-based method** for modelling multivariate data.
- **Implementation of APM-Smart Signal** (Legacy industrial anomaly detection product) at various customer sites.

Key technologies used: Semi-supervised learning, PCA, Similarity based method, Time-series reconstruction

■ POSTDOC FELLOW University of Alberta

June 2014 - Dec 2015

- **Engineered a fault monitoring algorithm** for detecting unbalance and dynamic faults in centrifuges
- Developed **anomaly detection and root cause analysis** techniques for multivariate time series data using Kernel-PCA, causality analysis, transfer entropy, and symbolic dynamic filtering
- Conducted independent research on novel algorithms for **vibration-based fault detection** and identification in rotating systems, utilizing signal processing methods like Empirical Mode Decomposition and Fourier transforms.
- Organized and led project update interface **meetings with sponsors (Syncrude)**.

Key technologies used: Empirical Mode decomposition, Vibration analysis, PCA, D-Markov Machine, Causality analysis, Transfer Entropy

■ CONSULTANT at GE Global Research Centre

July 2012 - May 2014

- Applied **machine learning and statistical methods for damage detection and diagnostics** on different industrial electro mechanical systems, like, **Electrical submersible pump**, compressor blade.

Key techniques: Downhole pressure drop analysis, change detection (step and ramp), T-test, ROC curve, Confusion matrix

■ SR. DESIGN ENGINEER at Tata Motors Limited

July 2004 - June 2006

- **Design modification** and development of Automobile (Trucks)
 - Did **finite element(stress) analysis** of several mechanical components critical to vehicle.
 - Responsibility to **document full description of vehicle**, which is sent to ARAI (Automotive Research authority of India) for approval of New Vehicles
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■ PHD RESEARCH

- Pattern identification in mechanical systems using **Symbolic Dynamic Filtering (SDF)** (A technique based on **Markov modelling**).
 - Data driven **remaining life prediction** using **PCA modelling and recursive Bayesian estimation**.
 - Optimal **partitioning of Time-series data** for distinct **feature extraction** and its application to damage classification.
 - **Vibration based anomaly detection** in complex electro-mechanical system using Symbolic Dynamic Filtering.
 - **Fractal and lacunarity analysis** of degrading images (surface interferogram) during crack initiation.
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■ EDUCATION

PHD IN MECHANICAL ENGINEERING

Thesis: Data Driven early defect detection and prognosis in materials

Techniques: Signal processing, Symbolic Dynamic filtering, Data Entropy, Bayesian Learning, Fractal and lacunarity analysis.

Penn State University

July 2011

■ MASTER OF SCIENCE - MS IN ELECTRICAL ENGINEERING

Penn State University

Dec 2008

■ M.TECH IN MECHANICAL SYSTEM DESIGN

Indian Institute of Technology, Kharagpur

May 2004

■ B.E IN MECHANICAL ENGINEERING

M.S. Ramaiah Institute of Technology

July 2002

■ PUBLICATIONS AND PATENTS

9 int. journal papers, 5 int conference papers, 1 book chapter, 1 Patent filed and under review.

■ REFERENCES

References available upon request

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