An AI-Driven Self-Service Tool for Incident Triaging & Prevention

Course No. : AIMLCZG628T

Course Title: Dissertation

Dissertation Done by:

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Degree Program: M.Tech. in Artificial Intelligence & Machine Learning

Research Area: Artificial Intelligence

Dissertation / Project Work carried out at: Verizon, Chennai

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Contents

1. Broad Area of Work

This project is situated in the broad area of Applied Artificial Intelligence and AIOps (AI for IT Operations). It involves the practical application of several key research fields to solve a significant enterprise-level problem:

- Natural Language Processing (NLP): To understand user-reported issues from chat logs and incident tickets and to perform semantic matching.
- Vector Search & Information Retrieval: To build a high-speed "semantic search" engine that finds similar historical solutions from a large dataset.
- Machine Learning (Clustering & Classification): To analyze incident data, automatically detect recurring patterns, and classify issues.

2. Background

In many large-scale organizations like Verizon, IT support and customer service teams are a critical function. However, they are often overwhelmed by a high volume of repetitive incidents. A large percentage of support tickets are for known issues that have been solved before. The "tribal knowledge" required to solve these issues is often lost in historical incident logs, old chat transcripts, or disparate Knowledge Base (KB) articles. This leads to high Mean Time To Resolution (MTTR), frustrated users, and inefficient support teams.

The relevance of this project to the student's work environment (Verizon) is the direct application of AI to optimize this exact process. The proposed solution is a Proof of Concept (PoC) for an **"Intelligent Incident Resolution & Autoheal Framework" (IIRAF)**, which will serve as the AI-driven self-service tool. By integrating with existing ticketing systems, the IIRAF framework can act as an intelligent layer. It will use the provided synthetic dataset (which mirrors real-world incident data) to build a system that can proactively assist support agents, automate resolutions for common patterns, and create a "self-healing" system that continuously learns, thereby directly addressing these key business inefficiencies.

3. Objectives

The primary objective is to design, develop, and validate a Proof of Concept (PoC) for the AI-driven self-service tool, referred to as the Intelligent Incident Resolution & Autoheal Framework (IIRAF).

The specific objectives are:

1. **To design** the complete architecture for an end-to-end incident resolution framework, including data ingestion, semantic search, pattern detection, and an auto-heal execution module.
2. **To implement** a semantic search engine using NLP (SentenceTransformers) and a vector database (FAISS) to match new issues against historical incidents and knowledge base articles.
3. **To build** a pattern detection module that analyzes incident data to identify frequently recurring issues and group them into actionable "patterns".
4. **To develop** an "Autoheal Executor" that can map validated patterns to a repository of automation actions for simulated, no-touch resolution.
5. **To deliver** a full-stack PoC, including a FastAPI backend API and a React-based

frontend, that demonstrates the end-to-end workflow on the provided synthetic dataset.

4. Scope of Work

The scope of this project is the development of a functional **Proof of Concept (PoC)** to be completed independently by the student.

In Scope:

- **Data:** The project will exclusively use the provided synthetic dataset (Incident_History.csv, Chat_Transcripts.csv, KB_Articles.csv, etc.).
- **Backend:** Development of a complete Python-based FastAPI server to host all core logic, ML models, and API endpoints.
- **Semantic Search:** Building a FAISS vector index from the incident and KB data.
- **Pattern Detection:** Implementing ML or rule-based logic to identify patterns from the data files.
- **Frontend:** Development of a React-based web interface to search for incidents, view patterns, and simulate auto-heal actions.
- **Simulation:** Auto-heal actions will be **simulated**. The system will log the "action" that *would* have been taken (e.g., "Simulated execution: restart_payment_gateway.sh") rather than executing any real scripts.

Out of Scope:

- This project is a PoC and will **not** be deployed in a live production environment.
- The framework will **not** connect to live enterprise ticketing systems (e.g., a real ServiceNow instance). All interactions are with the provided CSV datasets.
- The system will not perform real-time data ingestion; it will be pre-loaded with the dataset at startup.
- The MLOps integration (Continuous Training of model) has been brought out of scope due to the exhaustive effort involved and the time available as discussed with Dhuruba Adhikary sir.

