



Taming the beast of big data

Translating massive, fast-moving
datasets into actionable clarity.

Raw rows and columns are impossible to comprehend at scale

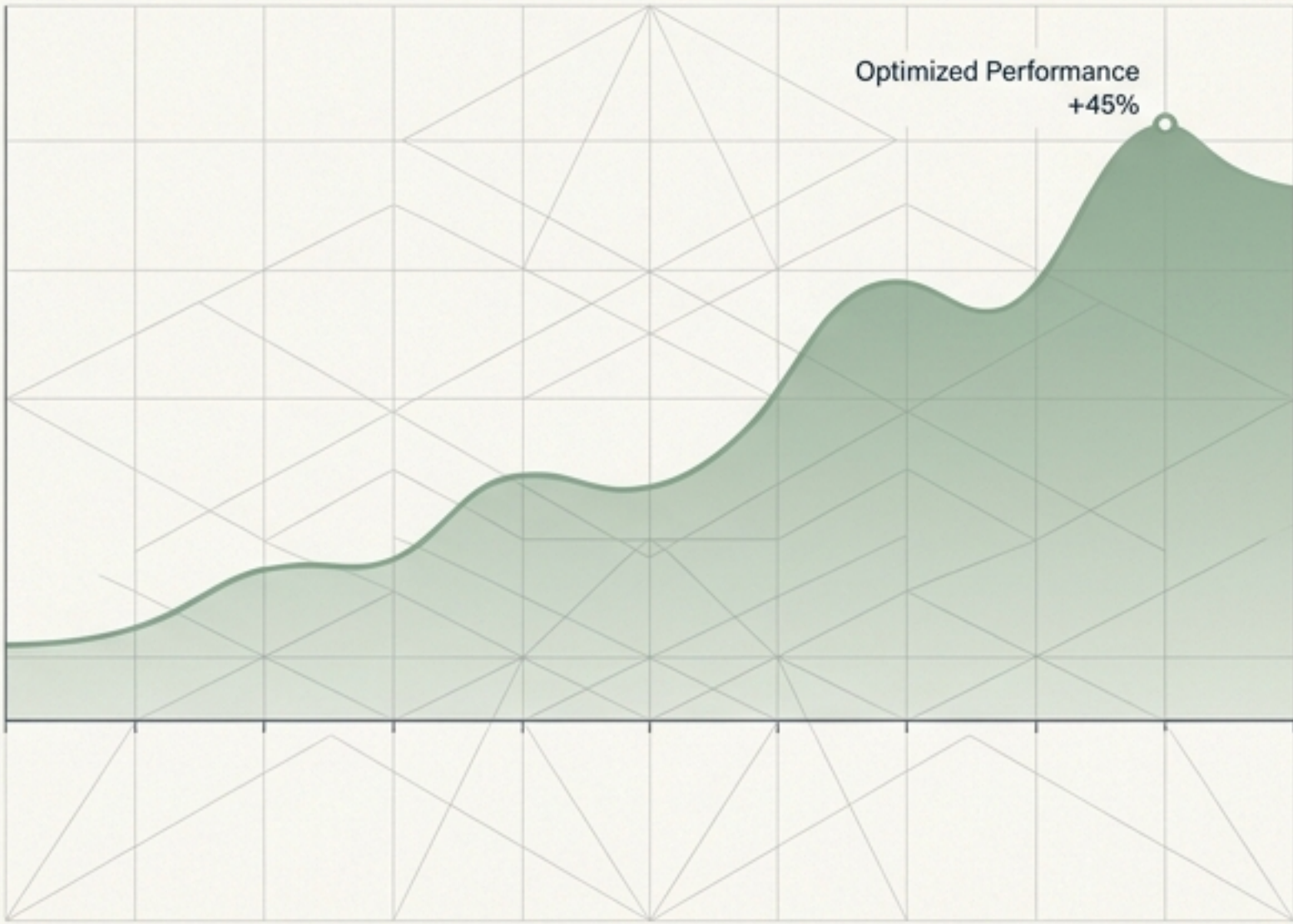
Standard visualization rules collapse under the weight of modern data. Translating this noise into graphical representations is the only way human operators can understand and act upon the information.



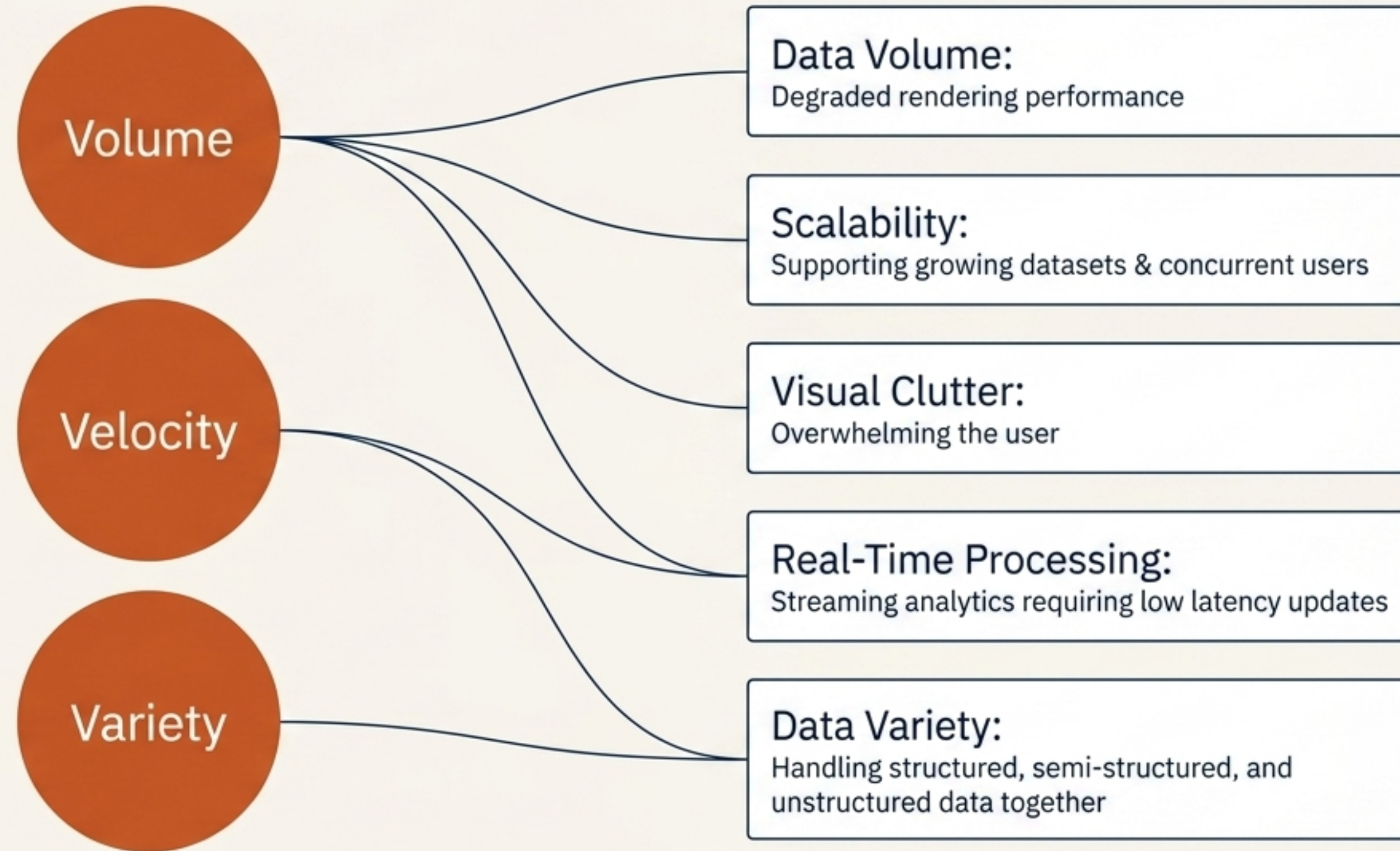
The Reality

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45.134.221.9 - [23/Oct/2024:10:15:32 +0000] "GET /api/v2/data HTTP/1.1" 200 1234
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The Solution



