



Graha Research

Research Internship · 18-Week Gantt Project Plan

Predictive Maintenance Platform

Design and prototype a predictive-maintenance platform for connected vehicles that combines multivariate time-series modelling, causal AI and explainable remaining-useful-life estimation.

18

Weeks

6

Planning Clusters

1

Thesis / Collaboration

Research Internship

Four 18-week Gantt Project Plans for thesis and research collaboration

Graha International GmbH offers four structured research internships, each delivered as an 18-week Gantt Project Plan organised into six best-practice planning clusters. This document details the internship highlighted below.

<p>INTERNSHIP 01</p> <p>Predictive Maintenance Platform</p> <p>Design and prototype a predictive-maintenance platform for connected vehicles that combines multivariate time-series modelling, causal AI and explainable remaining-useful-life estimation.</p>	<p>INTERNSHIP 02</p> <p>ESG Platform with GraphRAG</p> <p>Build an Environmental, Social and Governance (ESG) analytics platform that uses a Knowledge Graph and Retrieval-Augmented Generation (GraphRAG) to turn fragmented sustainability data into explainable, auditable ESG insights.</p>	<p>INTERNSHIP 03</p> <p>Digital Product Passport Platform</p> <p>Implement a Digital Product Passport (DPP) platform for connected-vehicle components that captures lifecycle, material and circularity data in an interoperable, data-sovereign data-space architecture.</p>	<p>INTERNSHIP 04</p> <p>Digital Twin Platform</p> <p>Develop a Digital Twin platform that mirrors onboard vehicle systems in real time, fusing sensor telemetry with physics- and data-driven models for simulation, monitoring and what-if analysis.</p>
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This document, Predictive Maintenance Platform

Design and prototype a predictive-maintenance platform for connected vehicles that combines multivariate time-series modelling, causal AI and explainable remaining-useful-life estimation.

Our Research Plan

Predictive Maintenance Platform · 18-Week Gantt Project Plan

Overview

This internship contributes to Graha International's research line on advanced predictive maintenance for onboard and offboard vehicle systems. The intern designs and prototypes a Predictive Maintenance (PdM) platform that ingests vehicle telematics time-series, detects anomalies, estimates State of Health (SoH) and Remaining Useful Life (RUL), and produces explainable maintenance recommendations.

The work is structured as an 18-week Gantt Project Plan and is suitable as the practical basis for a Bachelor's or Master's thesis or a research collaboration. It bridges academic inquiry and industrial application, with emphasis on reliability, explainability and reproducibility.

Objectives

- Build a reproducible pipeline for ingesting and cleaning multivariate vehicle telematics time-series.
- Implement and compare anomaly-detection and RUL/SoH estimation models (statistical, ML and deep-learning).
- Integrate a causal-reasoning layer that explains predicted failures rather than only forecasting them.
- Deliver an explainable maintenance-recommendation component with confidence indicators.
- Evaluate the platform against domain-informed ground truth and document the findings.

Candidate Profile

- Studies in Computer Science, Data Science, Electrical/Mechanical Engineering or a related field.
- Solid Python skills; familiarity with pandas, scikit-learn and a deep-learning framework.
- Basic understanding of time-series analysis and machine-learning evaluation.
- Interest in causal inference, explainable AI and connected-vehicle systems.
- Independent, structured working style and good scientific-writing skills.

18-Week Gantt Project Plan

The plan is organised into six best-practice planning clusters spanning 18 weeks. Each cluster states its focus, key activities and a milestone that must be reached before the next cluster begins.

WEEKS 1-3**Cluster 1 - Onboarding & Foundations**

Settle in, set up the working environment, and agree the detailed plan and success criteria with the academic and industrial supervisors.

KEY ACTIVITIES

- Onboarding at Graha International: tooling, data-governance and NDA briefing.
- Familiarisation with vehicle telematics, predictive-maintenance concepts and existing Graha assets.
- Set up a reproducible environment: version control, experiment tracking and a containerised workspace.
- Refine scope, success criteria and the detailed 18-week work plan with the supervisor.

Milestone, Approved internship work plan and a running, reproducible development environment.

WEEKS 4-6**Cluster 2 - Literature Review & Requirements**

Build the scientific foundation through a structured literature review and a precise requirements and evaluation specification.

KEY ACTIVITIES

- Structured literature review on RUL/SoH estimation, anomaly detection and causal AI for maintenance.
- Survey of relevant time-series imputation methods and predictive-maintenance datasets.
- Stakeholder and requirements analysis; definition of the core use cases and KPIs.
- Draft the conceptual approach and the evaluation methodology with metrics and baselines.

Milestone, Literature-review report and an agreed requirements and evaluation plan.

WEEKS 7-9**Cluster 3 - Data Engineering & System Architecture**

Prepare the data assets and design the end-to-end platform architecture.

KEY ACTIVITIES

- Acquire, profile and clean the telematics time-series; handle gaps with selected imputation methods.
- Engineer features and labels for anomaly, SoH and RUL tasks.
- Design the platform architecture: ingestion, processing, modelling, explanation and API layers.

