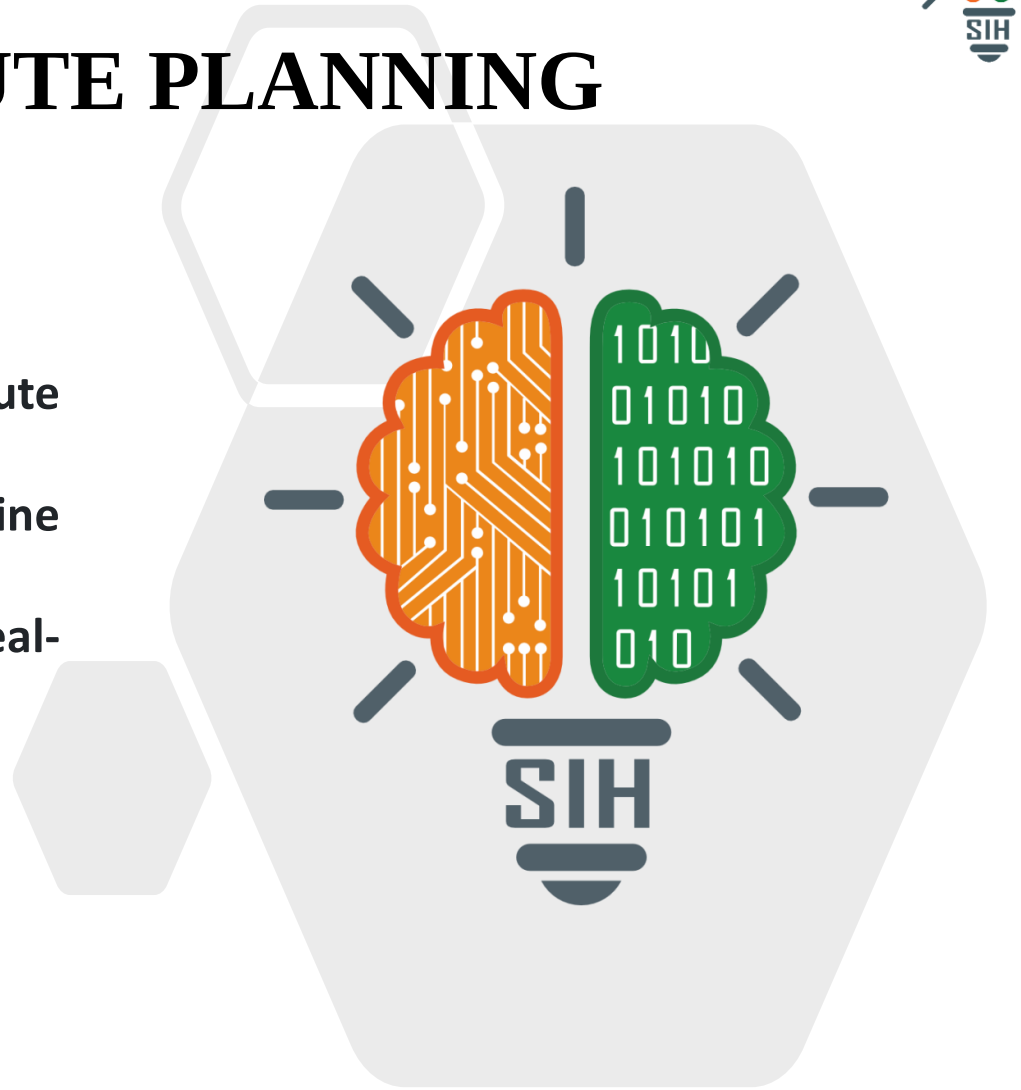
SMART INDIA HACKATHON 2024

ADAPTIVE ROUTE PLANNING



- **Problem Statement ID – 1617**
- **Problem Statement Title- Dynamic route rationalization model based on machine learning/AI would be required based on real-time traffic and road parameters.**
- **Theme- Smart Automation**
- **PS Category- Software**
- **Team Id- 37159**
- **Team Name - Traffixplorer**