The friction of big data causes traditional systems to fail

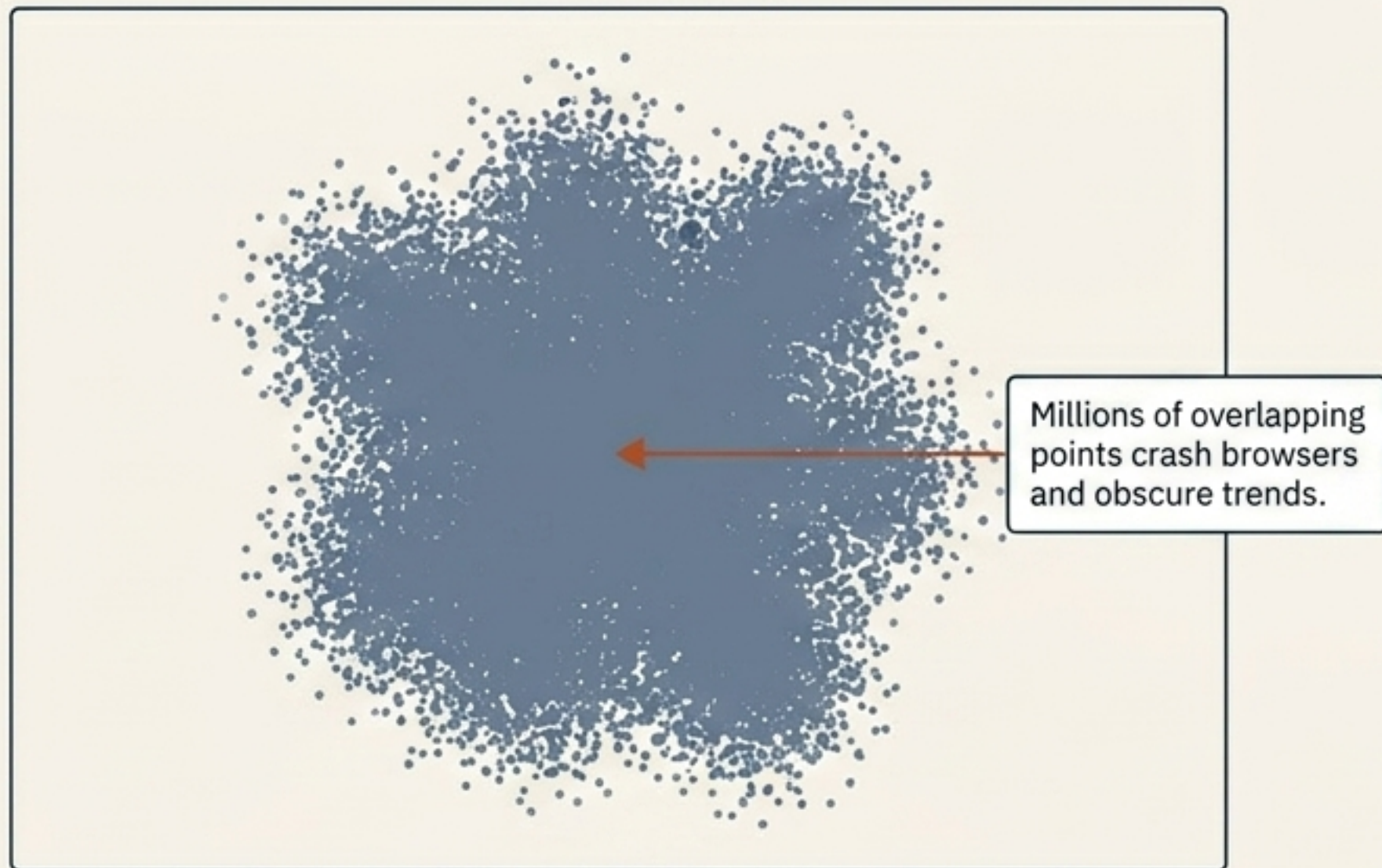


Aggregation prevents browsers from freezing under massive volume

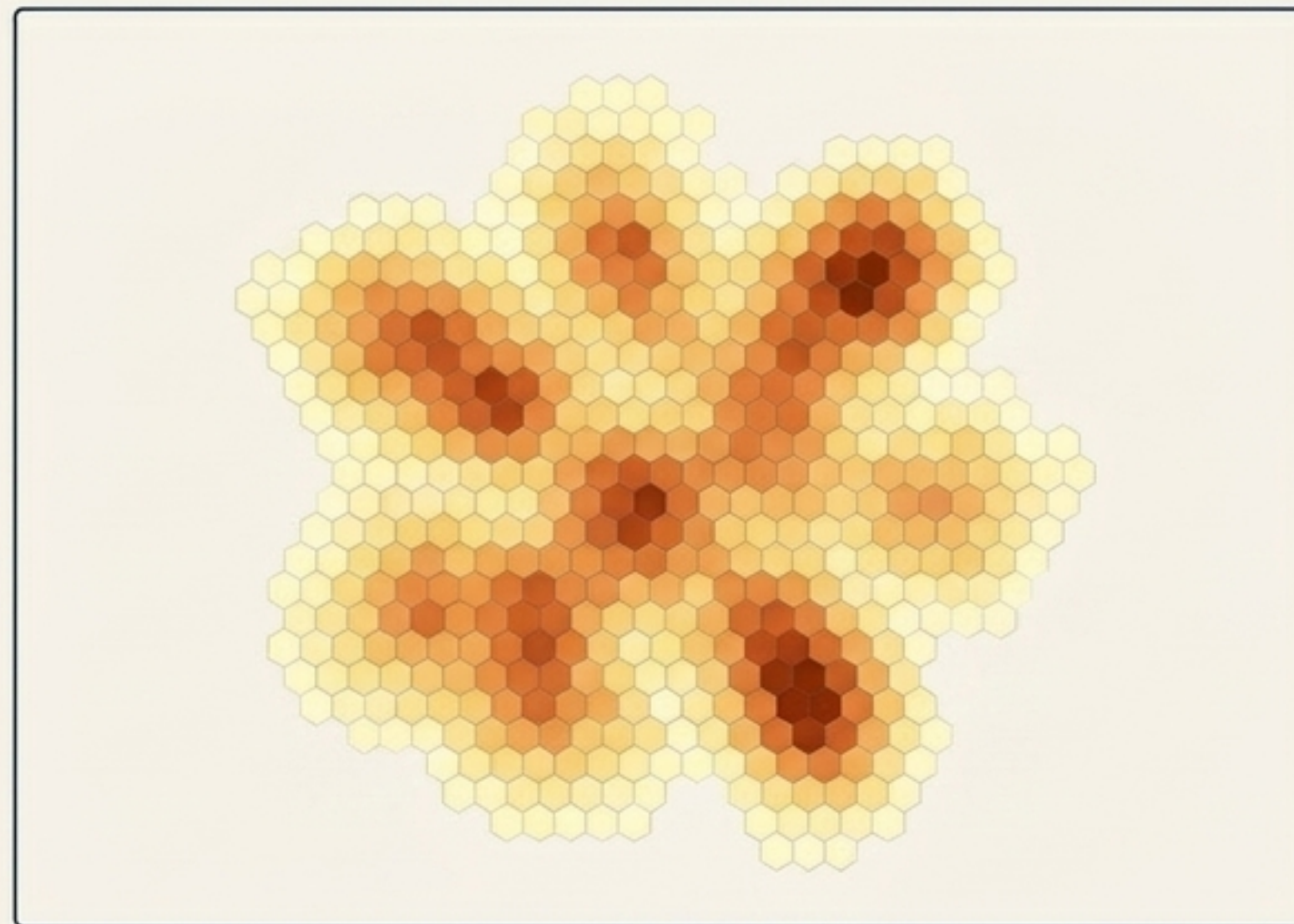
Big data visualization relies on data aggregation—such as binning and clustering—calculated before rendering. Color density replaces individual data points.



