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Advanced Data Visualization Techniques

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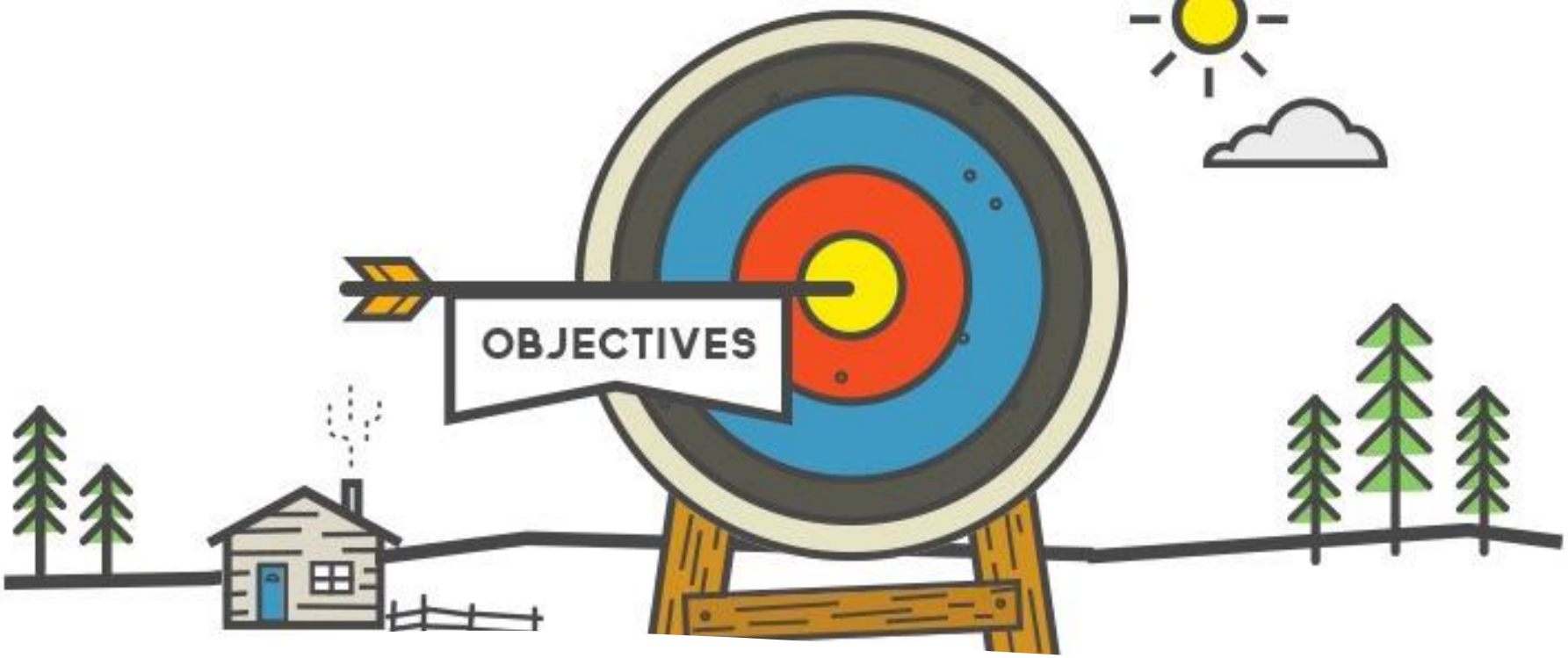


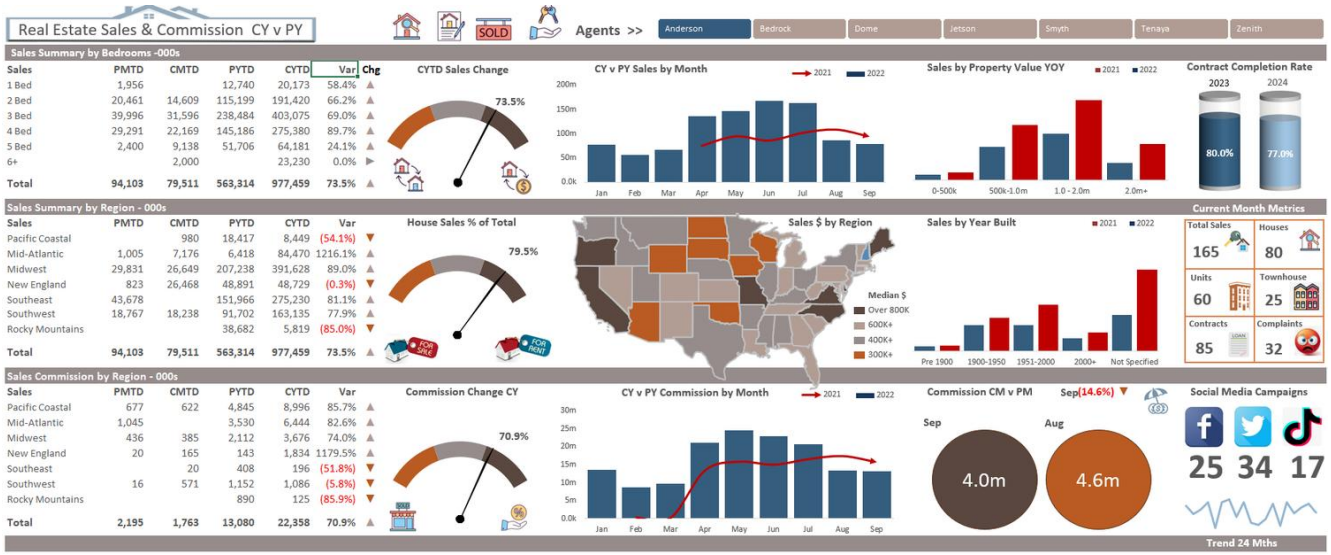
Learning Goals

By the end of this session, you will be able to:

- Understand advanced visualization techniques
- Distinguish key visualization types
- Recognize big data and real-time challenges
- Use advanced Tableau and Power BI features
- Build interactive geospatial visuals
- Apply visualization to support decisions

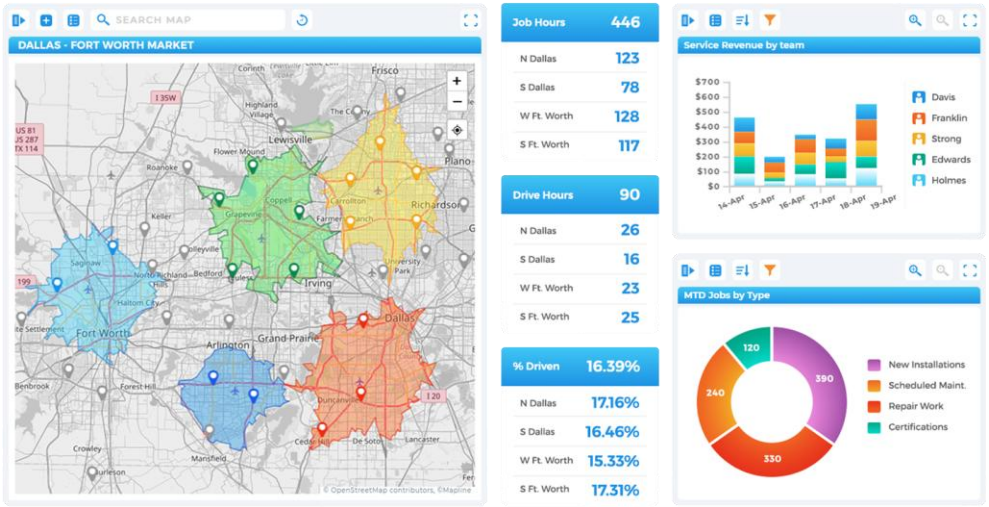
Advanced Data Visualization Techniques

- Moving from static charts to analytical systems
- Focus on extracting patterns, relationships, and decisions
- Visualization as a decision-support tool
- Used in forecasting, operations, and strategy



