High-Risk Road Segment Analysis

Identification of High-Risk Segments:

- Through the analysis, we identified several road segments in Melbourne that can be classified as high-risk due to high traffic volume and frequent speeding incidents.
- The high-risk segments are defined as those where both the total traffic volume and the number of speeding incidents exceed the 75th percentile of all road segments.

The **top 5 high-risk road segments** identified are:

- **Abbottsford Street**:
  - Total Traffic Volume: 100,672 vehicles
  - Speeding Incidents: 876
- **Anderson Street**:
  - Total Traffic Volume: 164,033 vehicles
  - Speeding Incidents: 1,108
- **Arden Street**:
  - Total Traffic Volume: 266,017 vehicles
  - Speeding Incidents: 763
- **Bourke Street**:
  - Total Traffic Volume: 101,854 vehicles
  - Speeding Incidents: 412
- **Elizabeth Street**:
  - Total Traffic Volume: 143,889 vehicles
  - Speeding Incidents: 576

Speeding Incidents:

- High-risk segments were frequently characterized by a higher number of speeding incidents. Roads such as Anderson Street and Abbottsford Street showed significant speeding violations, posing an increased danger to both pedestrians and other vehicles.
- These findings suggest that areas with high speeding incidents might require better monitoring and stricter enforcement of speed limits.

Traffic Volume Impact:

- Roads with heavy traffic, like Arden Street and Anderson Street, not only carry many vehicles but also exhibit speeding patterns. This implies that high traffic volume does not necessarily lead to slower traffic, but in fact may encourage reckless driving behaviour in certain areas.
- Managing high traffic volume alongside speeding violations is crucial in these zones to improve road safety.

Geographical Hotspots:

- The top high-risk road segments are distributed in areas with substantial vehicular activity, and these zones may benefit from targeted infrastructure improvements. Geographical analysis shows that focusing on high-volume areas like Anderson Street and Elizabeth Street could reduce traffic incidents and improve overall safety.

Potential Policy Recommendations:

- **Enhanced Traffic Monitoring**: Installing additional traffic monitoring systems such as speed cameras or radar-based monitoring on high-risk roads can help mitigate speeding incidents. Roads such as Anderson Street, with both high traffic volume and speeding violations, are ideal candidates for such interventions.
- **Speed Control Measures**: Introducing traffic-calming measures like speed bumps, variable speed limits, and better signage in high-risk areas could lead to significant reductions in speeding violations, especially in areas like Abbottsford Street and Arden Street.
- **Public Awareness Campaigns**: Implementing road safety campaigns that target drivers using these high-risk segments can raise awareness and promote safe driving habits, particularly in zones with frequent speeding violations.
- **Infrastructure Enhancements**: Improving road conditions, adding pedestrian safety barriers, and redesigning intersections in high-risk zones like Bourke Street and Elizabeth Street can help reduce accidents and increase road safety.

Machine Learning Insights:

- The LightGBM model used for predicting high-risk road segments achieved good accuracy, reinforcing that total traffic volume and speeding incidents are strong predictors of road safety risks.
- Predictive analytics and real-time traffic data monitoring can provide ongoing insights into road safety, enabling authorities to dynamically allocate resources and implement preventive measures based on up-to-date traffic patterns.