Standard Charts Fail

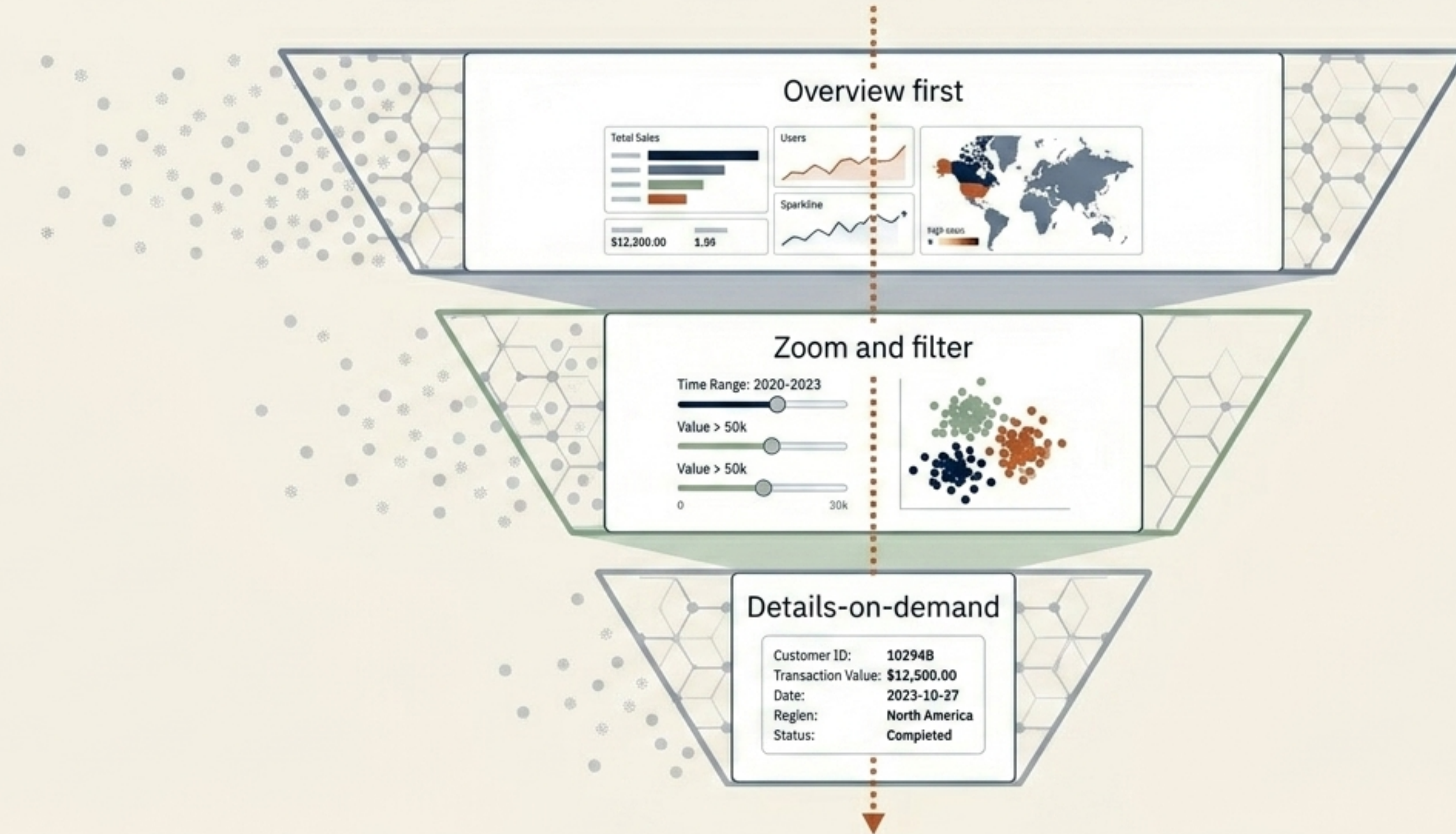


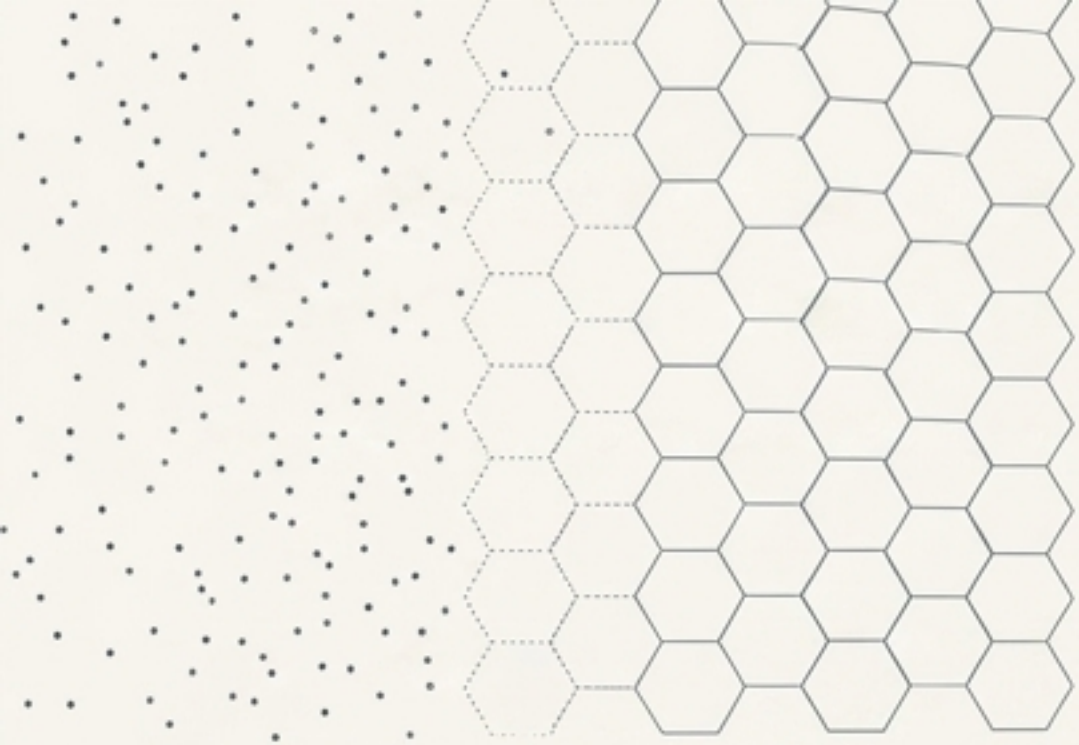
Hexbin Grid



Navigating massive datasets requires a strict interaction hierarchy

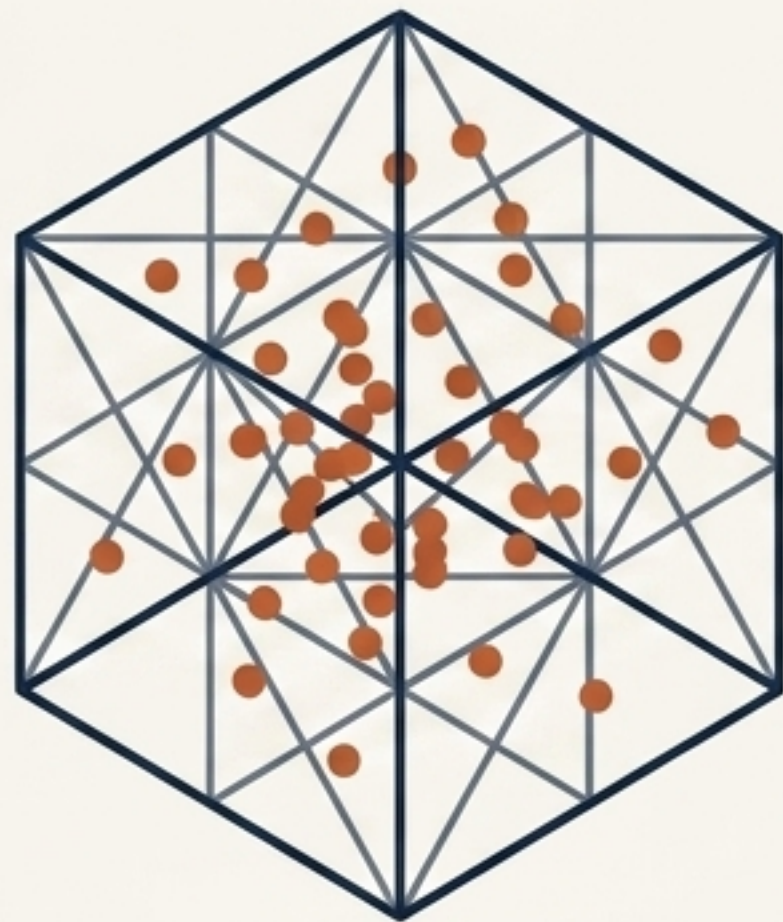
Overview first, zoom and filter, then details-on-demand. – Ben Shneiderman