Traffixplorer

ADAPTIVE ROUTE PLANNING

SMART INDIA HACKATHON 2024

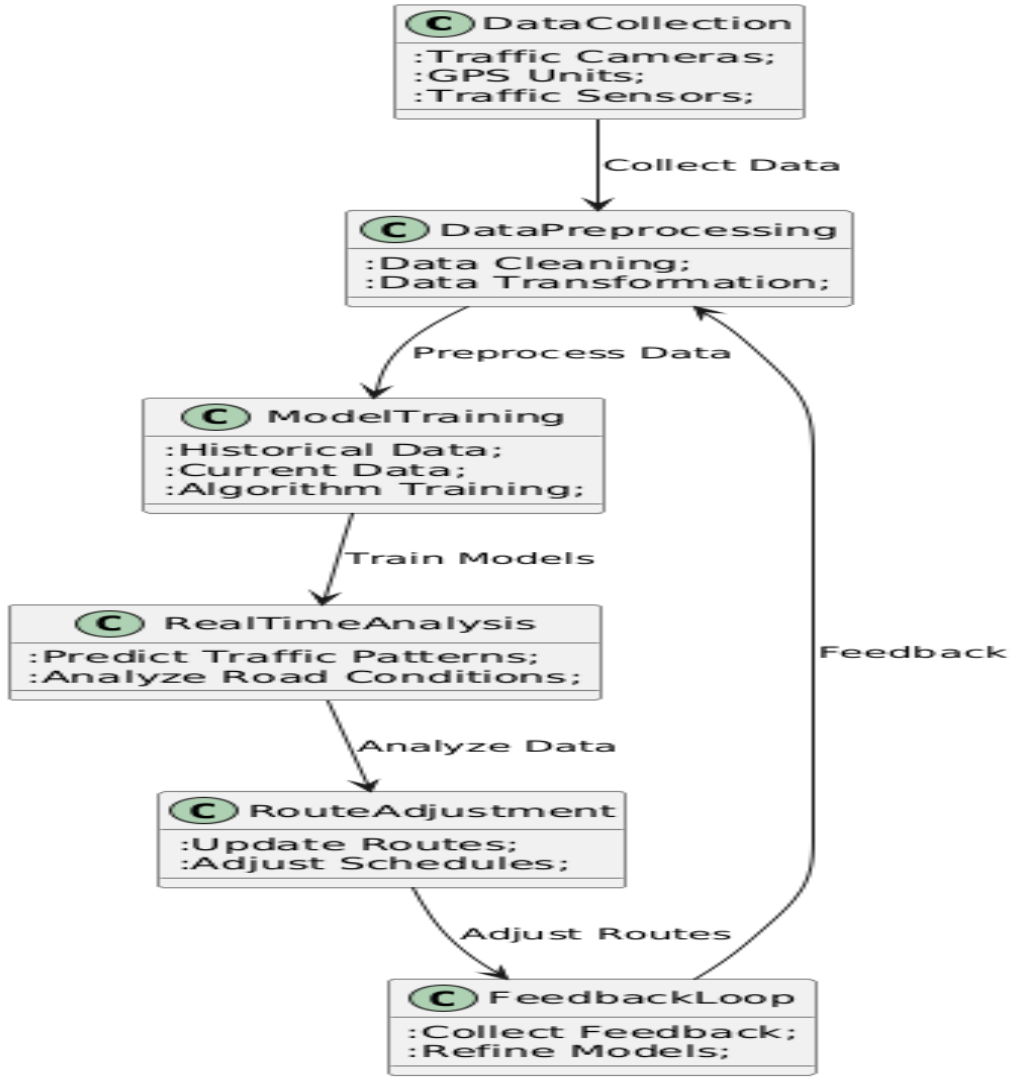
- **Dynamic Route Rationalization Model**
  - **Machine Learning Algorithms:** Predictive models for traffic congestion and route optimization.
  - **Real-Time Data Integration:** Incorporates traffic conditions, road parameters, and historical data.
  - **Adaptive Scheduling:** Flexible bus schedules based on current traffic conditions.
- **How it Addresses the Problem**
  - **Prevents Bus Bunching:** Adjusts routes to avoid multiple buses arriving at the same stop simultaneously.
  - **Reduces Delays:** Real-time adjustments minimize waiting times for passengers.
- **Innovation and Uniqueness**
  - **Real-Time Adjustments:** Unlike fixed schedules, the model adapts instantly to changing conditions.
  - **Integration of AI and ML:** Utilizes advanced algorithms for predictive analytics and route optimization.