- Specify the data model and the interfaces between components.

Milestone, Architecture design document and a prepared, documented dataset and data pipeline.

WEEKS 10-13

Cluster 4 - Implementation & Modelling

Implement the platform and the predictive and causal-reasoning models.

KEY ACTIVITIES

- Implement the ingestion and processing pipeline as reproducible services.
- Develop and train anomaly-detection and RUL/SoH models; compare statistical, ML and DL approaches.
- Integrate a causal-reasoning layer that links predicted failures to likely root causes.
- Build the explainable maintenance-recommendation component and a minimal review dashboard.

Milestone, Working PdM-platform prototype covering the core anomaly-to-recommendation use case.

WEEKS 14-16

Cluster 5 - Evaluation, Validation & Hardening

Evaluate, validate and harden the prototype against domain-informed ground truth.

KEY ACTIVITIES

- Run controlled experiments; measure precision, recall, RMSE, R-squared and RUL error.
- Validate causal explanations against literature- and domain-derived ground truth.
- Assess robustness to missing data and noise; check reproducibility of results.
- Iterate on the models and the pipeline based on the evaluation findings.

Milestone, Evaluation report with quantitative results and a validated, hardened prototype.

WEEKS 17-18

Cluster 6 - Documentation, Thesis & Final Defence

Consolidate the documentation, draft the thesis material and present the results.

KEY ACTIVITIES

- Consolidate code, documentation and reproducibility instructions.
- Write the thesis-ready report covering method, results and limitations.

- Prepare and deliver the final presentation and a live demo.
- Hand over the platform, datasets and backlog of future work to Graha.

Milestone, Final thesis-ready report, final presentation and a complete handover package.

Expected Outcomes

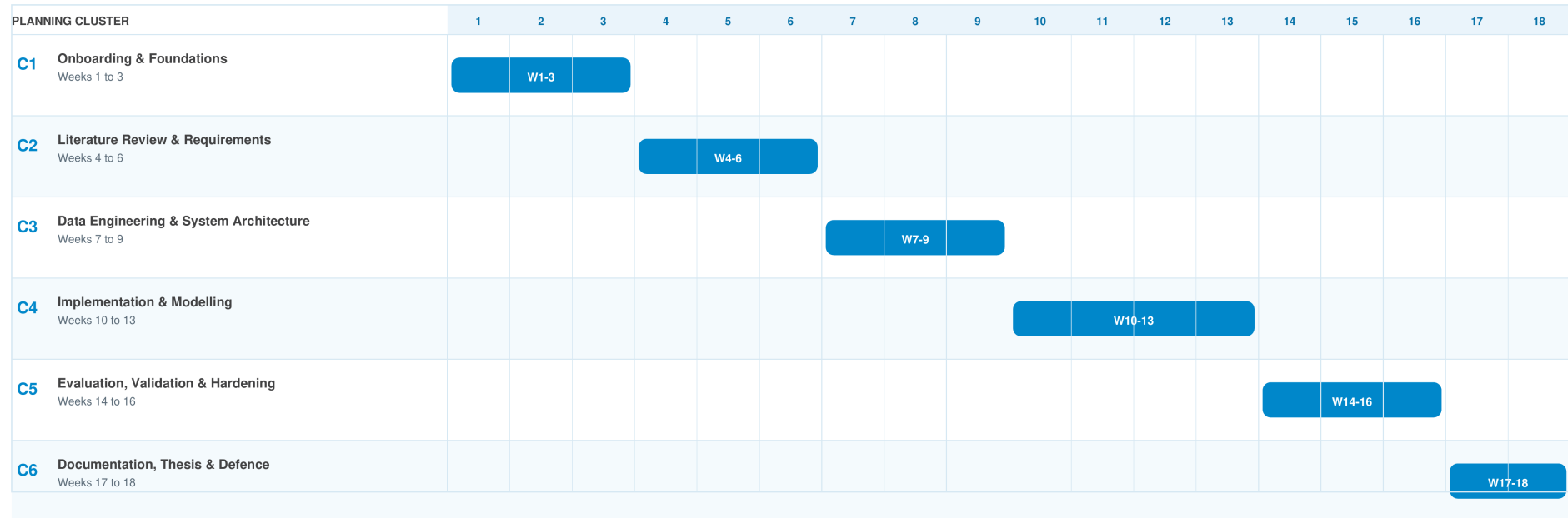
- A reproducible, documented Predictive Maintenance platform prototype.
- A comparative evaluation of anomaly-detection and RUL/SoH models.
- An explainable, causal maintenance-recommendation component.
- A thesis-ready scientific report and a reusable dataset and pipeline.

Project Timeline (Gantt Chart)

The 18-week plan visualised as a Gantt chart across Week 1 to Week 18.

18-Week Project Timeline

Six best-practice planning clusters across Week 1 to Week 18



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