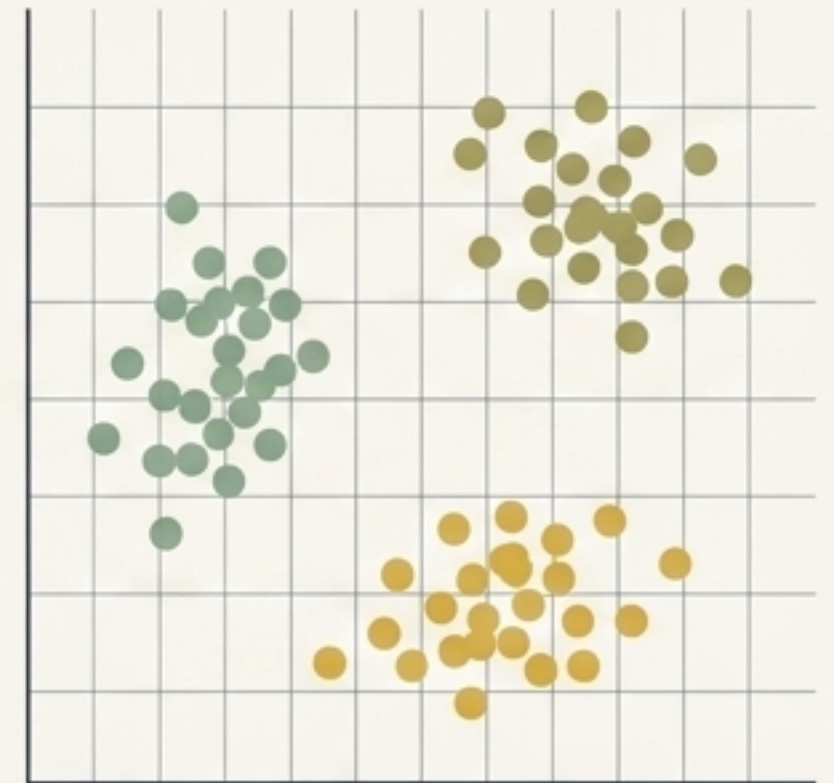
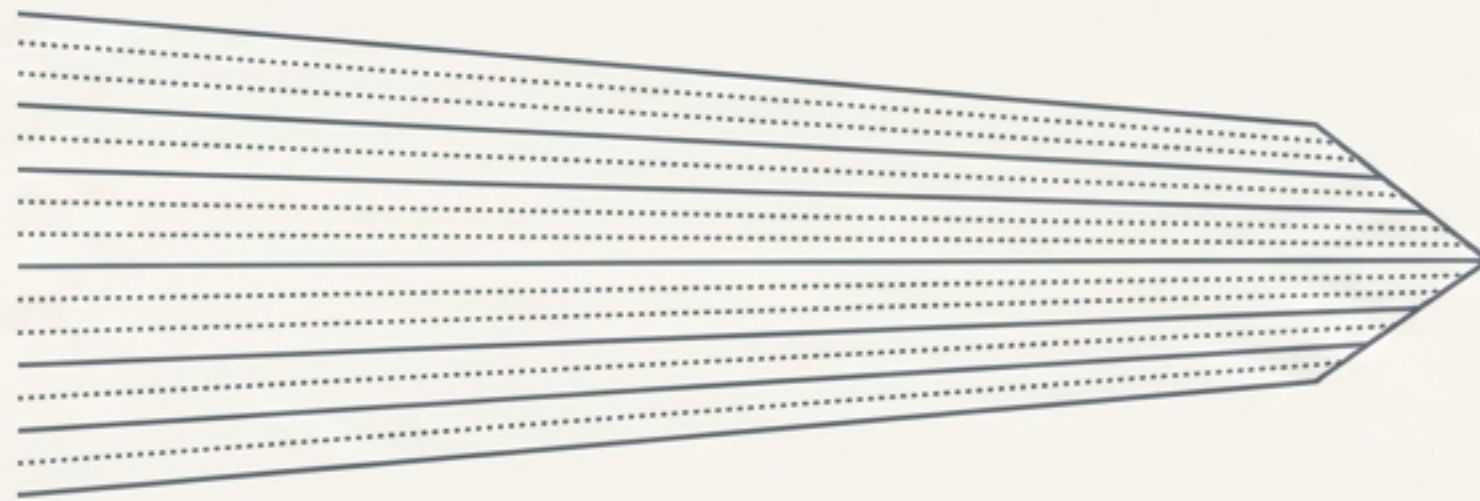


Projecting high dimensionality into readable physical spaces

When datasets include dozens of variables, concepts like dimensional reduction or parallel coordinates project complex multi-dimensional data into a flat, readable 2D or 3D space.



