# Project Progress Report – Phase 2

Course Name and ID: BTech (CS), STAT-IV-T058

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| **Project Title:** AIDRoute: AI-Powered Dynamic Relief Pathways |

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| **Team Name:** RapidRelief Squad |

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| **Team Members:** 1. Rohan Bhutani (23021437) – Team Lead – rohanbhutani@geu.ac.in 2. Shreya Ramola (23022625) – shreyaramola@geu.ac.in 3. Prema Rawat (230221554) – premarawat@geu.ac.in |

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| **Project Abstract** Our project, AIDRoute, focuses on building a statistically explainable and dynamically adaptive routing solution for disaster relief in India, especially for flood-prone areas like Uttarakhand. AIDRoute uses ARIMA models for road risk forecasting, regression techniques for demand prediction, and Bayesian updating for real-time route recalibration. The system leverages real-time and historical datasets, ensuring continuous optimization. A multi-criteria decision analysis (MCDA) layer is integrated to rank regions based on dynamic scores. Visual outputs include interactive maps, auto-generated reports, and exportable PowerPoint presentations for rapid deployment by NGOs and field workers. |

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| **Updated Project Approach and Architecture** The current system is modular and follows a layered architecture:  1. Data Handling Layer: Incorporates both real-time API inputs and CSV backups simulating realistic scenarios. 2. Forecasting Layer: Implements ARIMA for time series risk prediction, regression for demand estimation. 3. Bayesian Routing Layer: Adjusts route recommendations as data updates using Bayesian logic. 4. MCDA Scoring Engine: Aggregates dynamic inputs to score and prioritize zones. 5. Visualization Layer: Streamlit dashboard enhanced with Folium maps, real-time widgets, zone filtering, Excel summaries, and PPT exports.  Libraries used: pandas, numpy, scikit-learn, statsmodels, folium, streamlit, openpyxl, python-pptx. |

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| **Tasks Completed** • Dataset structure creation & preprocessing – Shreya Ramola • Forecast models (ARIMA, regression) – Rohan Bhutani • Bayesian routing logic – Rohan Bhutani • MCDA scoring implementation – Prema Rawat • Streamlit UI with zone and map controls – Shreya Ramola • PPT/Excel report auto-generation – Prema Rawat • Real-time + fallback data integration – Entire Team |

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| **Challenges/Roadblocks** • Limited Real-Time Data Access: Many official datasets lacked APIs. We used free no-auth APIs and designed realistic CSV simulators. • ARIMA Sensitivity: Forecast accuracy varied with lag choices; hyperparameter tuning was done using MAPE evaluations. • Bayesian Overhead: Balancing statistical rigor with simplicity was hard; we ensured logic remained interpretable. • Streamlit Sync Issues: UI responsiveness during live data changes was managed by modular refresh logic. • Zone Consistency: Unified administrative boundaries were enforced across all modules using shapefiles and data cleaning. |

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| **Tasks Pending** • MCDA weight tuning (final iteration) – Prema Rawat • UI improvements (filtering, animation) – Shreya Ramola • Route change animation on map – Rohan Bhutani • Final demo video and viva slides – Entire Team • Validation of forecast accuracy – Rohan Bhutani • Deployment package for offline NGOs – Entire Team |

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| **Project Outcome / Deliverables** • Forecast models for road risk (ARIMA) and demand (regression) • Bayesian decision system for live route optimization • MCDA zone scoring and exportable zone-wise report • Interactive Streamlit UI with real-time simulation • Auto-generated PPTs and dashboards for field teams |

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| **Progress Overview** We are 85% complete. Core modules are complete and integrated. UI and final MCDA tuning remain. Backend and forecast accuracy are ahead of plan. Deliverables will be completed within the next sprint with additional deployment support planned for NGOs. |

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| **Codebase Information** Repository: Private GitHub (shared upon request) Branch: main, dev testing on feature/ui Key Commits: • data-loader-v1: Introduced data input abstraction • forecasting-core: Integrated ARIMA and demand model • routing-logic-bayesian: Live decision logic completed • ui-streamlit-core: Frontend features integrated |

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| **Testing and Validation Status** • ARIMA Model Evaluation – Pass – MAPE below 15% across most zones • Bayesian Update Logic – Pass – Verified with synthetic updates • UI Functional Tests – Pass – All modules load and respond properly • MCDA Sensitivity Check – In progress – Weight tuning and consistency in review |

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| **Deliverables Progress** • Risk Forecasting Module – Completed • Demand Prediction Module – Completed • Bayesian Update Module – Completed • MCDA Ranking Engine – 85% Done • Streamlit Dashboard – Fully Functional • PowerPoint Generator – Completed • Zone Animation & Filter Enhancements – Pending |