CSE7101- Capstone Project Review-1

PROJECT TITLE - AI-Driven Smart Ambulance Routing and EMS Triage Dashboard for Disaster/Dispatch Management

Batch Number: CSE-156

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Content

- **Project Title & Details** – Overview of team, category, and SDG mapping
- **Problem Statement** – Challenges in current EMS systems
- **Objectives** – Specific aims of the proposed solution
- **Background & Related Work** – Context and importance
- **Literature Survey** – Review of existing research
- **Gap Analysis & Innovation** – Identified gaps and novel contributions
- **System Architecture** – High-level workflow and modules
- **Technology Stack** – Tools, languages, and platforms used
- **Timeline (Gantt Chart)** – Project phases and schedule
- **Expected Outcomes** – Anticipated results and benefits
- **GitHub Link**
- **References** – Key academic and technical sources

Problem Statement Number: PSCS_434 - SOFTWARE

Problem Description:

Current EMS systems fail to integrate real-time hospital capacity, patient severity, and disaster triage into dispatch and routing decisions, leading to delays in critical care.

Key Issues:

- **Static routing logic based only on shortest distance**
- **No pre-arrival triage (START/JumpSTART not implemented digitally)**
- **Fragmented ambulance and hospital monitoring**
- **No disaster-mode adaptability**

Objectives

OBJ-1 – Simulate GPS tracking of ambulances & patient vitals

OBJ-2 – AI/ML model for hospital recommendation based on ICU load, proximity, and emergency load

OBJ-3 – Implement EMS triage protocols for disaster-aware prioritization

OBJ-4 – Build an interactive Tableau dashboard for real-time visualization

🎨 Color-Coding System (START/JumpSTART Model-Based)

Color	Priority	Description	Typical Action
🔴 Red	Immediate (P1)	Life-threatening injuries but treatable with immediate intervention.	Immediate transport and advanced care.
🟡 Yellow	Delayed (P2)	Serious but non-life-threatening injuries. Can delay treatment briefly.	Delayed transport. Monitor and reassess.
🟢 Green	Minor (P3)	Walking wounded with minor injuries.	Ambulatory care or minor treatment on-site.
⚫ Black	Deceased / Expectant (P4)	No signs of life or injuries incompatible with survival given available resources.	No resuscitation. Focus on salvageable patients.

Background & Related Work

1. Growing demand for **HealthTech & MedTech** solutions to enhance emergency medical services (EMS).
2. **Increased road accidents, pandemics, and natural disasters** creating urgent need for faster response systems.
3. Literature shows strong work in **ambulance routing**, **triage protocols**, and **ICU forecasting** — but implemented in silos without integration.
4. **No unified, AI-powered, real-time EMS dashboard** combining routing, triage, and hospital load management.
5. Manual decision-making in EMS dispatch leads to **avoidable delays in critical patient care**.
6. Existing dashboards lack **real-time integration** with live hospital and traffic data sources.
7. Limited adoption of **automated triage protocols** like START/JumpSTART in digital form.

Literature Survey Summary

Key Reviewed Papers:

1. **Green AI Ambulance Routing** – Lacks hospital load integration

2. **CNN-SVM Routing in Urban Traffic** – No triage workflows

3. **QoS-aware Disaster Triage & Routing** – Early unification, but limited

4. **JumpSTART Pediatric Triage** – Manual process

5. **Explainable ML for ICU Prediction** – Not tied to dispatch
   Gap: No end-to-end integration of routing, triage, hospital recommendation, and dashboard.

Literature Survey - Comprehensive Review & Critical Analysis

Gap Analysis & Innovation

Existing Limitation	Our Innovation
Static routing	Real-time ML routing using ICU, distance, load
Manual triage	Automated START/JumpSTART
Fragmented monitoring	Unified Tableau dashboard
No disaster adaptability	Disaster mode with dynamic rules

System Architecture

Flow:

1. Emergency Call Intake
2. Triage Engine → assigns severity (Analysis)
3. AI Hospital Recommender → allocates hospitals using real-time data
4. ML Routing Engine → optimal ambulance path
5. Dashboard (Tableau) → live monitoring for stakeholders
   External Systems: Hospital DB, Traffic APIs, (Wearables)

Technology Stack - Software

Web Front End: HTML, CSS, JavaScript

AI Model: Python, Scikit-learn (ML MODEL - Routing Algorithm)

Backend: Flask (ML API), PostgreSQL (integration) / Cloud SQL

Visualization: Tableau / Looker Studio (Google Data Studio)

Data Simulation: Python scripts for GPS, vitals, hospital load

APIs: Google Maps API / Leaflet

Cloud: GCP - Google Cloud Platform

Timeline of the Project (Gantt Chart)

