Major Project Submission (A. Y. 2025-2026)

1. Project Title: Real-Time Urban Traffic Congestion Prediction Using AI

2. Team Details:

Team Number: 42

Team Members:

 - Jadi Meghana - 22881A6689
 - Koukuntla Vinay Reddy - 22881A6695
 - Endrapally Sai Shrujana - 23885A6610

Guide Name: Mr. Majjari Sudhakar

Designation: Assistant Professor

3. Problem Statement:

Background:

Urban areas are experiencing rapid growth in vehicle usage, leading to frequent traffic congestion. This causes delays, fuel wastage, and increased air pollution. Traditional systems are not equipped to handle real-time traffic complexities effectively.

Problem Definition:

The current traffic monitoring solutions mainly focus on reactive measures rather than predicting congestion. There is a lack of intelligent systems that can analyze dynamic traffic flow and predict future congestion patterns. This gap leads to inefficient traffic control and poor route planning.

Need for the Project:

Solving this issue is crucial to reduce travel time, lower environmental impact, and improve public satisfaction. A predictive solution can help traffic authorities take proactive measures. It also supports smart city goals by enabling efficient urban mobility.

Target Users/Beneficiaries:

The primary beneficiaries are daily commuters who can avoid congested routes. Traffic control departments can use the insights for better signal management and planning. Additionally, city planners can integrate this data into long-term infrastructure development.

4. Project Objectives:

Objective 1: To develop an AI-based model that can predict urban traffic congestion with at least 90% accuracy using real-time traffic data.

Objective 2: To integrate spatial-temporal features from multiple junctions and provide short-term congestion forecasts.

Objective 3: To design a user-friendly interface or dashboard that displays real-time congestion levels and alerts for traffic management authorities.

5. Abstract:

In the heart of every busy city, traffic congestion is the everyday villain slowing us down, burning extra fuel, and testing everyone's patience. As cities grow, so does the chaos on the roads. This project steps in like a digital traffic detective, using the power of Artificial Intelligence to track and understand real-time traffic conditions. With the help of live feeds from GPS, road sensors, and traffic cameras, the system observes the flow of vehicles just like a trained eye watches for signs of trouble. AI models specifically designed to learn patterns from traffic data quickly identify when and where congestion is building up. It's like giving the city a brain that can think ahead and warn us before traffic hits its worst. The smart system isn't just reactive it predicts traffic jams before they happen, helping authorities manage signals better and drivers choose smoother routes. The result is Less waiting, fewer emissions, and a smoother ride through the urban maze. It's a step toward turning our traffic-riddled cities into smarter, more efficient places to live and move.

Keywords: Artificial Intelligence, Urban Traffic Congestion, Real-Time Traffic Prediction, Digital Traffic Detective, GPS.

6. Tools and Technologies Used:

- **Data & Preprocessing**:
  Python, Pandas, NumPy, OSMnx, GeoPandas, scikit-learn
- **Modeling**:
  PyTorch, PyTorch Geometric / DGL, Graph WaveNet, Attention layers
- **Experimentation**:
  Jupyter/Colab, Matplotlib, TensorBoard or Weights & Biases
- **API & Deployment**:
  FastAPI or Flask, Docker, Render/Heroku
- **Frontend Dashboard**:
  Dash or React + Leaflet.js, Plotly/Recharts
- **Version Control & Docs**:
  GitHub, Markdown/LaTeX, PowerPoint/Slides

7. Expected Deliverables:

1. A live system that shows how the detective works in real-time. It collects traffic data, analyzes it, and flashes alerts when something suspicious (congestion) is building up.
2. All the algorithms, scripts, and logic behind the operation, carefully written and documented.
3. No case is solved without evidence. Our system will use datasets such as Live GPS Data , Traffic Camera Images
4. The case doesn't end here. Traffic patterns evolve, and so must our detective.

8. SDG Mapping:

SDG No	Goal Title	Justification
11	Sustainable Cities and Communities	This project promotes smart urban traffic systems, improves mobility, reduces congestion, and supports efficient city planning.
9	Industry, Innovation and Infrastructure	Utilizes AI and modern tech to optimize infrastructure and drive innovation in intelligent transportation systems.
13	Climate Action	By reducing idle time and traffic jams, this system helps cut vehicle emissions and supports environmentally friendly urban transport.

9. OBE Mapping:

Program Outcomes (POs)

PO number	Name of the PO Targeted	Justification
PO1	Engineering Knowledge	Applies knowledge of computing, machine learning, and NLP to solve anomaly detection in text data.
PO2	Problems Analysis	Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.
PO3	Design/Development of Solutions	Design creative solutions for complex engineering problems and develop systems/ components/processes with consideration for public health and safety, environment, and sustainability.
PO4	Conduct Investigations of Complex Problems	Conduct investigation of urban traffic patterns using research-based knowledge, data modeling, and analysis to provide valid conclusions.
PO5	Engineering Tool Usage	Leverages advanced tools like BERT, Word2Vec, TensorFlow, and Scikit learn for text processing and classification.
PO6	The Engineer and The World	Considers ethical and societal implications in detecting harmful or misleading textual data.
PO7	Ethics	Ensures responsible handling of user data and promotes ethical AI practices in content classification.
PO8	Individual and Collaborative Team Work	Encourages collaborative development and testing of the system in a team environment.
PO9	Communication	Involves presenting findings through visualizations, reports, and interactive tools.
PO10	Project Management and Finance	Manages development phases efficiently, integrating time and resource planning.
PO11	Life-Long Learning	Promotes continuous learning of evolving NLP technologies and adapting them into innovative solutions.

Program Specific Outcomes (PSOs):

PSO number	Name of the PSO Targeted	Justification
PSO1	AI Knowledge Application	Apply the knowledge of Artificial Intelligence to design, develop, and evaluate computational solutions for complex problems in diverse domains, such as healthcare, finance, and automation.
PSO2	ML Tools & Techniques	Demonstrate expertise in using advanced ML tools, techniques, and frameworks to develop innovative solutions for data analysis, pattern recognition, and intelligent decision-making systems.

Course Outcomes (COs)

CO1: **A8042-** Apply fundamental and disciplinary concepts and methods in ways appropriate to their principal areas of study.

CO2: A8042- Demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.

CO3: A8042- Identify, analyze, and solve problems creatively through sustained critical investigation.

CO4: A8042- Demonstrate awareness and application of appropriate personal, societal, and professional ethical standards.

CO5: A8042- Practice the skills, diligence, and commitment to excellence needed to engage in lifelong learning.

Bloom's Taxonomy Level

Analyze: You are analyzing real-time and historical traffic data to extract meaningful insights such as congestion patterns, peak traffic hours, and influential variables contributing to urban traffic buildup.

Apply: You apply Artificial Intelligence and Machine Learning algorithms to solve a real-world traffic management problem by building models that can predict congestion accurately**.**

Create: You create a complete end-to-end solution that involves collecting traffic data, training predictive models, and deploying a real-time system capable of forecasting congestion in urban environments.

10. Timeline

	June	July	August	September	October
Abstract Submission (Project Selection & Abstract)	■				
Submission of Literature Review Papers and Report	■				
I REVIEW: ALR (Abstract Review)		■			
II REVIEW (Literature Review)		■			
III REVIEW (Design and Implementation)			■	■	
Literature Review Research Paper submission					■
Literature Review Report submission					■

11. References

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Signature of the Supervisor   **Signature of Coordinator**   **Signature of HOD**