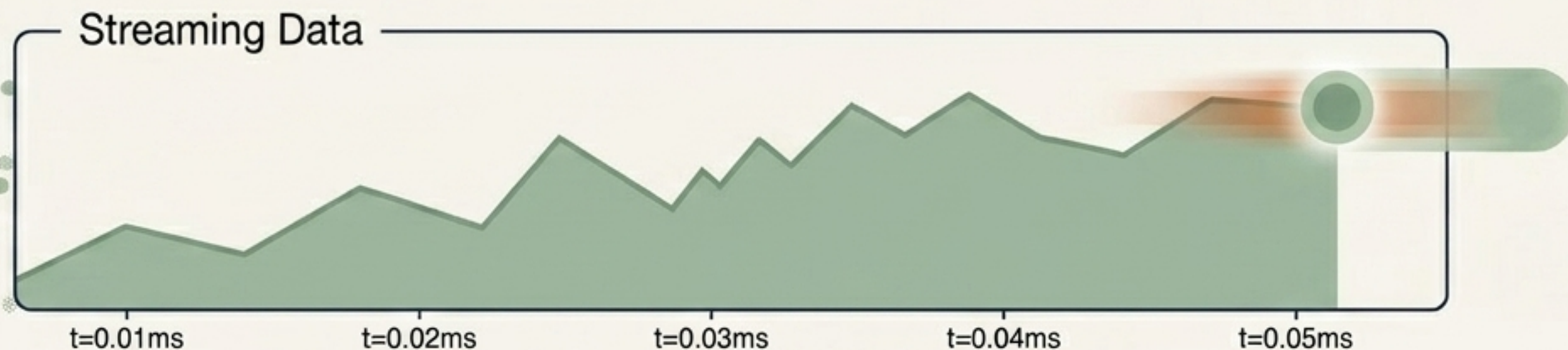
Dozens of Variables
(High Dimensionality)



Flattened 2D Projection

Velocity demands dynamic, low-latency visualization

High-speed data arrivals require visualizations that update dynamically without dropping frames. This is essential for live stock market feeds and IoT sensor dashboards.

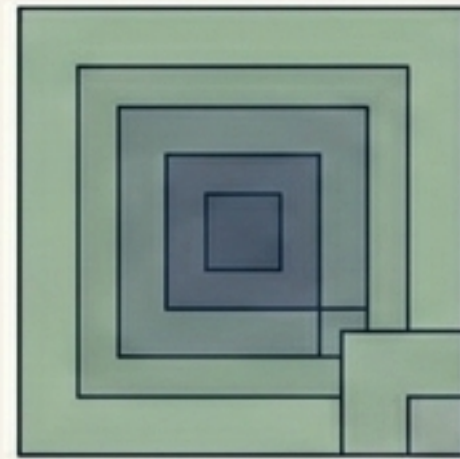


Mapping specific visual techniques to underlying data structures

Specialized visual techniques are required to make distinct mathematical trends visible to the human eye.

