

ANIL KUMAR KORUPOJU

Applied AI & Industrial Intelligence Specialist | Safety-Critical Systems | Digital Transformation

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[LinkedIn](#) | [GitHub](#) | [Hugging Face](#) | [Google Scholar](#)

EXECUTIVE SUMMARY

Applied AI and safety-critical systems specialist with 14+ years of experience delivering engineering, digitalization, and regulatory solutions across maritime and asset-intensive industries. Senior Surveyor (R&D) at the Indian Register of Shipping with expertise in IMO/IACS regulatory frameworks, classification rule development, structural reliability, and engineering governance.

Experience spans self-supervised anomaly detection, transformer-based predictive analytics, Retrieval-Augmented Generation (RAG), NLP automation, AI-assisted engineering workflows, and industrial intelligence systems operating at 100M+ observation scale. Contributor to international technical initiatives including IMO regulatory submissions, ISSC Committee V.7, IACS technical working groups, and industry digitalization initiatives.

Combines deep domain expertise, regulatory credibility, and applied AI capability to help organizations deploy trustworthy AI, industrial intelligence, and decision-support systems that improve safety, reliability, and operational performance.

PROFESSIONAL SPECIALIZATIONS

- Applied AI & Industrial Intelligence
- Safety-Critical AI & Engineering Systems
- Maritime Digitalization & Regulatory Innovation
- Structural Reliability & Asset Integrity
- Predictive Analytics & Intelligent Decision Support
- International Standards Development & Technical Governance

CORE COMPETENCIES

- **Applied AI & Intelligent Systems:** Applied Machine Learning, Generative AI, LLM Applications, Retrieval-Augmented Generation (RAG), Agentic AI Workflows, Self-Supervised Learning, Transformer Architectures (BERT, BART, T5, SAINT), Predictive Analytics, Anomaly Detection, AI Evaluation.
- **Technical Stack:** Python, PyTorch, TensorFlow, Scikit-learn, LangChain, FAISS, Hugging Face
- **Maritime & Structural Engineering:** Structural Assessment, Fatigue Analysis, FEA, Classification Rules, IMO Regulations, Digital Twins, SHM, Predictive Analytics, AIS Analytics.
- **Engineering & Infrastructure:** ANSYS, Abaqus, HyperMesh, MSC Patran/Nastran, MATLAB.
- **Data & Cloud Infrastructure:** Pandas, NumPy, Google Cloud Platform (GCP), Git, Docker.

INTERNATIONAL CONTRIBUTIONS & STANDARDS DEVELOPMENT

- **Contributor to IMO Resolution A.1204(34):** Code on Alerts and Indicators, 2025.
- **Author of IMO Submissions:** SSE 10/17 and SDC 10/14 defining global regulatory frameworks.
- **Member, ISSC 2028 Committee V.7:** Structural Assessment During Operations (SHM, Data Fusion, Edge ML).
- **Contributor to IACS CSR:** Fatigue rule development and structural reliability initiatives.
- **Contributor to IRS Guidelines:** Onboard Carbon Capture and Storage (OCCS) and Wind-Assisted Ship Propulsion (ongoing).
- **Participant:** International MARIN WiSP3 project.

SELECTED APPLIED AI PROJECTS

NAVISIGHT – Self-Supervised Maritime Anomaly Detection Framework | [GitHub](#)

- **Tech Stack:** PyTorch, Polars, HNSWlib, Masked Autoencoder (MAE), Transformer Networks, Self-Supervised Learning, Parquet.
- **Engineering Impact:** Designed and implemented a self-supervised maritime intelligence platform processing approximately **192 million AIS observations** for vessel behavior modeling and anomaly detection. Developed a transformer-based Maritime Masked Autoencoder (MAE) with multimodal feature fusion across vessel kinematics, environmental weather data, geospatial context, and data-quality indicators. Engineered a dual-channel anomaly detection architecture combining reconstruction error analysis and embedding-space behavioral drift monitoring using **128-dimensional vessel embeddings** and HNSW approximate-nearest-neighbor retrieval. Created a custom Manifold-Aware Anomaly Perturbation Engine (MAPE) for realistic synthetic anomaly generation and benchmarking, achieving **AUROC up to 0.93** across maritime anomaly scenarios. Research outcomes from this work form the basis of the manuscript "NAVISIGHT: A Self-Supervised Maritime Anomaly Detection Framework for AIS Trajectories," submitted to Ocean Engineering (2026).

AI-Powered Debugging System for Intelligent Root Cause Analysis (StackFix) | [GitHub](#)

- **Tech Stack:** Python, LangChain, FAISS, RAG, Hugging Face, SentenceTransformers.
- **Engineering Impact:** Designed a hybrid retrieval and reasoning workflow combining semantic vector search and LLM-based diagnosis for technical debugging across a 1M+ document corpus. Implemented FAISS retrieval, reranking pipelines, and selective web augmentation strategies to improve contextual relevance in AI-assisted troubleshooting workflows. Developed modular orchestration pipelines supporting scalable developer-support applications.

LLM-Based Intelligent PDF Question Answering System (ChatPDF-RAG) | [GitHub](#)

- **Tech Stack:** Python, LangChain, FAISS, Hugging Face, Mistral-7B, LLaMA-3, BAAI Cross-Encoders.
- **Engineering Impact:** Developed a conversational document intelligence system enabling context-aware semantic search over technical PDFs. Architected an isolated RAG pipeline utilizing **BAAI bge-rerankers** and open-weights LLMs (**Mistral-7B/LLaMA-3**) to ensure high-fidelity grounding strictly from uploaded safety and compliance documents. Built scalable embedding-based retrieval workflows with structured page-level citations to accelerate technical knowledge management.