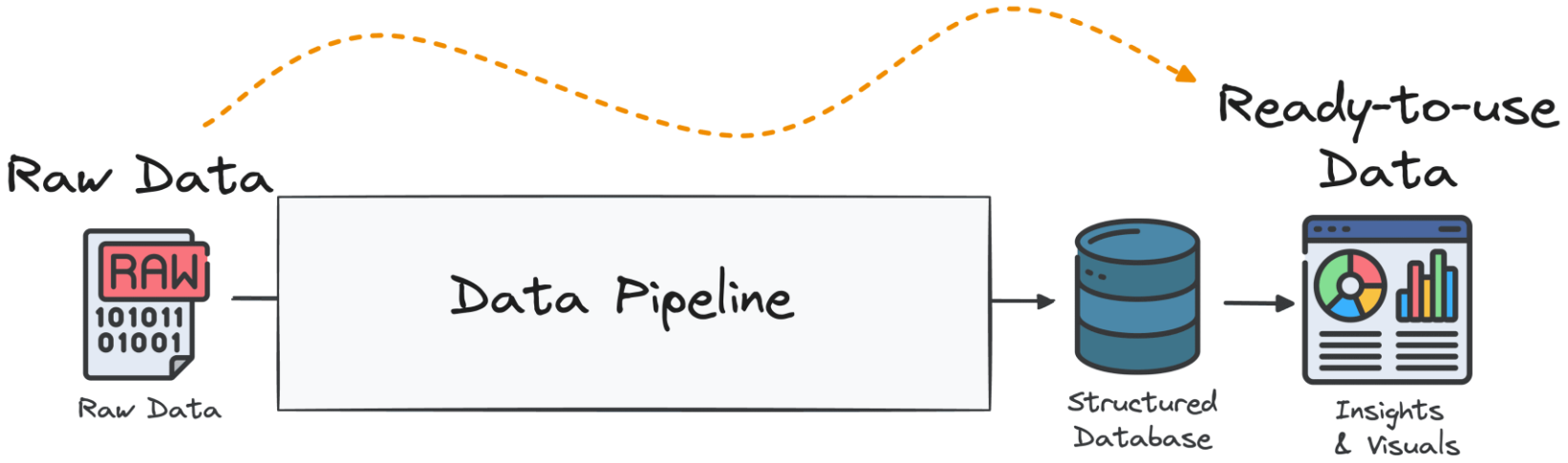
Why Advanced Visualization Matters

- Basic charts answer: What happened?
- Advanced visualization answers: Why and what next?
- Enables faster and more accurate decisions
- Reduces uncertainty



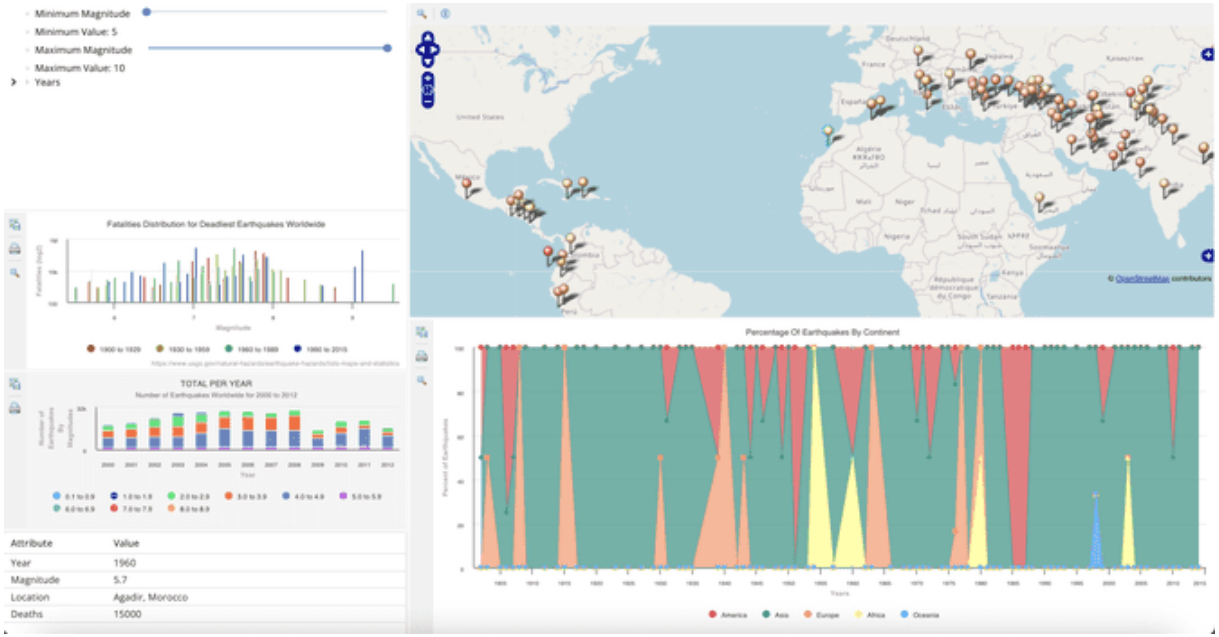
Data → Insight → Decision

- Data: raw numbers
- Patterns: trends and relationships
- Insights: interpretation
- Decisions: actions



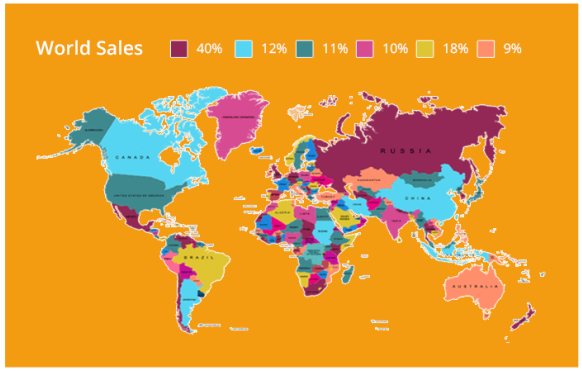
Types of Advanced Visualization

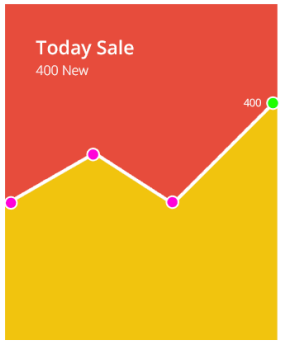
- Time Series
- Geospatial
- Network
- Real-time

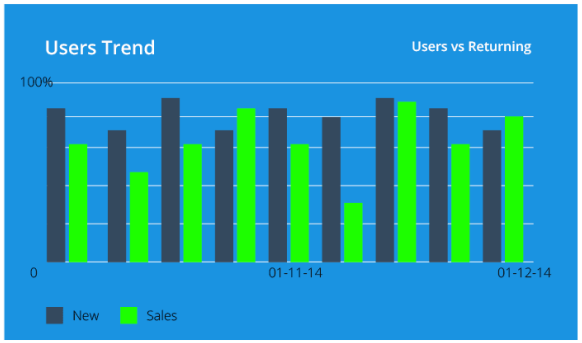


The Core Problem in Modern Data

- Too much data
- High complexity
- Cognitive limitations
- Risk of misinterpretation