Traffixplorer

TECHNICAL APPROACH

SMART INDIA HACKATHON 2024

- **Technologies to be Used:**
  - **Programming Languages:** Python, R
  - **Frameworks:** TensorFlow, scikit-learn
  - **Hardware:** GPS units, Traffic sensors
  - **Software:** Real-time data processing tools, GIS systems
- **Vehicle actuated controlled**
  - New traffic signal cutting down by adjusting in real time.
  - AI powered smart signal Known as Vehicle actuated controlled, VAC signal response to real time traffic condition unlike present timers with 360 ° that makes dynamic adjustment.



FEASIBILITY AND VIABILITY

- **Feasibility Analysis:**
  - **Technical Feasibility:** Utilizes well-established AI and machine learning techniques that are scalable and adaptable.
  - **Operational Feasibility:** Designed to integrate with existing bus management systems and infrastructure, minimizing disruption.
  - **Financial Feasibility:** Initial investment in technology and implementation is balanced by long-term savings from reduced operational costs and improved efficiency.
- **Potential Challenges and Risks:**
  - **Data Accuracy:** Ensuring the accuracy of real-time data from multiple sources can be challenging.
  - **System Integration**: Integrating new technology with existing systems may encounter compatibility issues.
  - **Model Complexity:** Developing and fine-tuning sophisticated models requires significant expertise and computational resources.
- **Strategies for Overcoming Challenges:**
  - **Data Validation:** Implement robust data validation and cleaning processes to ensure data quality.
  - **Pilot Testing:** Begin with a pilot program to test system integration and make necessary adjustments before full deployment.
  - **Modular Design:** Use a modular approach to allow for gradual implementation and easier troubleshooting.

IMPACT AND BENEFITS

- **Operational Efficiency:**
  - **Reduced Bus Bunching:** Enhanced scheduling reduces instances of multiple buses arriving at the same stop simultaneously, improving service reliability
  - **Improved Route Utilization:** Efficiently allocates buses to routes based on real-time demand, optimizing resource use.
- **Passenger Experience:**
  - **Timely Service:** Accurate real-time updates reduce waiting times and improve overall travel experience.
  - **Alternative Routes:** Provides passengers with real-time alternative route suggestions to avoid delays.
- **Environmental Impact:**
  - **Reduced Emissions:** Optimized routes decrease idle times and fuel consumption, contributing to lower emissions
  - **Sustainable Operations:** Supports more environmentally friendly public transport by enhancing operational efficiency.
- **Economic Benefits:**
  - **Cost Savings:** Reduces operational costs through more efficient route management and better fleet utilization.
  - **Increased Ridership:** Enhanced service quality can attract more passengers and improve overall public transport adoption.

RESEARCH AND REFERENCES

- Guo Z., Zhang Y., Lv J., Liu Y., and Liu Y., An online learning collaborative method for traffic forecasting and routing optimization, IEEE Transactions on Intelligent Transportation Systems. (2021)
- Liu J., Wan J., Wang Q., Deng P., Zhou K., and Qiao Y., A survey on position-based routing for vehicular ad hoc networks, Telecommunication Systems. (2016) 62, no. 1, 15–30, https://doi.org/10.1007/s11235-015-9979-7, 2-s2.0-84924663165.
- Awang A., Husain K., Kamel N., and Aissa S., Routing in vehicular ad-hoc networks: a survey on single-and cross-layer design techniques, and perspectives, IEEE Access. (2017) 5, 9497–9517, https://doi.org/10.1109/ACCESS.2017.2692240, 2-s2.0-85028451053.