

```
-- Create a new database for traffic monitoring
CREATE DATABASE TRAFFIC_MONITORING_SYSTEM;

-- Switch to the newly created database
USE TRAFFIC_MONITORING_SYSTEM;

/* Data Import: Data was imported into the table [Hyderabad Traffic Monitoring
System_Updated]
using SQL Server Management Studio's Import functionality. */

-- Select all columns from the imported table to view the data
SELECT *
FROM [dbo].[Hyderabad Traffic Monitoring System_Updated];

-- LET'S GET STARTED WITH EXPLORATORY DATA ANALYSIS USING SQL

-- Let's write a SQL procedure to analyze time-series data for traffic
prediction.

GO
CREATE PROCEDURE AnalyzeTrafficData
    @Area NVARCHAR(255),
    @Location NVARCHAR(255)
AS
BEGIN
    SET NOCOUNT ON;

    BEGIN TRY
        IF OBJECT_ID('tempdb..#TrafficSummary') IS NOT NULL
            DROP TABLE #TrafficSummary;

        CREATE TABLE #TrafficSummary (
            [Date] DATE,
            [Hour] INT,
            AverageVehicleCount FLOAT,
            AverageSpeed FLOAT
        );

        INSERT INTO #TrafficSummary ([Date], [Hour], AverageVehicleCount,
            AverageSpeed)
        SELECT
            [Date],
            DATEPART(HOUR, [Timestamp]) AS [Hour], -- Assuming the column is
            [Timestamp]
            AVG(CAST([Vehicle Count] AS FLOAT)) AS AverageVehicleCount,
            AVG([Average Speed (in km/h)]) AS AverageSpeed
        FROM [dbo].[Hyderabad Traffic Monitoring System_Updated]
        WHERE [Area] = @Area
            AND [Location] = @Location
        GROUP BY [Date], DATEPART(HOUR, [Timestamp]);
```

```

WITH PeakHourData AS (
    SELECT
        [Date],
        [Hour],
        AVG(AverageVehicleCount) AS AvgVehicleCount
    FROM #TrafficSummary
    GROUP BY [Date], [Hour]
),
MaxPeakHour AS (
    SELECT
        [Date],
        MAX(AvgVehicleCount) AS MaxAvgVehicleCount
    FROM PeakHourData
    GROUP BY [Date]
)
SELECT
    p.[Date],
    p.[Hour] AS PeakHour,
    MAX(t.AverageVehicleCount) AS MaxVehicleCount,
    AVG(t.AverageVehicleCount) AS AvgVehicleCount,
    MAX(t.AverageSpeed) AS MaxSpeed,
    AVG(t.AverageSpeed) AS AvgSpeed
FROM #TrafficSummary AS t
JOIN PeakHourData AS p
    ON t.[Date] = p.[Date] AND t.[Hour] = p.[Hour]
JOIN MaxPeakHour AS m
    ON t.[Date] = m.[Date] AND p.AvgVehicleCount = m.MaxAvgVehicleCount
GROUP BY p.[Date], p.[Hour]
ORDER BY p.[Date], MaxVehicleCount DESC;

END TRY
BEGIN CATCH
    SELECT
        ERROR_NUMBER() AS ErrorNumber,
        ERROR_SEVERITY() AS ErrorSeverity,
        ERROR_STATE() AS ErrorState,
        ERROR_PROCEDURE() AS ErrorProcedure,
        ERROR_LINE() AS ErrorLine,
        ERROR_MESSAGE() AS ErrorMessage;
END CATCH;

IF OBJECT_ID('tempdb..#TrafficSummary') IS NOT NULL
    DROP TABLE #TrafficSummary;
END;
GO

-- Test Cases For The Procedure

EXEC AnalyzeTrafficData
    @Area = 'Madhapur',
    @Location = 'B';

EXEC AnalyzeTrafficData

```

```
@Area = 'Gachibowli',  
@Location = 'D';
```

```
-- Let's develop SQL queries to further our analysis by extracting specific  
information from the dataset.
```

```
--Analysis: Average Speed by Location
```

```
--Description: Compute the average speed recorded at different locations,  
formatted to 2 decimal places.
```

```
SELECT  
    Location,  
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS 'Average Speed'  
FROM  
    [dbo].[Hyderabad Traffic Monitoring System_Updated]  
GROUP BY  
    Location  
ORDER BY  
    'Average Speed' DESC;
```

```
--Analysis: Average Vehicle Count by Area
```

```
--Description: Calculate the average number of vehicles for each area, formatted  
to 2 decimal places.
```

```
SELECT  
    Area,  
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS 'Average  
    Vehicle Count'  
FROM  
    [dbo].[Hyderabad Traffic Monitoring System_Updated]  
GROUP BY  
    Area  
ORDER BY  
    'Average Vehicle Count' DESC;
```

```
--Analysis: Frequency of Extreme Congestion Levels by Date
```

```
--Description: Count how often high congestion levels (e.g., "High") are  
recorded for each date.
```

```
SELECT  
    [Date],  
    COUNT(*) AS 'Extreme Congestion Frequency'  
FROM  
    [dbo].[Hyderabad Traffic Monitoring System_Updated]  
WHERE  
    [Congestion Level] = 'Extreme'  
GROUP BY  
    [Date]  
ORDER BY  
    [Date];
```