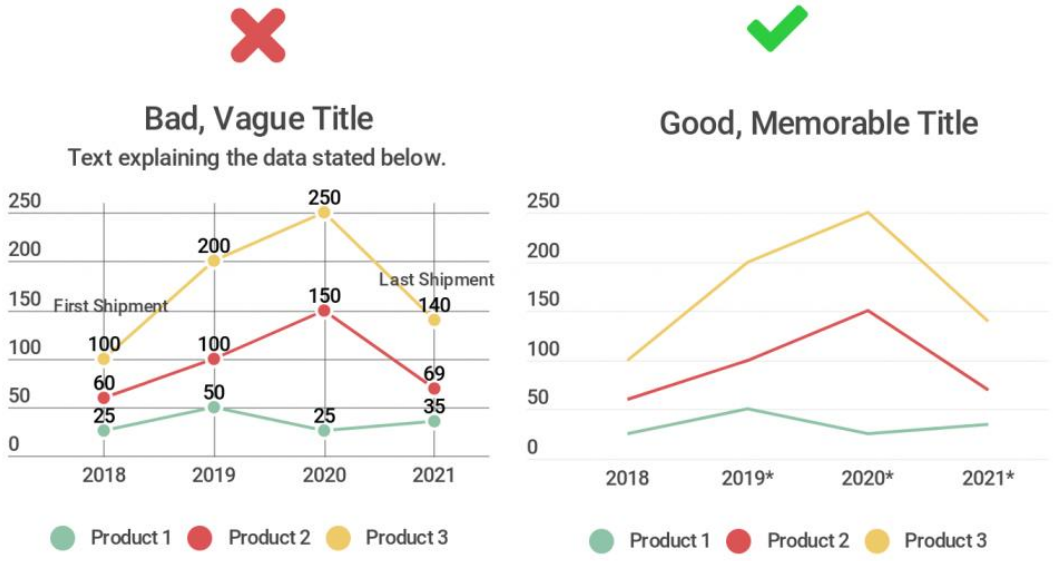






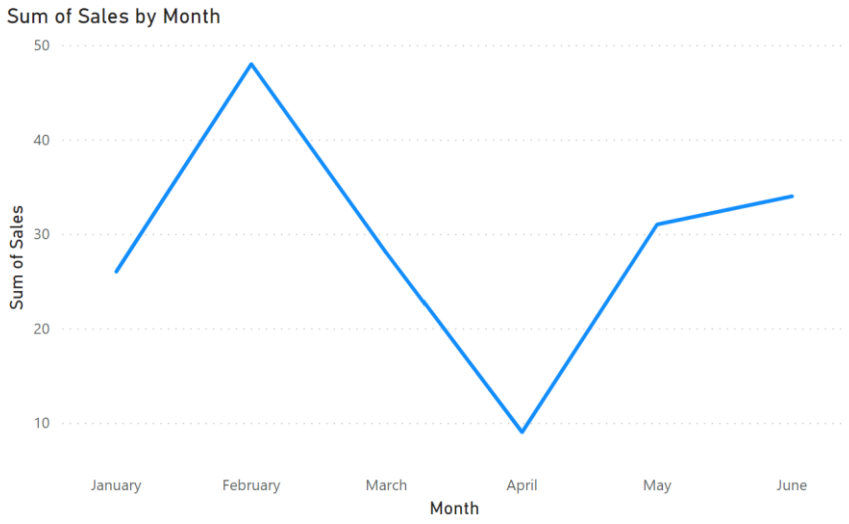
One Question per Chart

- One chart = one question
- Avoid mixing insights
- Simplicity improves clarity



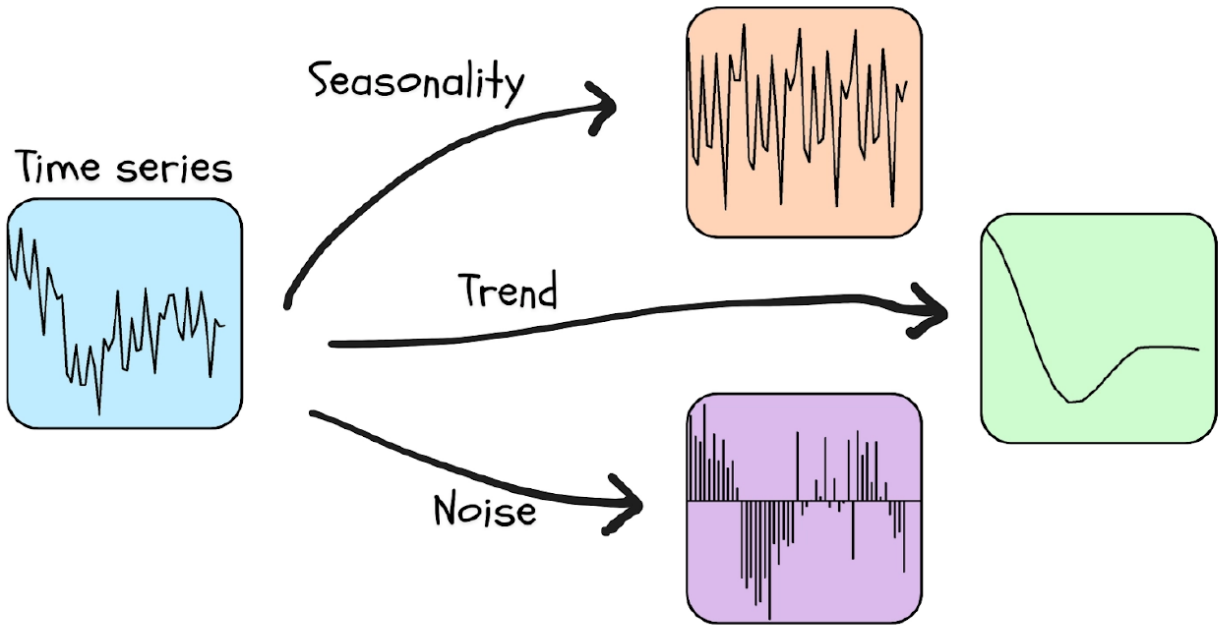
Time Series Concept

- Chronological data
- Dependency over time
- Used for forecasting



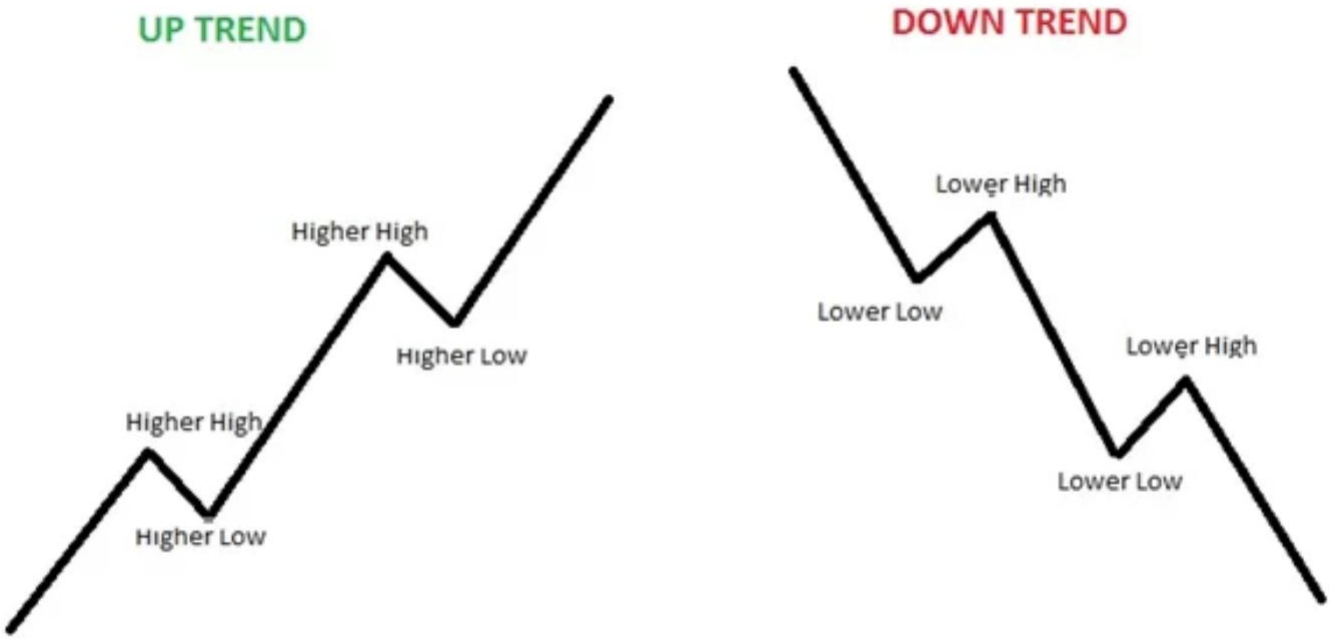
Time Series Patterns

- Trend
- Seasonality
- Noise
- Anomalies



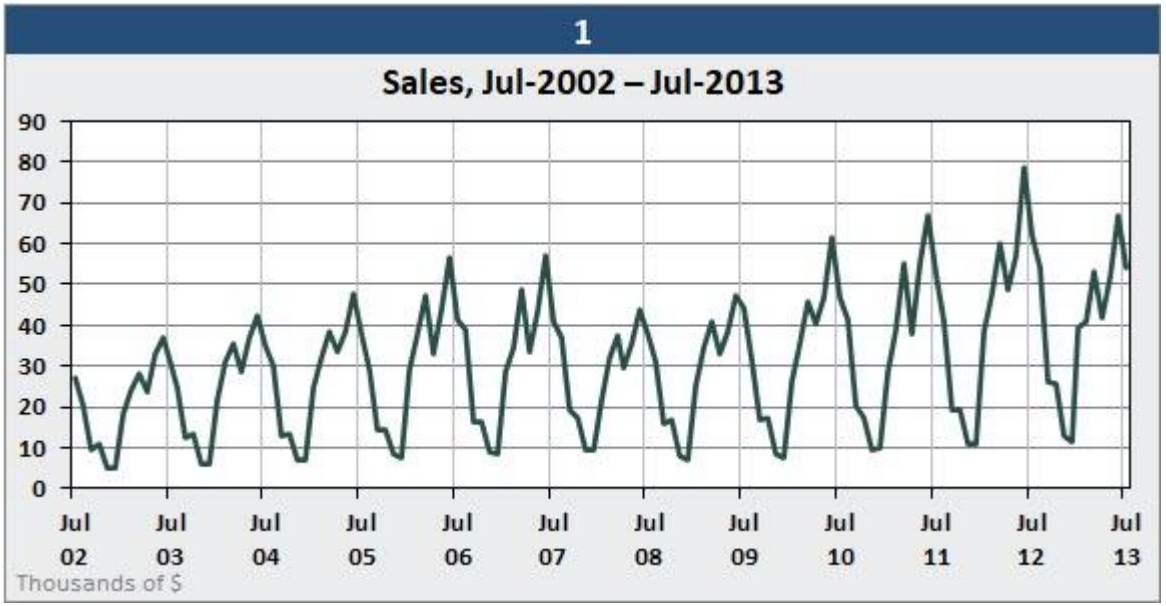