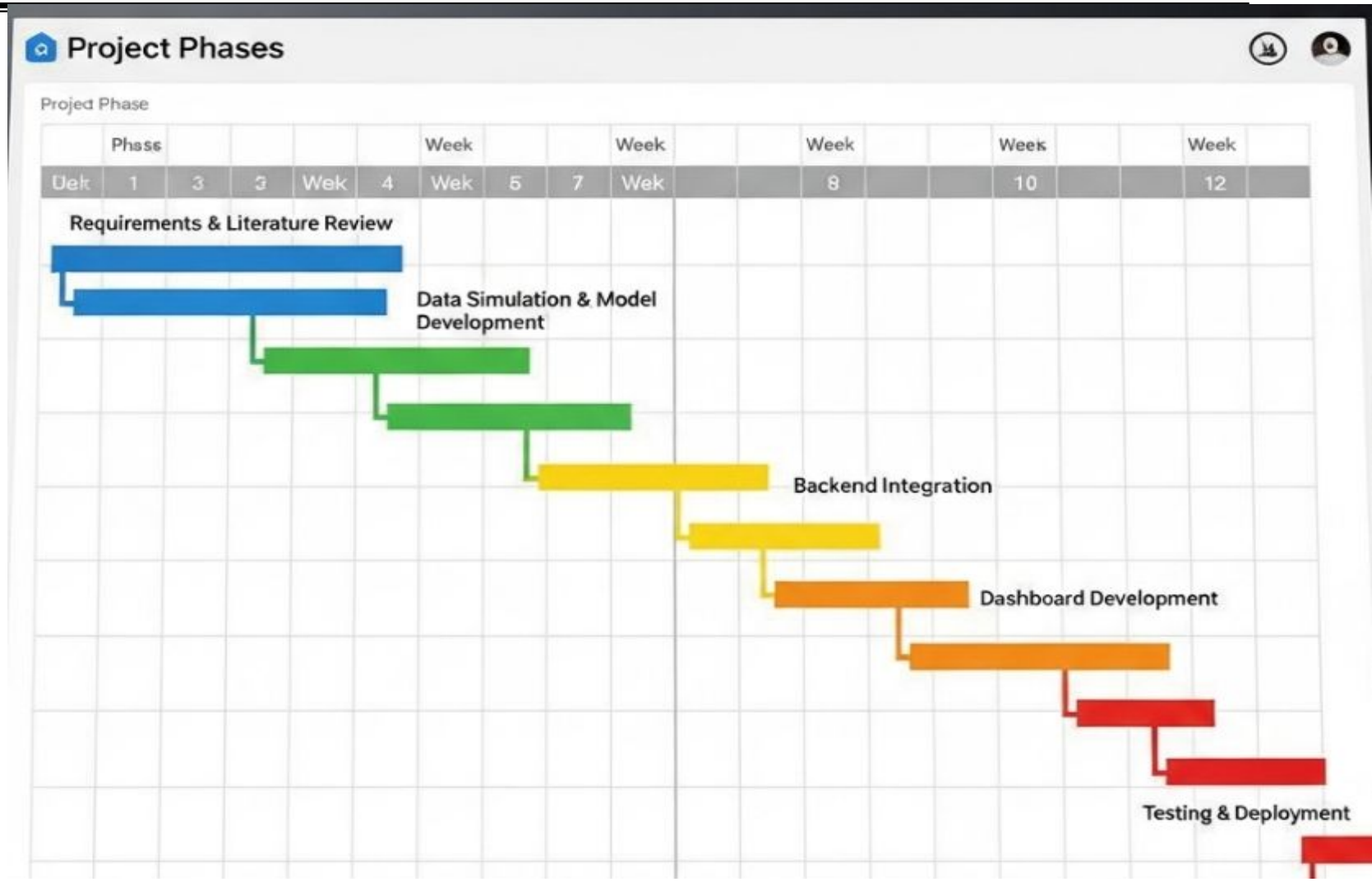
Phase 1 (Weeks 1-2): Focus on requirements gathering and literature review.

Phase 2 (Weeks 3-5): Involves data simulation and model development.

Phase 3 (Weeks 6-8): Dedicated to backend integration.

Phase 4 (Weeks 9-10): Centered on dashboard development.

Phase 5 (Weeks 11-12): Concludes with testing and deployment.



Expected Outcomes

- Reduced dispatch-to-hospital time
- Pre-arrival triage decision-making
- Real-time ICU and load-aware hospital recommendations
- Disaster-ready EMS workflows
- Scalable, software-only solution

Github Link

Github Link

"The GitHub repository provides public access to our project's source code, documentation, and data simulation scripts. You'll find implementations of the AI/ML models for hospital recommendation and ambulance routing, along with setup instructions to run the system. We welcome community contributions and feedback.

GitHub Link: https://github.com/FURIOUSCHAMP007/CAPSTONE-PROJECT

References (IEEE Paper format)

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Thank
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