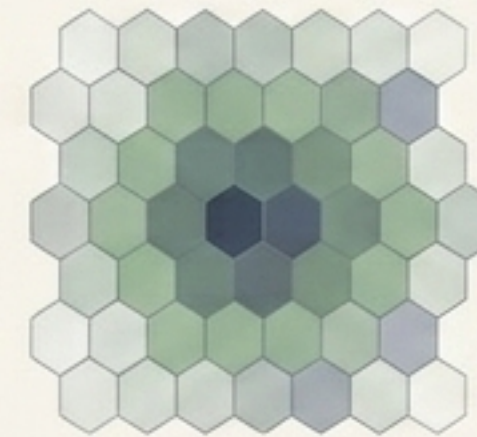
Hierarchy & Proportion

Treemaps & Circle Packing



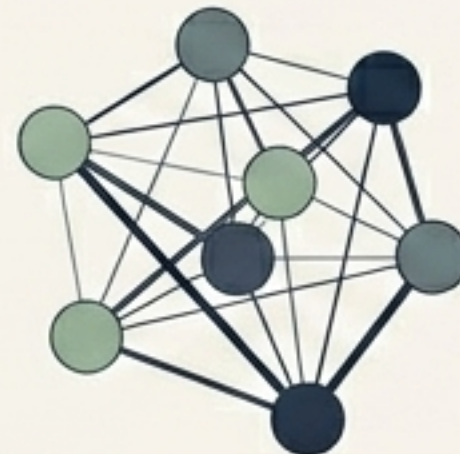
Density & Concentration

Heatmaps & Hexbins



Relationships

Network Graphs



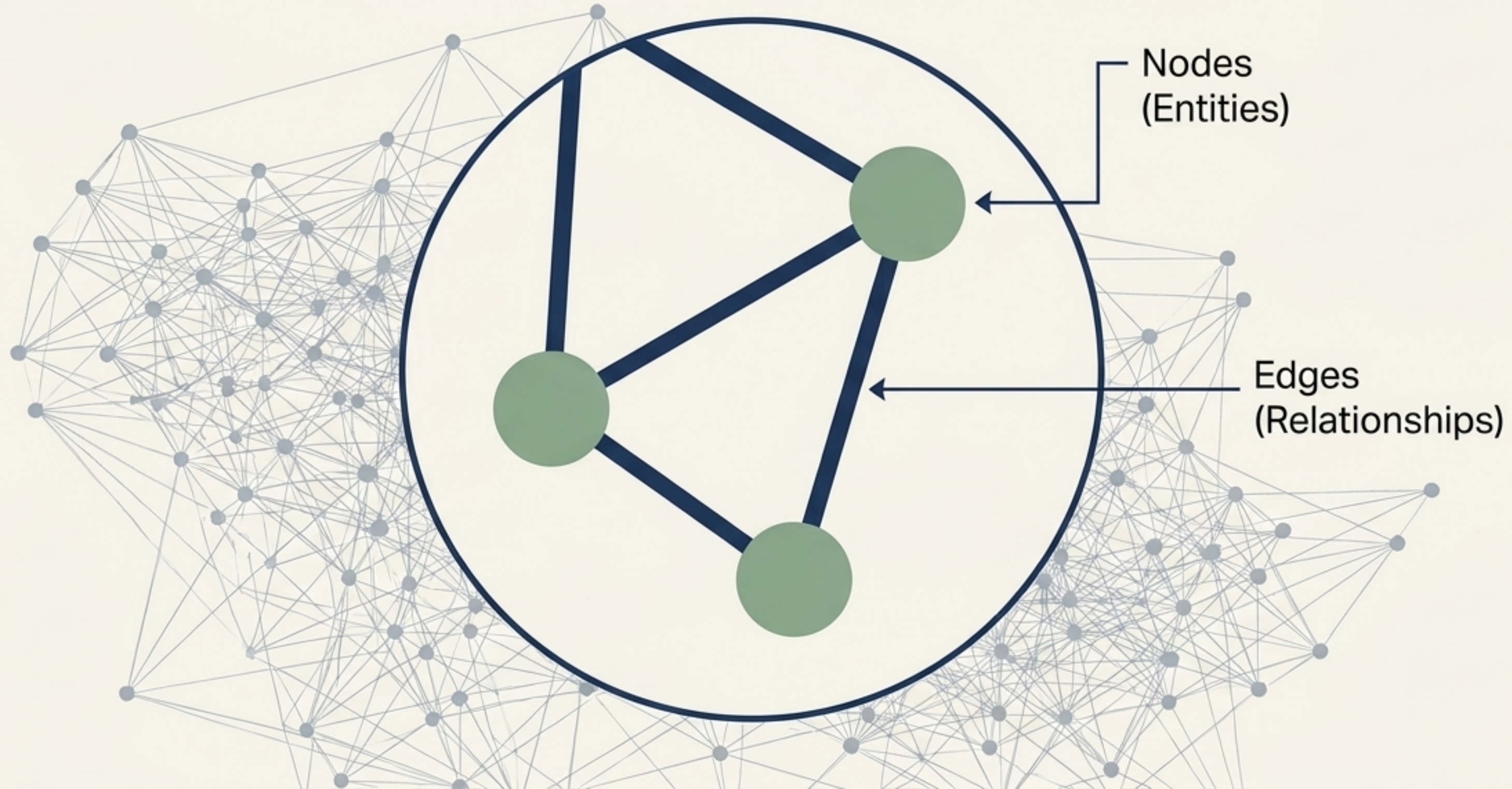
Unstructured Text

Word Clouds & Text Networks



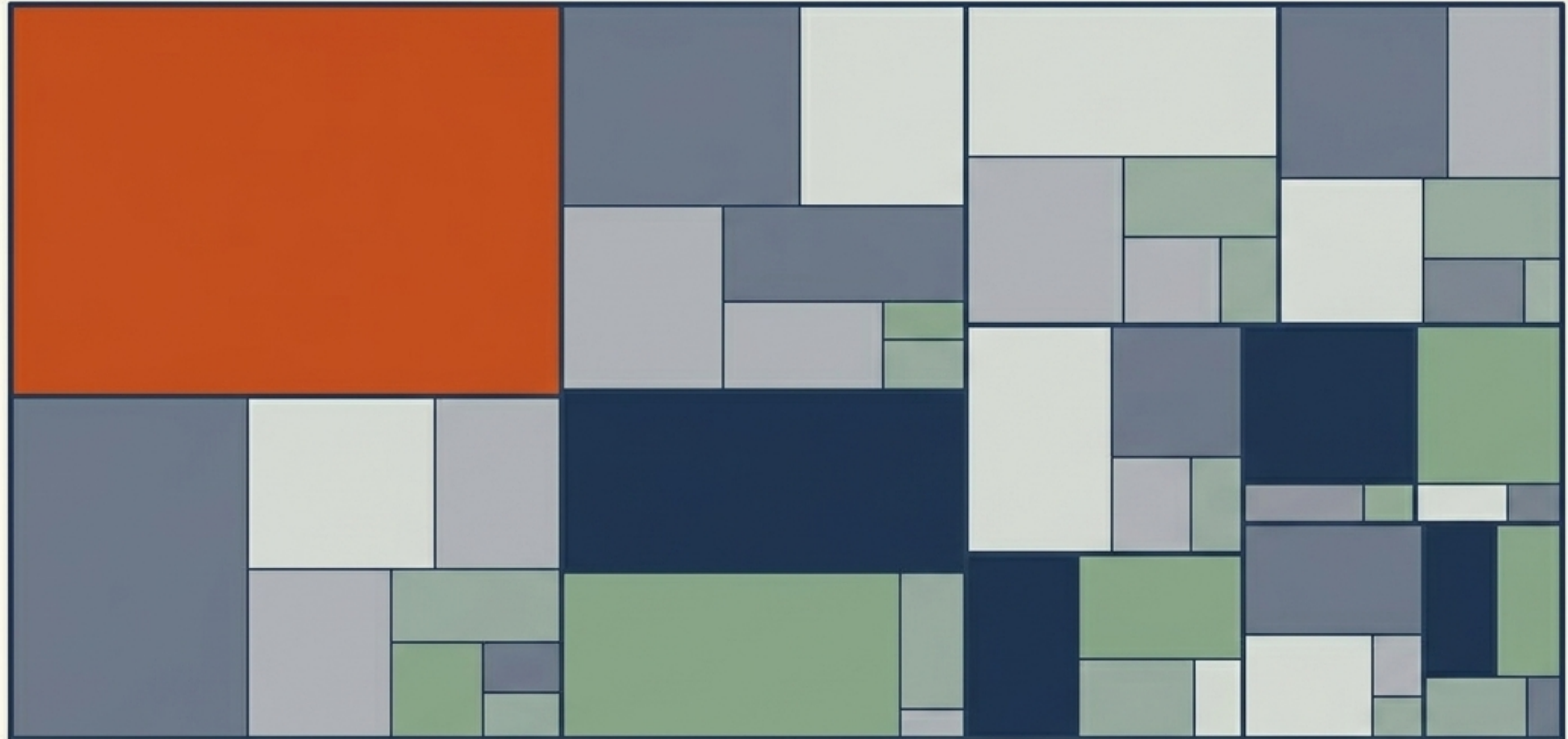
Uncovering hidden relationships through network graphing

Essential for mapping interconnections. It reveals hidden structures in social media connections, supply chain logistics, and fraud detection networks.



Visualizing hierarchy and proportion at a single glance

Treemaps and circle packing use nested shapes to display hierarchical big data. By tying physical size to data proportion, it becomes instantly obvious which categories dominate the dataset without reading a single number.



The big data visualization tool ecosystem

	Enterprise BI Tools	Open-Source Ecosystems	Developer Frameworks
Best For	Business users	Ecosystem operators	Data scientists & developers
Core Capability	Drag-and-drop interactive dashboards	Direct cluster visualization	Code-based custom tailoring
Primary Use Case	Connecting to big data warehouses	Massive log files, time-series, streaming IoT	Highly interactive web-based graphics
Example Tools	Tableau, Power BI, QlikSense, Snowflake, BigQuery	Apache Superset, Kibana (Elasticsearch), Grafana	D3.js, Plotly, Bokeh (Python)