Trend Analysis

- Long-term direction
- Supports strategy



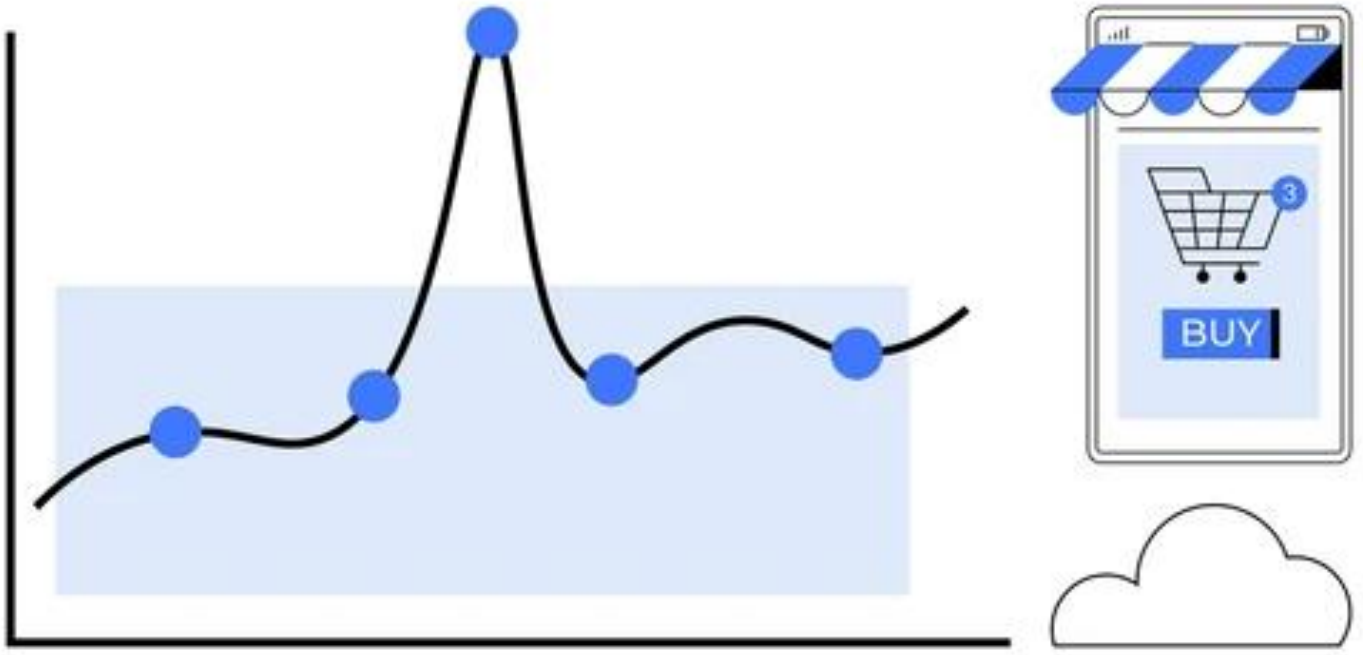
Seasonality

- Repeating patterns
- Important for forecasting



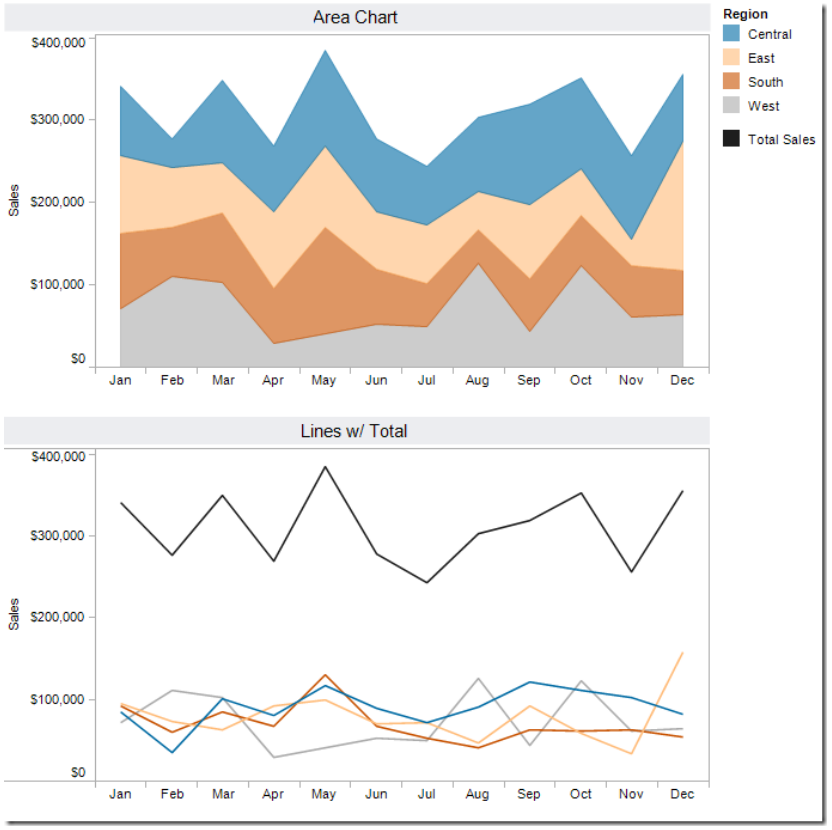
Anomaly Detection

- Unexpected spikes
- Risk or opportunity



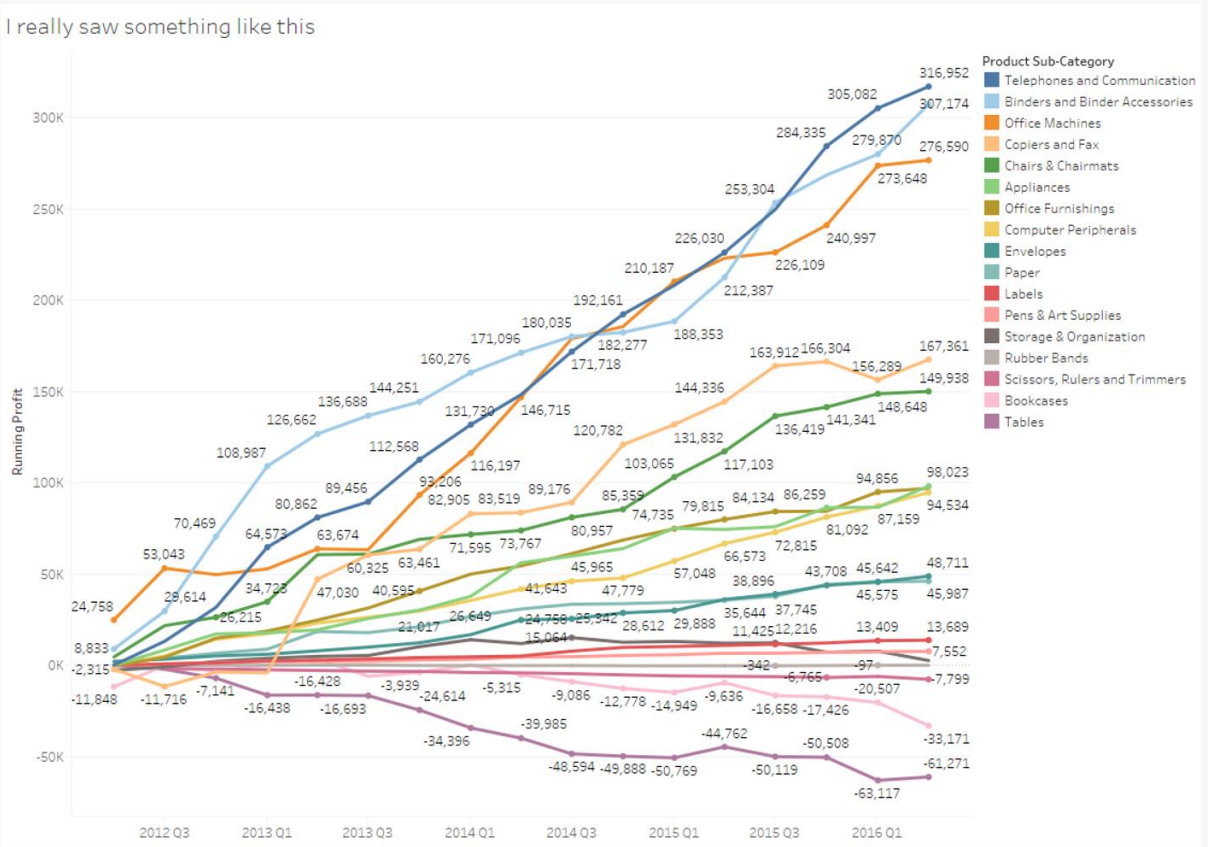
Time Series Techniques

- Line charts
- Area charts
- Moving averages



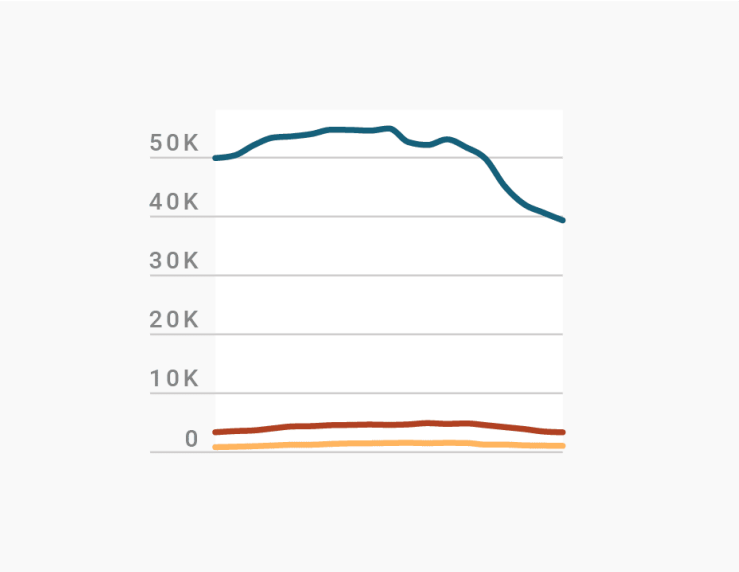
