Grammar of Graphics

A Systematic Framework for Building Visualizations

1 **Data**
Foundation: Raw dataset to visualize

2 **Aesthetics**
Map data to visual properties (x, y, color)

3 **Geometries**
Visual marks (points, lines, bars)

4 **Statistics**
Transform data (mean, count, regression)

5 **Scales**
Control mapping from data to aesthetics

6 **Coordinates**
Map to 2D plane (Cartesian, polar)

7 **Facets**

Framework

ggplot2

by Leland Wilkinson

Key Concepts

📊 Build graphics incrementally

🔄 Separates data from visuals

🎨 Systematic & composable

🏗️ Layer-based architecture

Split data into multiple subplots

Step-by-Step Implementation

Building Visualizations Layer by Layer

📊 Practical Example: Car Fuel Efficiency Analysis

Using the mtcars dataset, we'll visualize the relationship between car weight (wt) and fuel efficiency (mpg). Watch how each layer progressively builds the visualization from an empty canvas to a complete, insightful graph.

↓

✨ Complete Visualization Achieved

By layering all 7 components, we've built a sophisticated multi-dimensional visualization that reveals:

📌 **Key Insights:**
• Heavier cars have worse fuel efficiency (negative correlation)
• More cylinders → heavier cars → worse MPG (shown by red colors)
• Manual transmission cars are generally lighter and more efficient

This is the power of Grammar of Graphics: systematic, composable, and infinitely flexible!