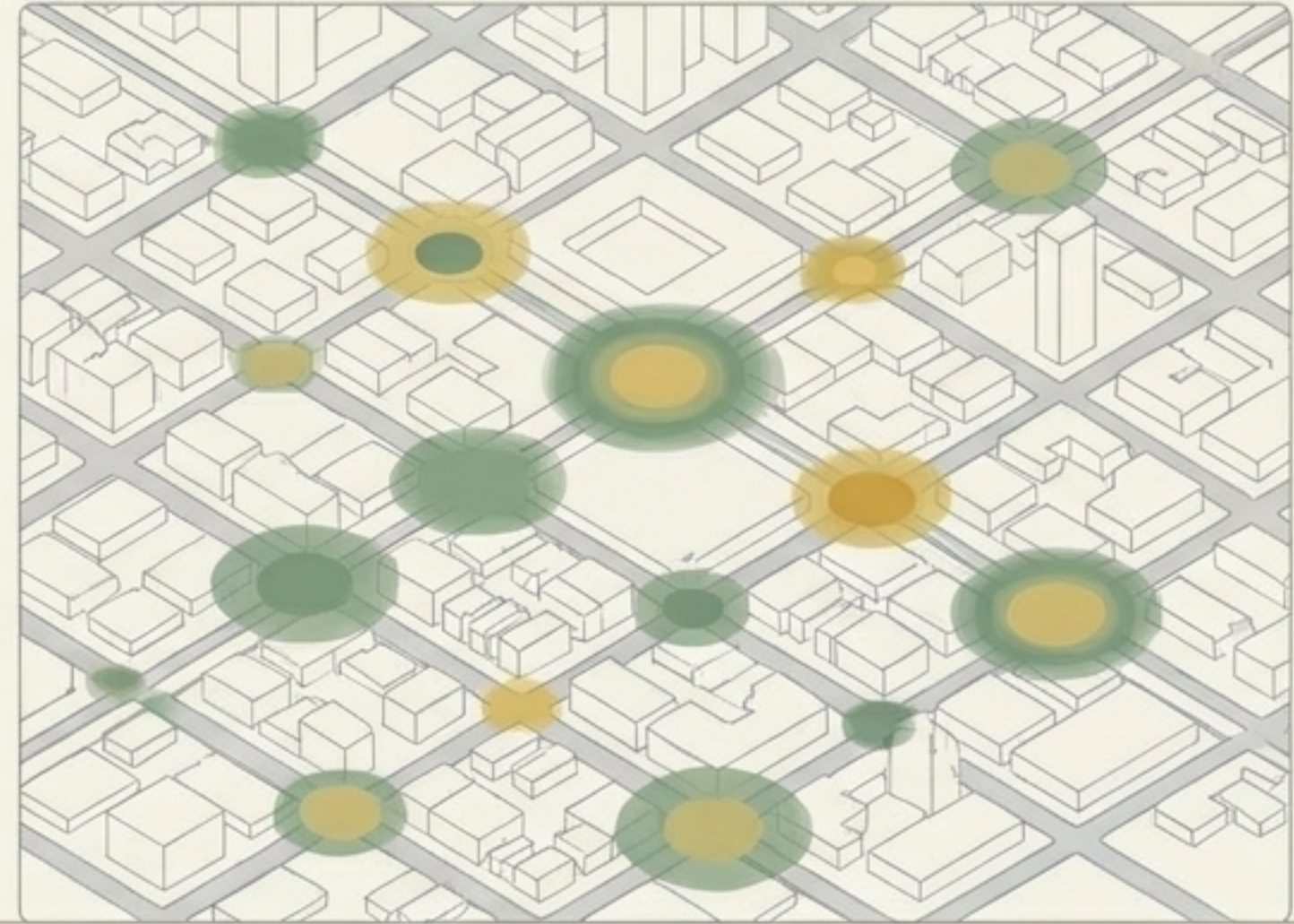
Deploying visualization to govern complex systems

Finance & Fraud Detection



Visualizing transaction flows among millions of accounts makes money laundering clusters instantly obvious.

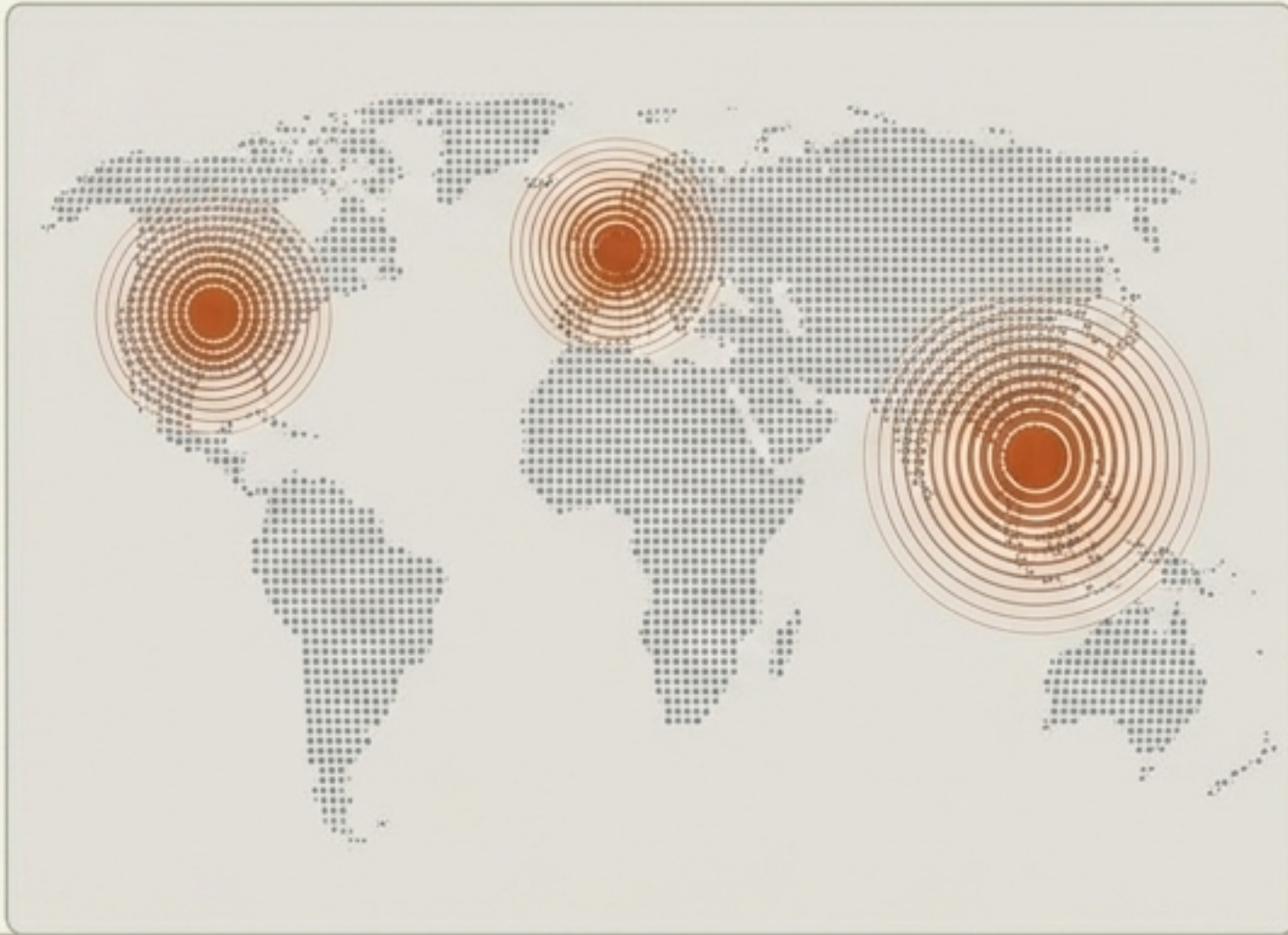
Smart Cities & IoT



Urban planners monitor traffic congestion, transit efficiency, and power grid consumption using millions of live sensors.