Overplotting Problem

- Too many lines
- Hard to read

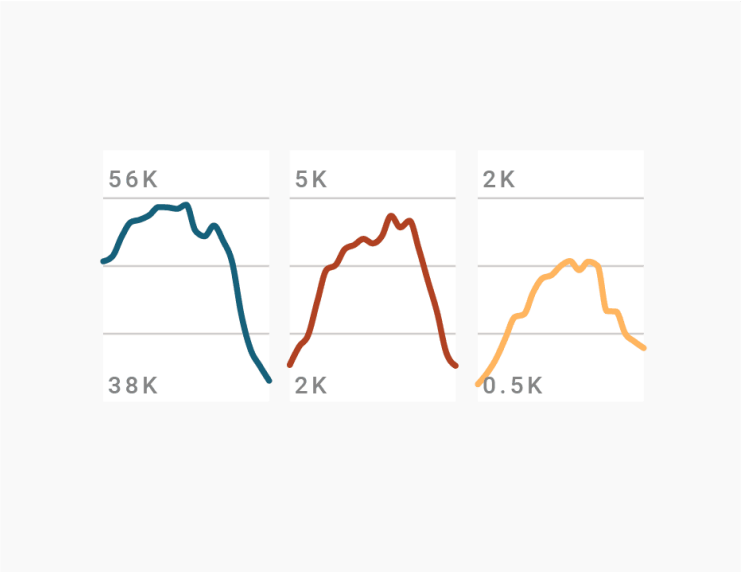


Solutions

- Filtering
- Highlighting
- Small multiples



GOOD

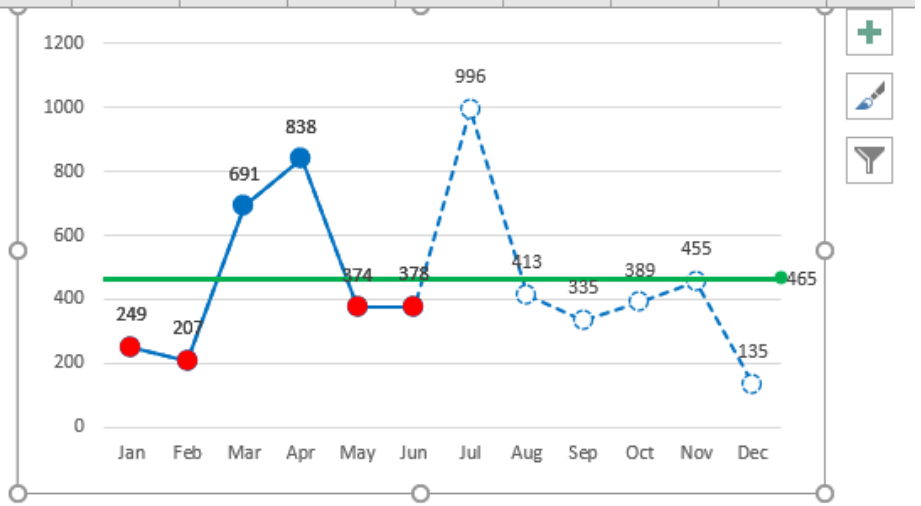


ALSO GOOD

Forecasting

- Built-in models
- No coding needed

	A	B	C
1	Month	Amount	Forecast
2	Jan	249	322
3	Feb	207	367
4	Mar	691	512
5	Apr	838	634
6	May	374	470
7	Jun	378	530
8	Jul		996
9	Aug		413
10	Sep		335
11	Oct		389
12	Nov		455
13	Dec		135
14			
15			



