**🚦 Road Accident Analysis Dashboard – Documentation**

**📌 Project Overview**

This project analyses **road accident data** to uncover key patterns, trends, and risk factors that contribute to accidents. Using **SQL views** for structured aggregations and **Power BI** for interactive dashboards, this project provides actionable insights on accident severity, time-based trends, high-risk locations, and the influence of environmental conditions.

The dashboard enables decision-makers (e.g., traffic authorities, policymakers, and urban planners) to **identify accident hotspots, reduce risks, and improve road safety**.

**📂 Project Components**

**Dataset**

* Source: RoadAccidents table
* Key fields:
  + AccidentDate
  + Accident\_Severity
  + Day\_of\_Week
  + Time
  + Number\_of\_Casualties
  + Vehicle\_Type
  + Road\_Type, Road\_Surface\_Conditions, Speed\_limit
  + Light\_Conditions, Weather\_Conditions
  + Urban\_or\_Rural\_Area
  + Latitude, Longitude

**SQL Views for Insights**

The SQL layer prepares clean aggregated views for Power BI:

* **Accident Trends**
  + TotalAccidentByYear → Yearly trend
  + TotalAccidentByMonth → Monthly trend
  + TotalAccidentByDay → Day-of-week trend
  + FatalityRateYear → Yearly fatality rate (%)
* **Severity & Casualties**
  + TotalSeverity → Distribution by severity
  + AvgCasualties → Average casualties per accident
  + FatalAccidentsByMonth → Fatalities by month
* **Environmental Factors**
  + AccidentsByRoadSurface → Road surface impact
  + WeatherImpact → Fatal accidents by weather
  + LightingCondition → Day vs night conditions
* **Vehicle & Location Analysis**
  + VehicleType, SeverityByVehicleType, AverageCasualtiesVehicle
  + AccidentsByRegion → Urban vs rural
  + TopLocationsAccidents → Top 10 hotspots
  + AccidentsLatLong → Geo hotspots
* **Road & Speed Factors**
  + AccidentsBySpeedLimit
  + RoadType
  + PeakAccidentHours
  + DayNightAccidents

**Dashboard Features**

The Power BI dashboard consists of:

* **KPI Cards**:
  + Total Casualties, Total Accidents, Fatal/Serious/Slight Casualties, YOY Change
* **Trend Analysis**:
  + Monthly trend (CY vs PY)
  + Fatal Accidents by Month
  + Peak Accident Hours
* **Distribution Charts**:
  + Casualties by Urban/Rural
  + Casualties by Road Type & Speed Limit
  + Accidents by Day of Week, Light & Weather conditions
* **Vehicle Impact**:
  + Accidents by Vehicle Type
  + Severity by Vehicle Type
  + Average casualties by vehicle type
* **Geographical Analysis**:
  + Top 10 accident-prone locations
  + Hotspot map (Lat/Long plotting)
* **Comparisons**:
  + Day vs Night Accidents
  + Fatality Rate over Years

**📊 Key Insights**

1. **Time Trends**
   * Most accidents occur during **evening peak hours (5–7 PM)**.
   * Accidents peak in **December**, lowest in **January**.
2. **Severity**
   * Majority are **slight injuries**, but **fatal accidents** show spikes in specific months.
3. **Environmental Conditions**
   * **Wet road surfaces** and **dark hours** increase accident likelihood.
   * Fatal accidents are higher in **rainy/foggy weather**.
4. **Vehicle & Road Types**
   * **Cars** contribute to the majority of accidents.
   * **Single carriageways** are the most accident-prone.
5. **Geographical Factors**
   * Urban areas show higher accident frequency.
   * Certain districts repeatedly appear as **hotspots**.

**⚙️ Tech Stack**

* **SQL Server** → Data preprocessing and creating views
* **Power BI** → Dashboard & DAX measures
* **GitHub Repo** → Project hosting and documentation

**🚀 Future Enhancements**

* Add **Predictive Analytics** (ML model for accident severity).
* Build **real-time dashboard** by integrating live traffic APIs.
* Enhance **geo-visualizations** with clustering (heatmaps).
* Introduce **drill-through reports** for location & vehicle-specific insights.