Deep Learning-Based Ship Collision Risk Assessment using AIS & Weather Data | [GitHub](#)

- **Tech Stack:** PyTorch, SAINT Transformer, AIS Analytics, Deep Learning, Fuzzy Logic.
- **Engineering Impact:** Developed a transformer-based collision risk prediction framework using AIS and environmental weather datasets. Applied the SAINT (Self-Attention and Intersample Attention Transformer) architecture for maritime safety analytics. Engineered data pipelines to interpolate 3-

hourly geospatial weather data into 1-second ship kinematics, demonstrating superior predictive performance over traditional ML baselines (SVM, RVM, MLP).

PROFESSIONAL EXPERIENCE

Indian Register of Shipping (IRS) | Mumbai, India | Sep 2012 – Present

Senior technical contributor within the Research & Development function, combining classification expertise, international standards development, and AI-enabled engineering innovation across safety-critical maritime systems.

Senior Surveyor – Research & Development | Apr 2024 – Present

Surveyor-I – Research & Development | Apr 2019 – Mar 2024

Surveyor – Research & Development | Apr 2016 – Mar 2019

Assistant Surveyor – Research & Development | Sep 2012 – Mar 2016

- **Regulatory & Classification Leadership:** Contributed to the development and revision of international maritime regulations and classification rules spanning structural safety, digitalization, and green shipping.
- **Computational Engineering Automation:** Developed a MATLAB-based spectral fatigue analysis tool aligned with industry standards, enabling automated spectral fatigue assessment workflows and significantly reducing manual engineering evaluation effort for complex ship structural evaluations.
- **Enterprise AI Integration:** Developed an AI-assisted engineering document transformation system leveraging BERT, BART, and T5 architectures to automate conversion of external FEML reports into IRS-compliant technical documentation, reducing manual effort and improving consistency across engineering workflows.
- **Digital Transformation & Decision Support:** Contributed to digitalization initiatives spanning engineering automation, intelligent workflows, and data-driven decision-support systems supporting safety-critical maritime operations and compliance processes.
- **Structural Rule Development (IACS CSR):** Contributed to the IACS Hull Panel technical work on fatigue assessment methodologies for weld root cracking by embedding detailed 3D solid cruciform joint models within global ship shell models and evaluating fatigue life using the Effective Notch Stress approach, supporting quantitative updates to Common Structural Rules (CSR).
- **IMO Impact:** Authored IMO submissions directly leading to the formal adoption of the **IMO Code on Alerts and Indicators, 2025**. Worked as a project manager of the IACS Safety Panel Project Team.
- **Mentorship & Industry Engagement:** Mentored maritime students for IMO simulation and regulatory competitions, guiding the IMU I-ESKIMO 2024 runner-up team on carbon capture and wind propulsion regulatory frameworks.

Geosol Associates - India | Greater Hyderabad Area | Jul 2008 – Jan 2010

Design Engineer

- Conducted structural design of complex reinforced earth retaining wall systems.

AWARDS & RECOGNITION

- **Outstanding Individual Performance Award** — IRS (2023)
- **Outstanding Team Award** — IRS (2021)
- **2nd Best Paper Award** — GLOMARS 2024 (Institute of Marine Engineers India)
- **Reviewer Recognition** — Transportation Research Part C: Emerging Technologies

- **Letter of Appreciation** — IMU I-ESKIMO 2024 Mentorship

PUBLICATIONS & THOUGHT LEADERSHIP

Industry Publications

- Most Maritime AI Failures Will Be Data Failures, Not Algorithmic. [Splash247 \(2026\)](#)
- Why AI in Maritime Safety Requires Class Discipline. [Cyprus Shipping News \(2026\)](#)
- Why Data Quality Will Make or Break Maritime AI. [SeaNews \(2026\)](#)

Journal Articles

- NAVISIGHT: A Self-Supervised Maritime Anomaly Detection Framework for AIS Trajectories. *Ocean Engineering* (Submitted, 2026)
- Ship Collision Risk Evaluation using AIS and Weather Data through Fuzzy Logic and Deep Learning. *Ocean Engineering*, 2024.
- Effect of Weld Parameters on Effective Notch Stress at Weld Root and Toe of Load Carrying Cruciform Joints. *Journal of Marine Science and Application*, 2023.
- Review of Application of AI and ML in Marine Sector. *Journal of the Institute of Marine Engineers*, 2024.

Conference Publications

- Prediction of ENS at Weld Root and Toe of Load Carrying Cruciform Joints Using ML. *Springer Proceedings*, ICSOT 2025.

EDUCATION & CERTIFICATIONS

Degrees

- **IIT Kharagpur** | M. Tech — Structural Engineering (2012)
- **JNTU Hyderabad** | B. Tech — Civil Engineering (2008)

Certifications

- IBM AI Engineering Professional
- IBM Generative AI with LLMs
- Google Advanced Data Analytics
- Advanced Machine Learning on Google Cloud
- GCP Machine Learning Engineer (Preparation)
- ISO 9001 Lead Auditor
- ISO 27001 Lead Auditor

RESEARCH & TECHNICAL INTERESTS

- Trusted AI and AI Assurance
- Industrial Intelligence & Decision Support
- Safety-Critical AI Systems
- AI Governance for Regulated Industries
- Maritime Autonomy & Digital Twins
- Explainable AI for Engineering Applications