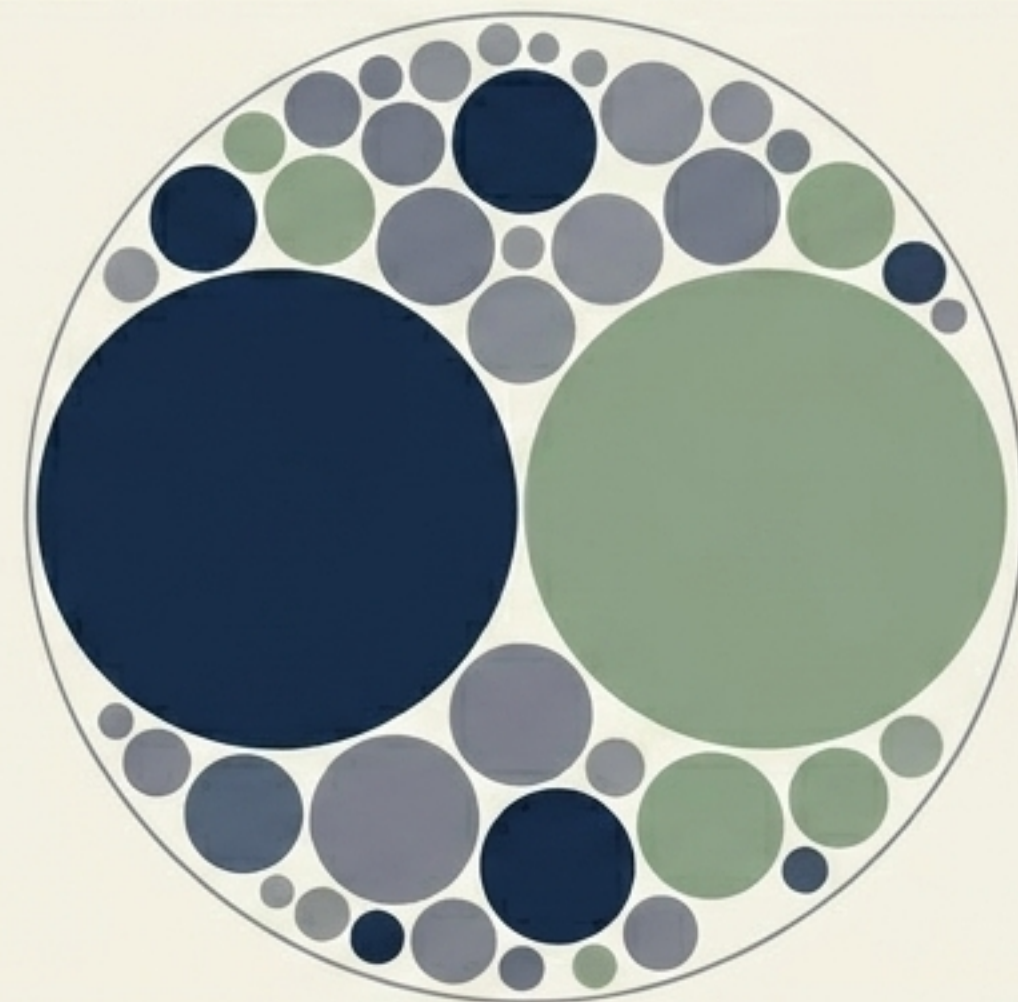
Deploying visualization to track human behavior at scale

Healthcare & Epidemiology



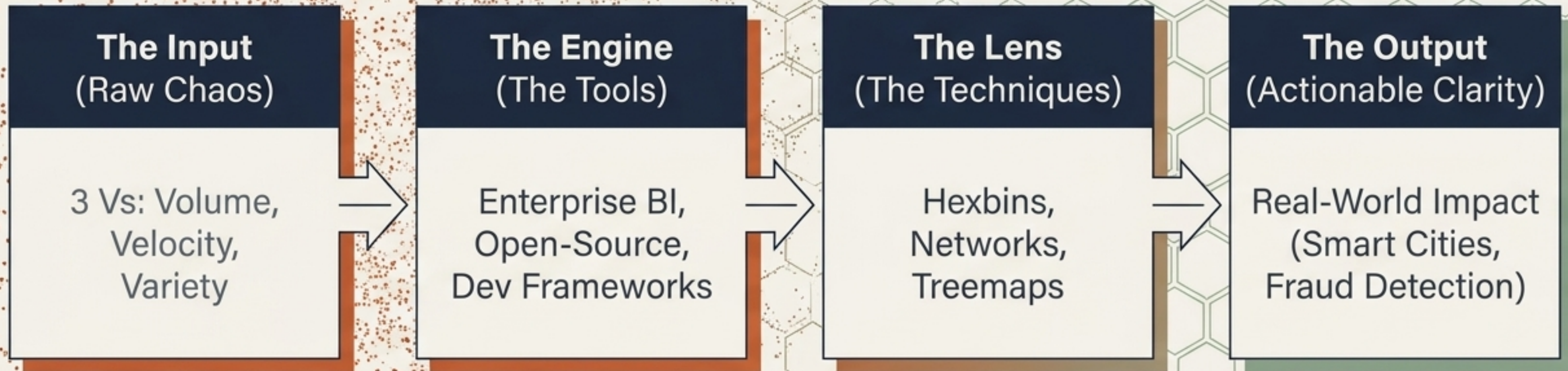
Tracking global health crises and virus outbreaks in real-time by analyzing billions of anonymized records and travel data.

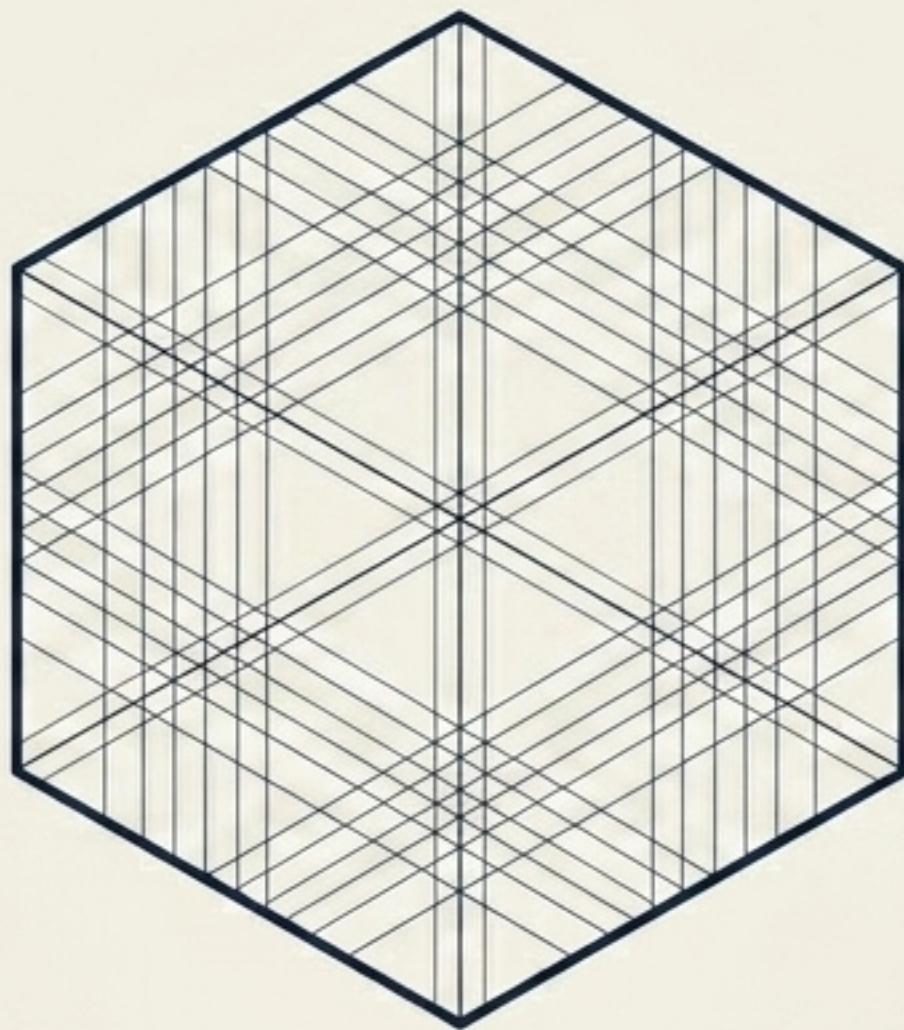
E-Commerce & Retail



Tracking inventory demand, monitoring supply chains, and visualizing real-time purchasing behavior across millions of simultaneous users.

The big data visualization blueprint





**Data holds no value until
it can be understood.**

Visualization is the critical translation layer between
machine-scale execution and human-scale insight.