Road Accident Analysis Project Documentation

# SQL Queries

SELECT \* FROM RoadAccidents  
-- Accidents per Year  
CREATE VIEW TotalAccidentByYear AS  
SELECT   
 YEAR(AccidentDate) AS AccYear,  
 COUNT(\*) AS TotalAccidentByYear  
FROM RoadAccidents  
GROUP BY YEAR(AccidentDate)  
  
-- Accidents per Month  
CREATE VIEW TotalAccidentByMonth AS  
SELECT  
 DATENAME(MONTH, AccidentDate) AS AccMonth,  
 COUNT(\*) AS TotalAccidentByMonth  
FROM RoadAccidents  
GROUP BY DATENAME(MONTH, AccidentDate)  
  
-- Accidents by Day of Week  
CREATE VIEW TotalAccidentByDay AS  
SELECT  
 Day\_of\_Week,  
 COUNT(\*) AS TotalAccidentByDay  
FROM RoadAccidents  
GROUP BY Day\_of\_Week  
ORDER BY TotalAccidentByDay DESC;  
  
-- Accident Count by Severity  
CREATE VIEW TotalSeverity AS  
SELECT  
 Accident\_Severity,  
 COUNT(\*) AS TotalSeverity  
FROM RoadAccidents  
GROUP BY Accident\_Severity  
ORDER BY TotalSeverity DESC;  
  
-- Average Casualties per Accident  
CREATE VIEW AvgCasualties AS  
SELECT  
 AVG(TRY\_CAST(Number\_of\_Casualties AS FLOAT)) AS TotalCasualties  
FROM RoadAccidents;  
  
-- Fatal Accidents by Month  
CREATE VIEW FatalAccidentsByMonth AS  
SELECT  
 DATENAME(MONTH, AccidentDate) AS AccidentMonth,  
 COUNT(\*) AS FatalAccidentByMonth  
FROM RoadAccidents  
WHERE Accident\_Severity = 'Fatal'  
GROUP BY DATENAME(MONTH, AccidentDate)  
ORDER BY FatalAccidentByMonth DESC;  
  
-- Accidents by Road Surface  
CREATE VIEW AccidentsByRoadSurface AS  
SELECT  
CASE  
 WHEN TRIM(Road\_Surface\_Conditions) IS NULL THEN 'Unknown'  
 ELSE Road\_Surface\_Conditions  
END AS Road\_Surface\_Conditions,  
 COUNT(\*) AS SurfaceConditions  
FROM RoadAccidents  
GROUP BY Road\_Surface\_Conditions  
ORDER BY SurfaceConditions DESC;  
  
-- Weather Impact on Fatal Accidents  
CREATE VIEW WeatherImpact AS  
SELECT  
CASE  
 WHEN TRIM(Weather\_Conditions) IS NULL THEN 'Unknown'  
 ELSE Weather\_Conditions  
END AS Weather\_Conditions,  
 COUNT(\*) FatalAcc  
FROM RoadAccidents  
WHERE Accident\_Severity = 'Fatal'  
GROUP BY Weather\_Conditions  
ORDER BY FatalAcc DESC;  
  
-- Accidents by Lighting Condition  
CREATE VIEW LightingCondition AS  
SELECT  
 Light\_Conditions,  
 COUNT(\*) AS TotalAcc  
FROM RoadAccidents  
GROUP BY Light\_Conditions  
ORDER BY TotalAcc DESC;  
  
-- Accidents by Vehicle Type  
CREATE VIEW VehicleType AS  
SELECT  
 Vehicle\_Type,  
 COUNT(\*) AS TotalAcc  
FROM RoadAccidents  
GROUP BY Vehicle\_Type  
ORDER BY TotalAcc DESC;  
  
-- Severity by Vehicle Type  
CREATE VIEW SeverityByVehicleType AS  
SELECT  
 Accident\_Severity,  
 Vehicle\_Type,  
 COUNT(\*) AS Total  
FROM RoadAccidents  
GROUP BY Accident\_Severity,Vehicle\_Type  
ORDER BY Total DESC;  
  
-- Average Casualties by Vehicle Type  
CREATE VIEW AverageCasualtiesVehicle AS   
SELECT  
 Vehicle\_Type,  
 AVG(TRY\_CAST(Number\_of\_Casualties AS FLOAT)) AS AvgCasualties  
FROM RoadAccidents  
GROUP BY Vehicle\_Type  
ORDER BY AvgCasualties DESC;  
  