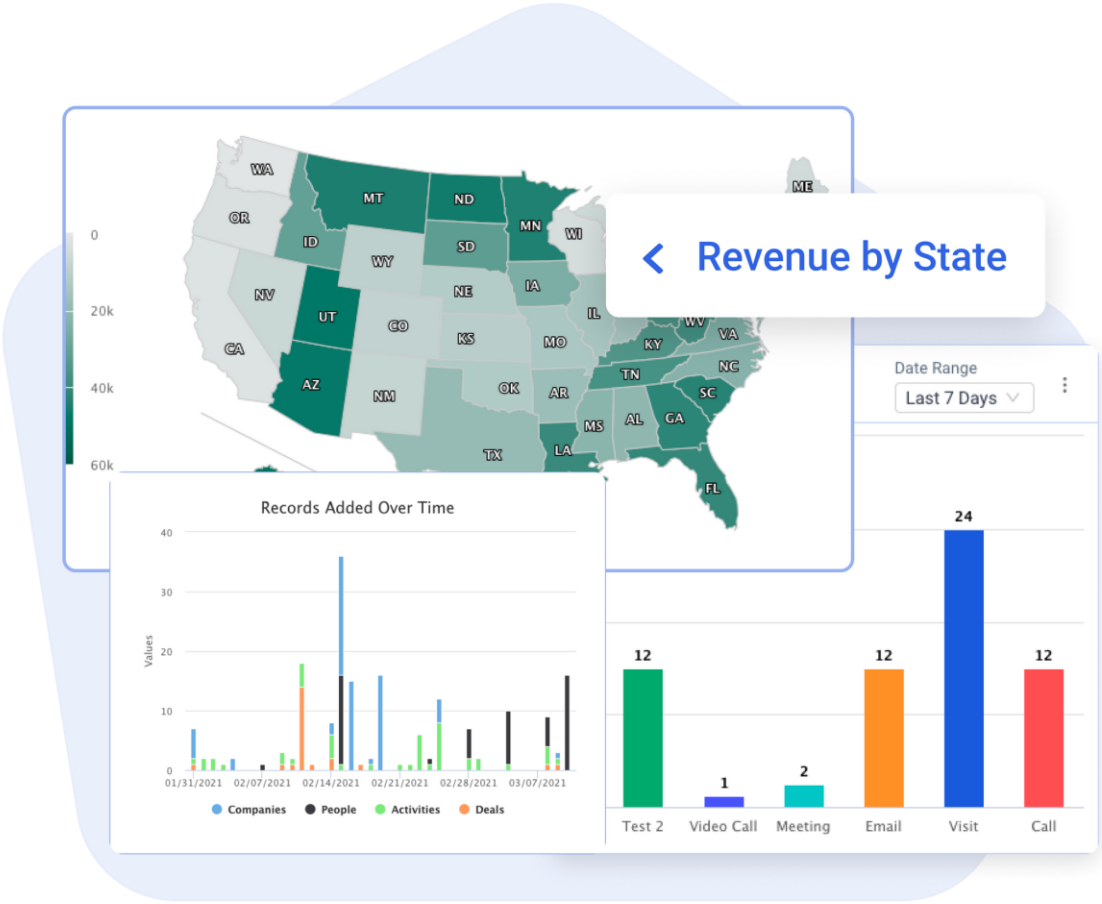
- Time series predicts future

Geospatial Concept

- Data + location

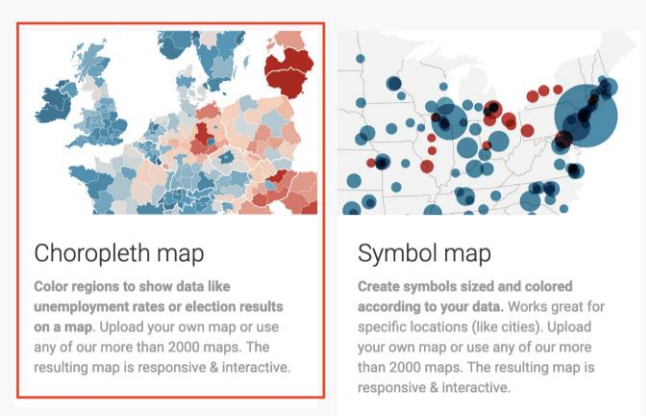
Importance

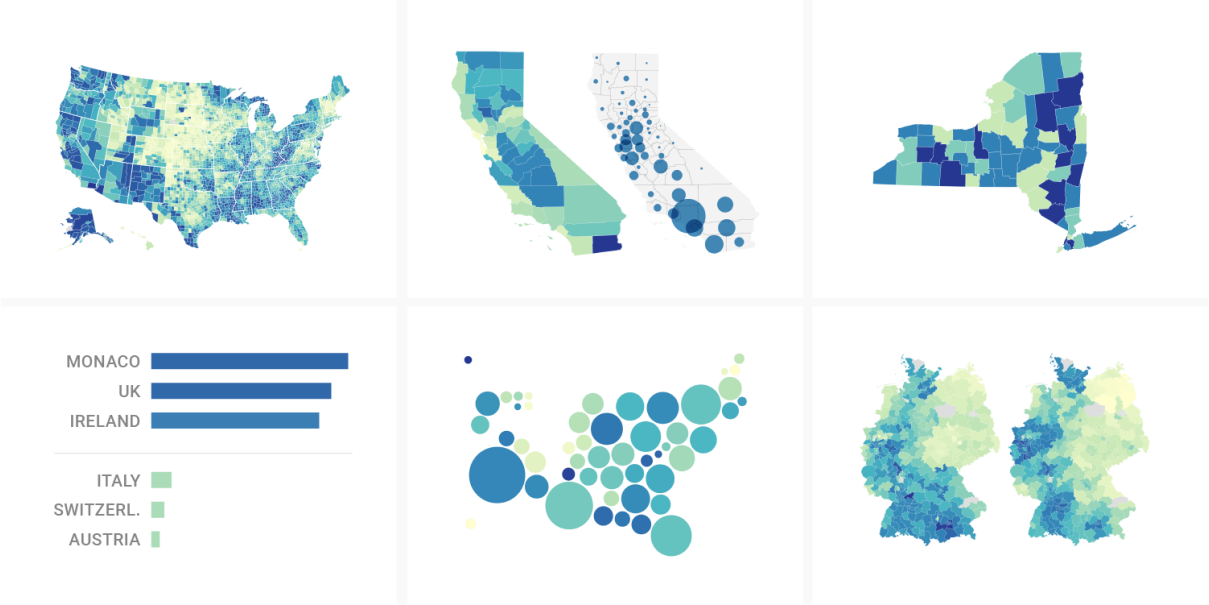
- Location impacts decisions



Map Types

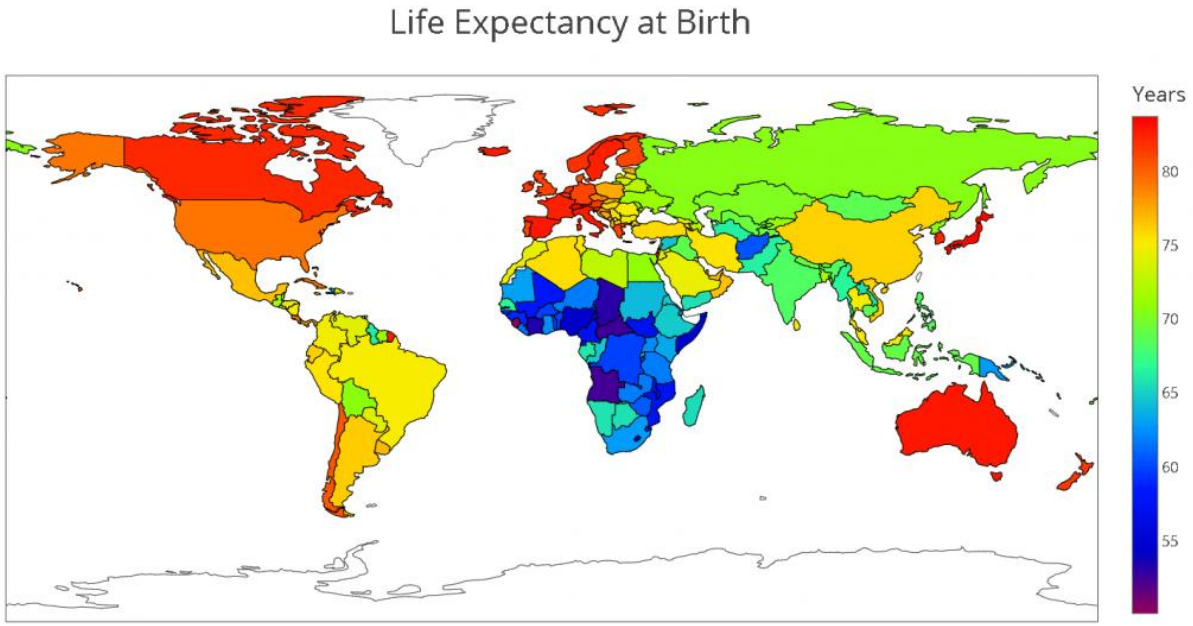
- Choropleth
- Bubble
- Heatmap





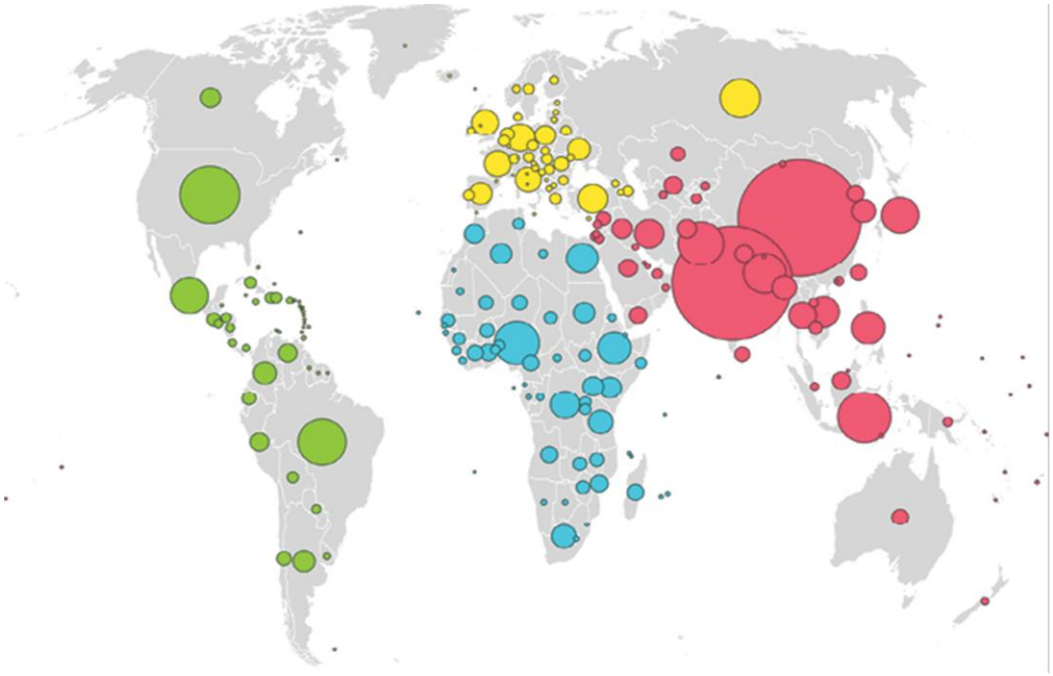
Choropleth Maps

- Color intensity
- Needs normalization



Bubble Maps

- Size represents value

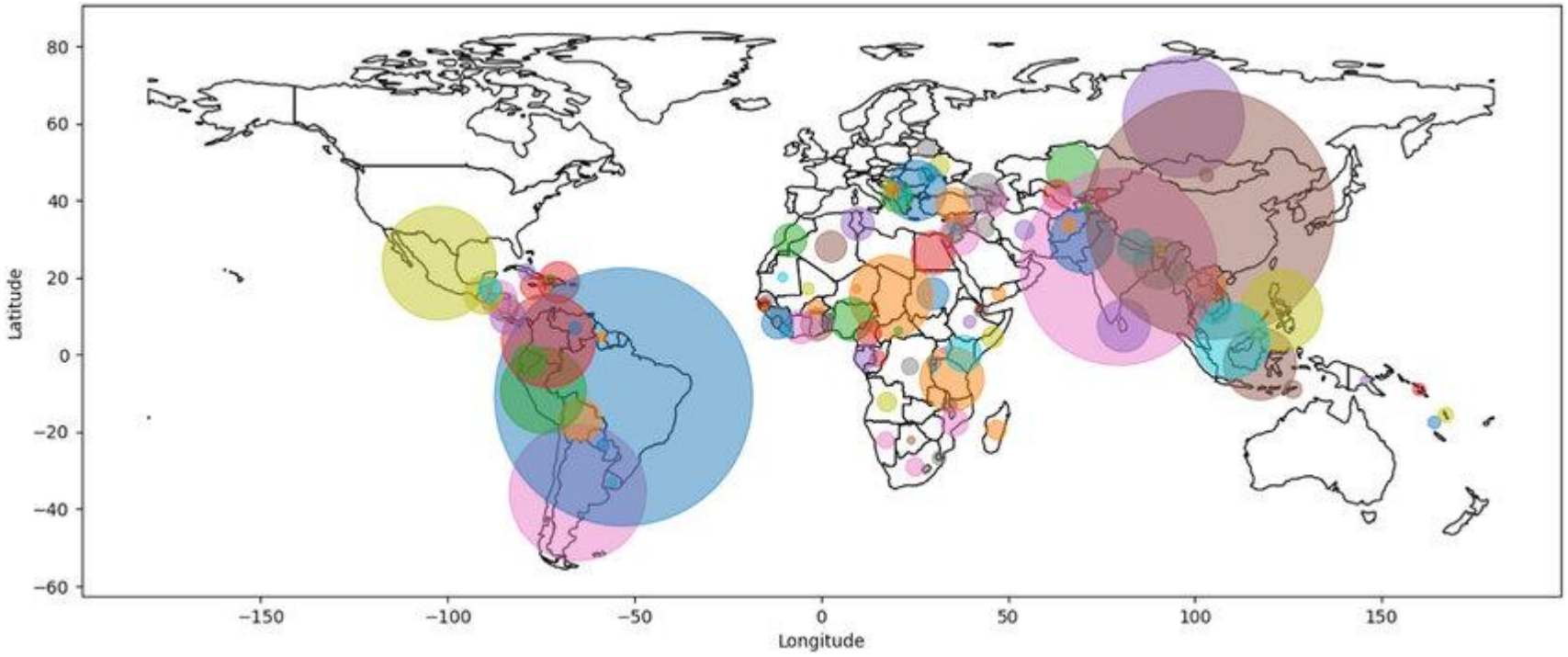


Business Use Cases

- Sales
- Risk
- Logistics

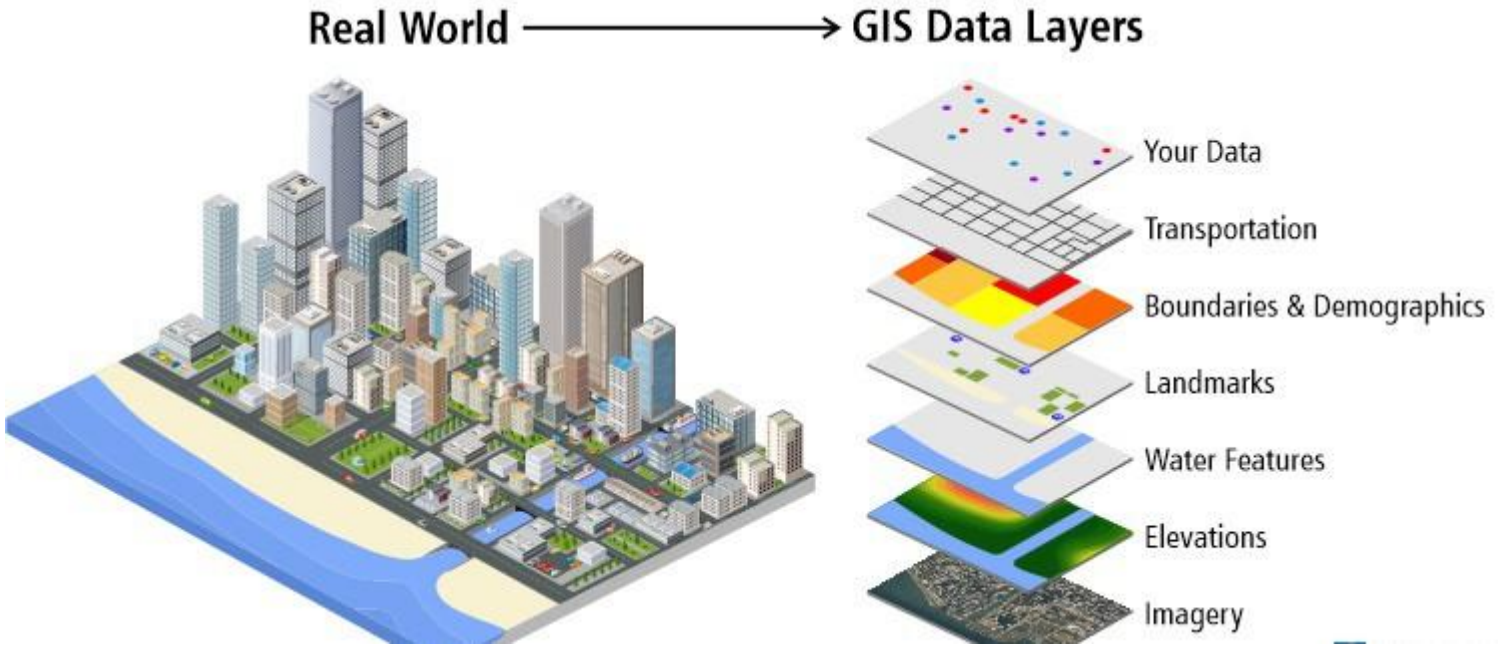
Pitfalls

- Misleading visuals
- Scale issues



Advanced Mapping

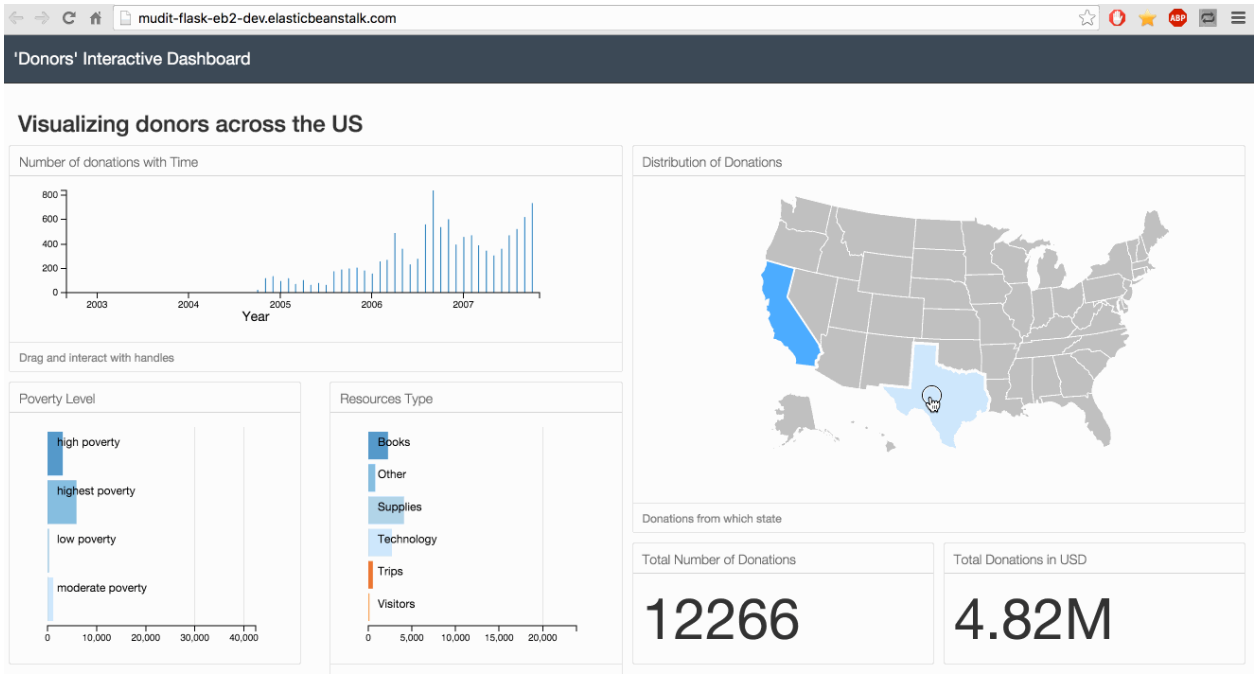
- Layers
- GIS integration



Interactivity

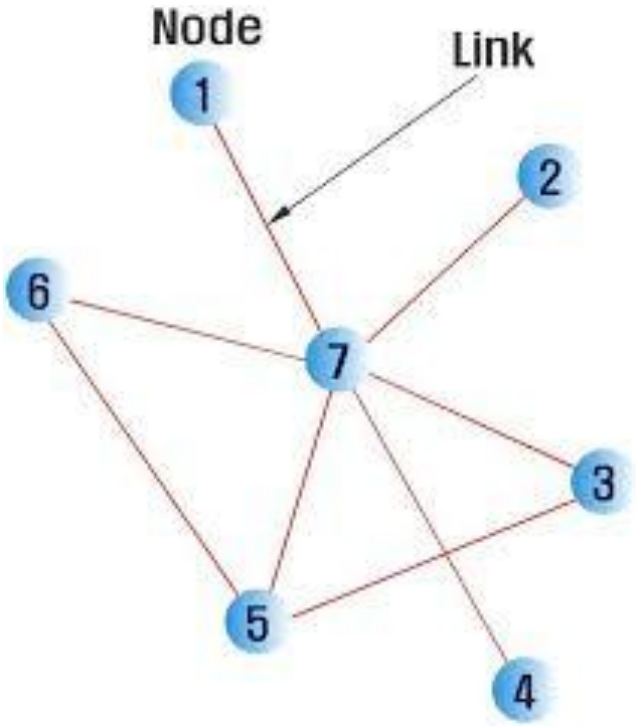
- Zoom
- Tooltips

Maps show WHERE, not WHY