5. Plan of Work

Phases	Start Date-End Date	Work to be done
Dissertation Outline	2 Nov 2025 – 15 Nov 2025	Literature Review and prepare Dissertation Outline
Design, Development & testing Sprint 1	16 Nov 2025 – 29 Nov 2025	**1. Build Backend API (FastAPI):** Create core server. **2. Implement Semantic Search:** Load Incident_History.csv & KB_Articles.csv into a FAISS vector index. Create /api/v1/search endpoint. **3. Build Frontend (React):** Create a web UI with a search bar to query the API and display incident/KB results. **4. Implement Pattern Detection:** Analyze Chat_Transcripts.csv and Pattern_Repository.csv. Create a /api/v1/patterns endpoint. **Mid-Sem Deliverable:** A functional web app for searching incidents and viewing detected patterns.
Design, Development & testing Sprint 2	30 Nov 2025 – 26 Dec 2025	**1. Build Autoheal Module:** Link patterns from Phase 3 to Autoheal_Actions.csv. Create a "Simulate Heal" button in the UI. **2. Final Testing:** Conduct end-to-end testing of the full workflow. **3. Write Final Report:** Document all code, architecture, and results for the dissertation. **Final Deliverable:** A complete, working PoC demonstrating the full lifecycle (Search -> Detect -> Auto-Heal -> Feedback) and the final dissertation report.
Testing	27 Dec 2025 – 17 Jan 2026	Software Testing, User Evaluation & Conclusion
Dissertation Review & Final submission	18 Jan 2026-1 Feb 2026	Supervisor & Additional Examiner review & Feedback. Final Review and submission of Dissertation

6. Literature References

Below are references for my initial literature review:

[1] Reimers, N., & Gurevych, I. (2019). *Sentence-BERT: Sentence Embeddings using Siamese BERT-Networks*. Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing. (Primary paper for the all-MiniLM-L6-v2 model).

[2] Tatineni, Sumanth. (2023). AIOps in Cloud-native DevOps: IT Operations Management with Artificial Intelligence. Journal of Artificial Intelligence & Cloud Computing. 1-7. 10.47363/JAICC/2023(2)154.

[3] Chen, Tianqi & Guestrin, Carlos. (2016). XGBoost: A Scalable Tree Boosting System. 785-794. 10.1145/2939672.2939785.

[4] FastAPI Official Documentation: https://fastapi.tiangolo.com/ (Primary reference for the backend API framework).

7. Particulars of the Supervisor and Examiner

	Supervisor	Additional Examiner
Name	Natarajan Jayapal Balajee	Mageswaran Murugan
Qualification	MCA	BE
Designation	Sr. Manager – Software Development	Sr. Manager – Software Development
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8. Remarks of the Supervisor

The measurable **Key Performance Indicators (KPIs)**—including **accuracy, precision, and recall**—prove that the student is focused on rigorous, quantifiable results and practical improvements in the defect resolution cycle.

Based on our conversation, the student is a **highly capable individual** with the drive and technical facility required to execute this complex experiment to a high standard. This project is a **guaranteed publication candidate** and represents a significant contribution to the field. I fully endorse this project and am excited to see the results.

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
WORK INTEGRATED LEARNING PROGRAMMES (WILP) DIVISION
SECOND SEMESTER OF ACADEMIC YEAR 2024-2025

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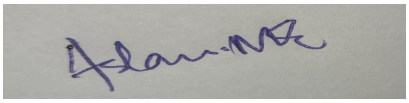	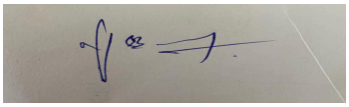	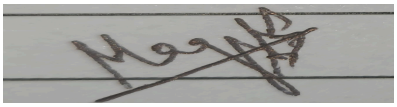
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