-- Accidents by Region  
CREATE VIEW AccidentsByRegion AS  
SELECT  
 Urban\_or\_Rural\_Area,  
 COUNT(\*) AS Total  
FROM RoadAccidents  
GROUP BY Urban\_or\_Rural\_Area  
ORDER BY Total DESC;  
  
-- Top Locations with Most Accidents  
CREATE VIEW TopLocationsAccidents AS   
SELECT TOP 10  
 Local\_Authority\_District,  
 COUNT(\*) TotalAccidents  
FROM RoadAccidents  
GROUP BY Local\_Authority\_District  
ORDER BY TotalAccidents DESC;  
  
-- Accidents by Speed Limit  
CREATE VIEW AccidentsBySpeedLimit AS  
SELECT   
 Speed\_limit,  
 COUNT(\*) TotalAcc  
FROM RoadAccidents  
GROUP BY Speed\_limit  
ORDER BY TotalAcc DESC;  
  
CREATE VIEW AvgSpeed AS  
SELECT   
 AVG(Speed\_limit) AvgSpeed  
FROM RoadAccidents;  
  
-- Accidents on Road Type  
CREATE VIEW RoadType AS  
SELECT  
CASE  
 WHEN TRIM(Road\_Type) IS NULL THEN 'Unknown'  
 ELSE Road\_Type  
END AS Road\_Type,  
 COUNT(\*) AS TotalAcc  
FROM RoadAccidents  
GROUP BY Road\_Type  
ORDER BY TotalAcc DESC;  
  
-- Peak Accident Hours  
CREATE VIEW PeakAccidentHours AS  
SELECT   
 DATEPART(HOUR, Time) AS HourOfDay,  
 COUNT(\*) AS TotalAccidents  
FROM RoadAccidents  
WHERE Time IS NOT NULL  
GROUP BY DATEPART(HOUR, TRY\_CAST(Time AS TIME))  
ORDER BY TotalAccidents DESC;  
  
-- Day vs Night Accidents  
CREATE VIEW DayNightAccidents AS  
SELECT  
CASE  
 WHEN DATEPART(HOUR, Time) BETWEEN 6 AND 18 THEN 'Day'  
 ELSE 'Night'  
END TimeOfDay,  
 COUNT(\*) AS TotalAccidents  
FROM RoadAccidents  
WHERE Time IS NOT NULL  
GROUP BY DATEPART(HOUR, Time)  
ORDER BY TotalAccidents DESC;  
  
-- Accidents Hotspots by Lat/Long  
CREATE VIEW AccidentsLatLong AS  
SELECT   
 Latitude,  
 Longitude,  
 COUNT(\*) AS TotalAccidents  
FROM RoadAccidents  
GROUP BY Latitude, Longitude  
ORDER BY TotalAccidents DESC;  
  
-- Fatality Rate per Year  
CREATE VIEW FatalityRateYear AS  
SELECT   
 YEAR(AccidentDate) AS AccYear,  
 SUM(CASE WHEN Accident\_Severity = 'Fatal' THEN 1 ELSE 0 END) \* 100.0 / COUNT(\*) AS FatalityRate  
FROM RoadAccidents  
GROUP BY YEAR(AccidentDate)  
ORDER BY FatalityRate DESC;

# DAX Queries

CY Accident Count = TOTALYTD(DISTINCTCOUNT(RoadAccidents[Accident\_Index]), Calender[Date])   
  
CY Casualties = TOTALYTD(SUM(RoadAccidents[Number\_of\_Casualties]), Calender[Date])   
  
PY Accidents = CALCULATE(DISTINCTCOUNT(RoadAccidents[Accident\_Index]), SAMEPERIODLASTYEAR(Calender[Date]))   
  
PY casualties = CALCULATE(SUM(RoadAccidents[Number\_of\_Casualties]), SAMEPERIODLASTYEAR(Calender[Date]))   
  
Total Accidents = COUNTROWS('RoadAccidents')   
  
YOY Accidents = ([CY Accident Count] - [PY Accidents]) / [PY Accidents]   
  
YOY Casualties = ([CY Casualties] - [PY casualties]) / [PY casualties]   
  
Calendar = CALENDAR(MIN(RoadAccidents[AccidentDate]), MAX(RoadAccidents[AccidentDate]))