--Analysis: Daily Traffic Trends

--Description: Determine the average vehicle counts and speeds for each day.

```
SELECT
    [Date],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS 'Average
    Vehicle Count',
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS 'Average Speed'
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
GROUP BY
    [Date]
ORDER BY
    [Date];
```

--Analysis: Impact of Weather Conditions on Traffic

--Description: Examine how different weather conditions affect vehicle counts and speeds.

```
SELECT
    [Weather Condition],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average
    Vehicle Count],
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
GROUP BY
    [Weather Condition]
ORDER BY
    [Weather Condition];
```

--Analysis: Visibility's Effect on Traffic

--Description: Analyze how visibility levels impact average vehicle count and speed.

```
SELECT
    [Visibility Level],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average
    Vehicle Count],
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
GROUP BY
    [Visibility Level]
ORDER BY
    [Visibility Level];
```

--Analysis: Temperature and Traffic Correlation

--Description: Study the correlation between temperature and traffic metrics such as vehicle count and speed.

```
SELECT
    CAST([Temperature (in C)] AS DECIMAL(10, 2)) AS [Temperature (C)],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average
    Vehicle Count],
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
GROUP BY
    [Temperature (in C)]
ORDER BY
    [Temperature (C)];
```

--Analysis: Humidity's Influence on Traffic

--Description: Assess how humidity levels affect traffic patterns, including vehicle count and speed.

```
SELECT
    CAST([Humidity (in %)] AS DECIMAL(10, 2)) AS [Humidity (%)],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average
    Vehicle Count],
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
GROUP BY
    [Humidity (in %)]
ORDER BY
    [Humidity (%)];
```

--Analysis: Wind Speed and Traffic Analysis

--Description: Evaluate the effect of wind speed on vehicle count and average speed.

```
SELECT
    CAST([Wind Speed (in km/h)] AS DECIMAL(10, 2)) AS [Wind Speed (km/h)],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average
    Vehicle Count],
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
GROUP BY
    [Wind Speed (in km/h)]
ORDER BY
    [Wind Speed (km/h)];
```

--Analysis: Traffic Signal Status Impact

--Description: Investigate how different traffic signal statuses affect vehicle count and congestion levels.

```
SELECT
    [Traffic Signal Status],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average Vehicle Count],
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
GROUP BY
    [Traffic Signal Status]
ORDER BY
    [Traffic Signal Status];
```

--Analysis: Roadwork and Traffic Flow

--Description: Analyze the impact of roadwork on traffic metrics like vehicle count and congestion. [↗](#)

```
SELECT
    [Roadwork],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average Vehicle Count],
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
GROUP BY
    [Roadwork]
ORDER BY
    [Roadwork];
```

--Analysis: Accident Levels and Traffic

--Description: Examine how accident levels affect vehicle count, congestion, and average speed. [↗](#)

```
SELECT
    [Accident Level],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average Vehicle Count],
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
GROUP BY
    [Accident Level]
ORDER BY
    [Accident Level];
```

--Analysis: Traffic Comparison by Area and Location

--Description: Compare traffic metrics such as vehicle count and speed across different areas and locations. [↗](#)

```
SELECT
```

```

    [Area],
    [Location],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average
    Vehicle Count],
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
GROUP BY
    [Area], [Location]
ORDER BY
    [Area], [Location];

```

--Analysis: Average Traffic Metrics During Peak Hours by Day

--Description: Calculate average vehicle count and speed specifically during peak hours for each day.

```

WITH PeakHoursCTE AS (
    SELECT
        [Date],
        DATEPART(HOUR, [Time]) AS PeakHour,
        AVG(CAST([Vehicle Count] AS FLOAT)) AS AvgVehicleCount
    FROM
        [dbo].[Hyderabad Traffic Monitoring System_Updated]
    GROUP BY
        [Date], DATEPART(HOUR, [Time])
),
DailyPeakHours AS (
    SELECT
        [Date],
        PeakHour
    FROM
        PeakHoursCTE
    WHERE
        AvgVehicleCount = (
            SELECT MAX(AvgVehicleCount)
            FROM PeakHoursCTE AS Sub
            WHERE Sub.[Date] = PeakHoursCTE.[Date]
        )
)
SELECT
    [Date],
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average
    Vehicle Count],
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]
FROM
    [dbo].[Hyderabad Traffic Monitoring System_Updated]
WHERE
    DATEPART(HOUR, [Time]) IN (
        SELECT PeakHour
        FROM DailyPeakHours
        WHERE [Date] = [dbo].[Hyderabad Traffic Monitoring System_Updated].
        [Date]
    )

```

```
)  
GROUP BY  
    [Date]  
ORDER BY  
    [Date];
```

```
--Analysis: Comparison of Traffic Metrics Before and After Roadwork  
--Description: Analyze changes in traffic metrics before and after roadwork events.
```

```
SELECT  
    CASE  
        WHEN [Roadwork] = 'Yes' THEN 'During Roadwork'  
        ELSE 'Before Roadwork'  
    END AS [Roadwork Period],  
    CAST(AVG(CAST([Vehicle Count] AS FLOAT)) AS DECIMAL(10, 2)) AS [Average  
        Vehicle Count],  
    CAST(AVG([Average Speed (in km/h)]) AS DECIMAL(10, 2)) AS [Average Speed]  
FROM  
    [dbo].[Hyderabad Traffic Monitoring System_Updated]  
GROUP BY  
    [Roadwork]  
ORDER BY  
    [Roadwork Period];
```