

Company	VSoft Technologies
Project	Traffic Data Clustering System (Ant Colony Streaming Algorithm)
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## Software Requirements Specification (SRS)

### 1. Purpose

The purpose of the Traffic Data Clustering System is to analyze and visualize vehicle traffic density using Ant Colony Streaming Clustering Algorithm. The system enables city planners and traffic analysts to identify congestion patterns in real time by clustering vehicle data points based on proximity, speed, and timestamp. The project aims to help improve traffic management and reduce congestion.

### 2. Project Scope

The system allows users to upload CSV datasets containing latitude, longitude, speed, timestamp, and city data. Using an ant colony-based clustering algorithm, traffic points are categorized as High (Red), Medium (Yellow), or Low (Green) density zones. A web-based dashboard visualizes these clusters dynamically, providing actionable insights into current traffic conditions.

### 3. Functional Requirements

- The system shall allow users to upload traffic data in CSV format. - The system shall process the uploaded dataset using the Ant Colony Streaming Algorithm. - The system shall categorize traffic points into High, Medium, and Low density. - The system shall display results on an interactive map and chart interface. - The system shall refresh to simulate real-time updates with randomly generated traffic intensity. - The system shall store dataset and clustering results in MySQL database.

### 4. Non-Functional Requirements

- **Performance:** System should process up to 10,000 data points within 5 seconds. - **Scalability:** Should support additional cities and data expansion. - **Security:** File uploads restricted to CSV format only; data sanitized before processing. - **Usability:** Simple and responsive UI built with Bootstrap. - **Reliability:** System must handle unexpected file formats gracefully.

### 5. Technologies Used

- **Backend:** Spring Boot (Java) - **Frontend:** HTML, CSS, JavaScript, Bootstrap - **Visualization:** Chart.js, Google Maps API / Leaflet.js - **Database:** MySQL - **Algorithm:** Ant Colony Streaming Clustering Algorithm

## 6. Database Schema

```
**Table: traffic_data** | Column Name | Data Type | Description |
|-----|-----|-----| | id | INT (PK) | Unique record identifier | | latitude |
DOUBLE | Vehicle latitude coordinate | | longitude | DOUBLE | Vehicle longitude
coordinate | | speed | FLOAT | Vehicle speed (km/h) | | timestamp | DATETIME | Data
collection time | | city | VARCHAR(100) | City name | **Table: traffic_cluster** | Column
Name | Data Type | Description | |-----|-----|-----| | id | INT (PK) | Cluster
record identifier | | cluster_type | VARCHAR(20) | (High / Medium / Low) | | created_at |
DATETIME | Cluster creation timestamp | | city | VARCHAR(100) | City name |
```

## 7. Conclusion

The Traffic Data Clustering System provides a scalable and data-driven approach to analyze vehicle density using bio-inspired algorithms. The integration of the Ant Colony Algorithm enables efficient clustering, visualization, and interpretation of traffic data to support smart city initiatives.