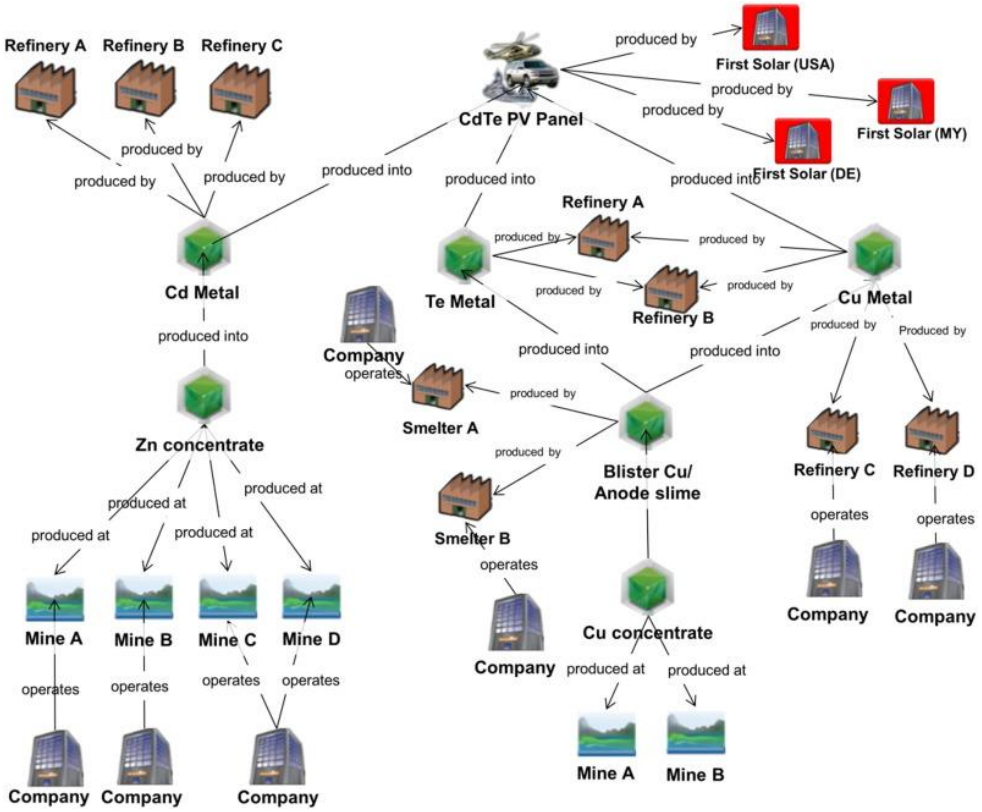
Network Concept

- Nodes represent entities and edges represent connections between them



Use Cases

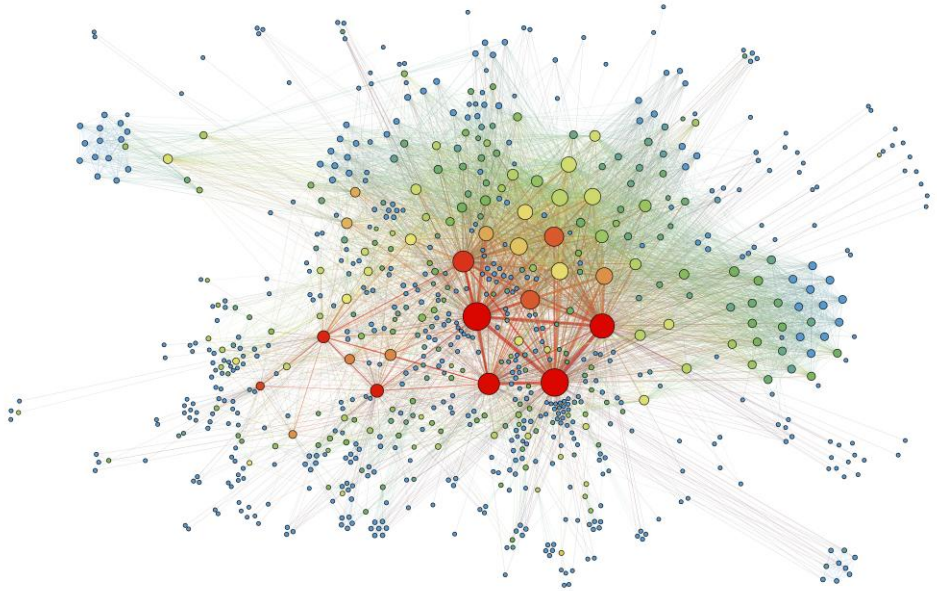
- Social networks
- Fraud



Hairball Problem

Large networks often:

- become unreadable
- Too complex

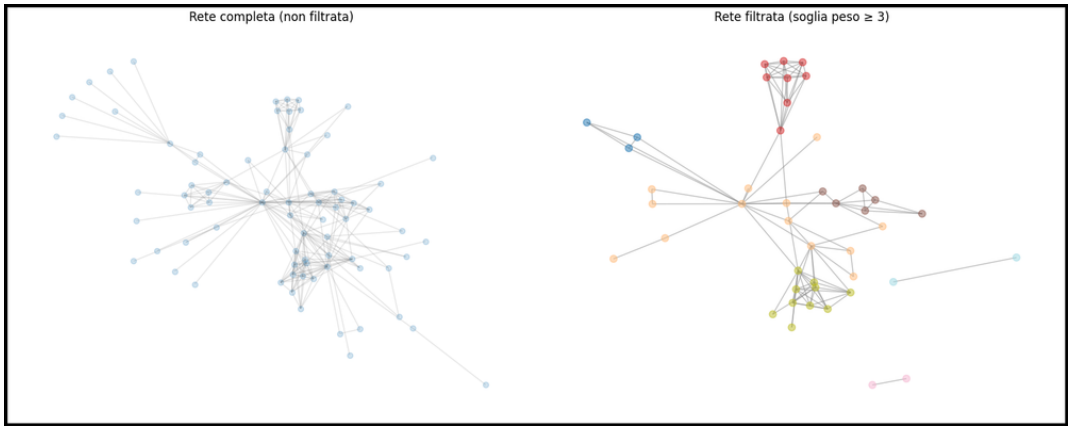


Constraints

- Screen
- Brain

Solutions

- Filtering
- Clustering

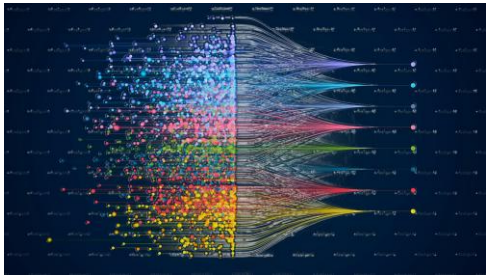


Networks are exploratory

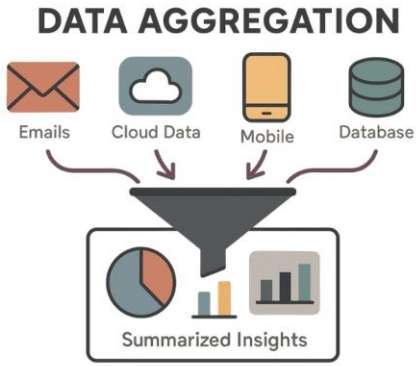
- Large datasets cannot be visualized directly in raw form

Big Data Problem

- Never visualize raw data



- Use **Techniques**
  - Aggregation
  - Sampling



Real-Time

Real-time dashboards update continuously as new data arrives. They are used for live monitoring and operational awareness.

- Finance
- IoT
- Industry

Speed vs accuracy:

In real-time analytics, speed often comes at the cost of precision. Good systems balance responsiveness with reliability.

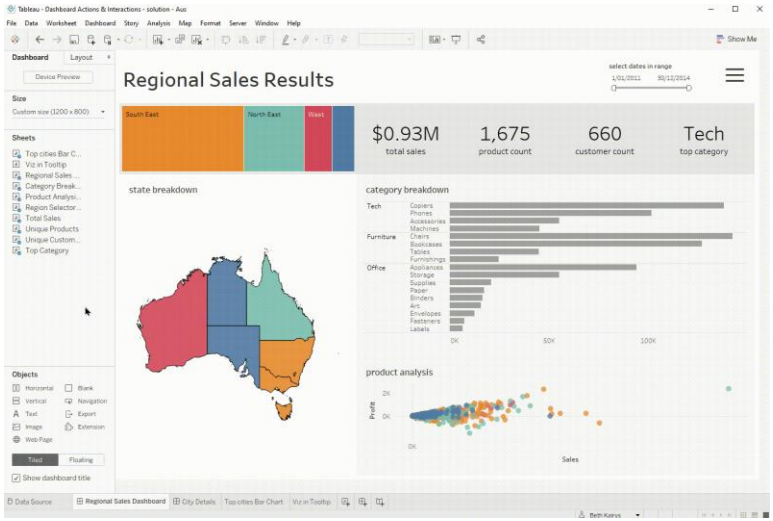
Advanced Features

- Static charts → Interactive dashboards
- Dashboards → AI-assisted analytics
- Tools support faster insight generation

Tools support thinking — they don't replace it

Tableau & Power BI Capabilities (What Matters)

- Natural language queries (Ask / Q&A)
- Built-in analytics (forecasting, trends)
- Interactive dashboards (filters, drill-down)
- Visual exploration of data



Key Insight

- Tools do not create insights
- Analysts create insights
- Tools only accelerate analysis

Tableau and Power BI don’t make decisions

👉 You do

Hands-on Lab

- Build a geospatial dashboard
- Add interaction (filters / drill-down)
- Combine map + supporting visual
- Extract one clear business insight