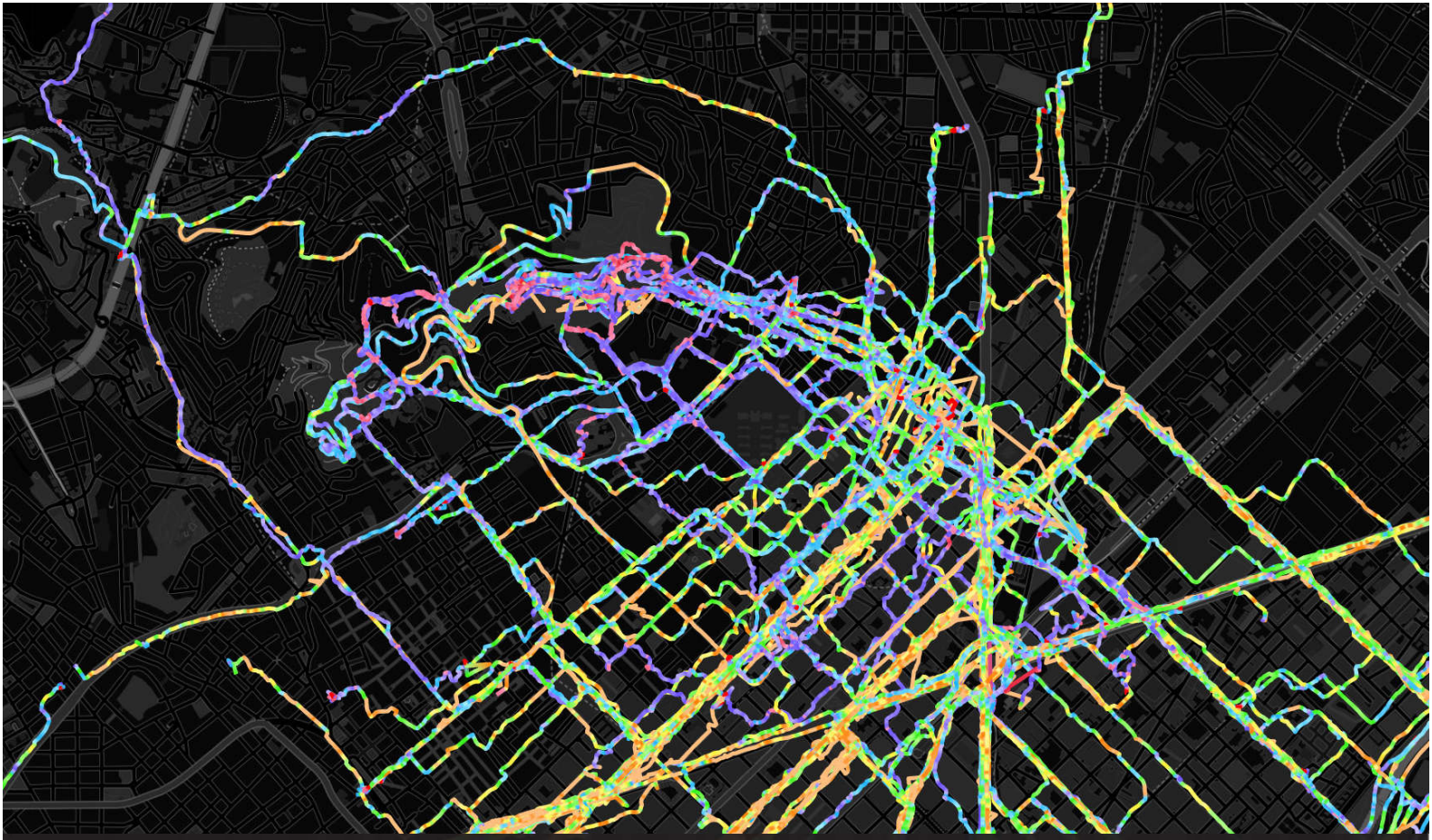


Multiparadigm Data Science

With the Power of the Wolfram Language

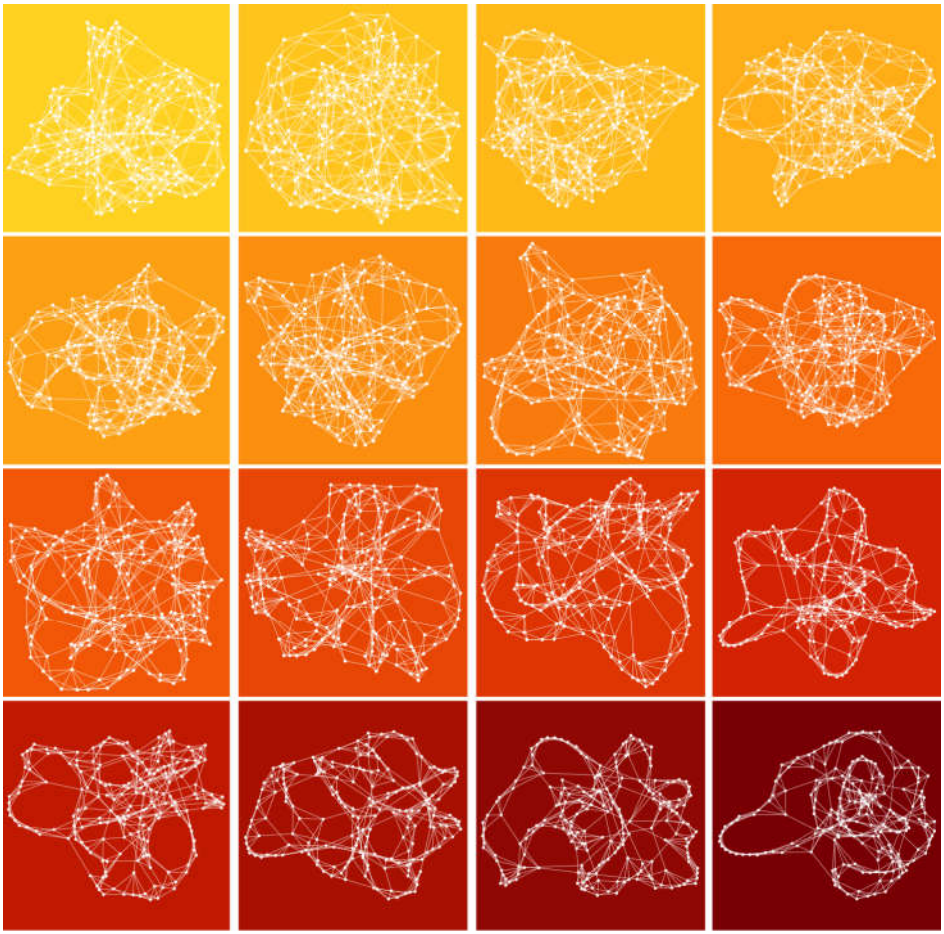
ADDITIVE
SOFT- & HARDWARE FÜR TECHNIK & WISSENSCHAFT

Multiparadigm data science uses modern analytical techniques, automation and human-data interfaces to move the bar on answers. Rather than confining itself to a narrow set of traditional statistical analyses, it applies a wide range of cutting-edge algorithms and interdisciplinary computational methods to extract insights, meaning and decisions from data.

Having the right interface to get answers from data is crucial. Different interfaces are suited to different tasks—from natural-language queries to scheduled report generation to live modeling presentations. In some cases you want deployment as an interactive cloud document, in others as a web API.

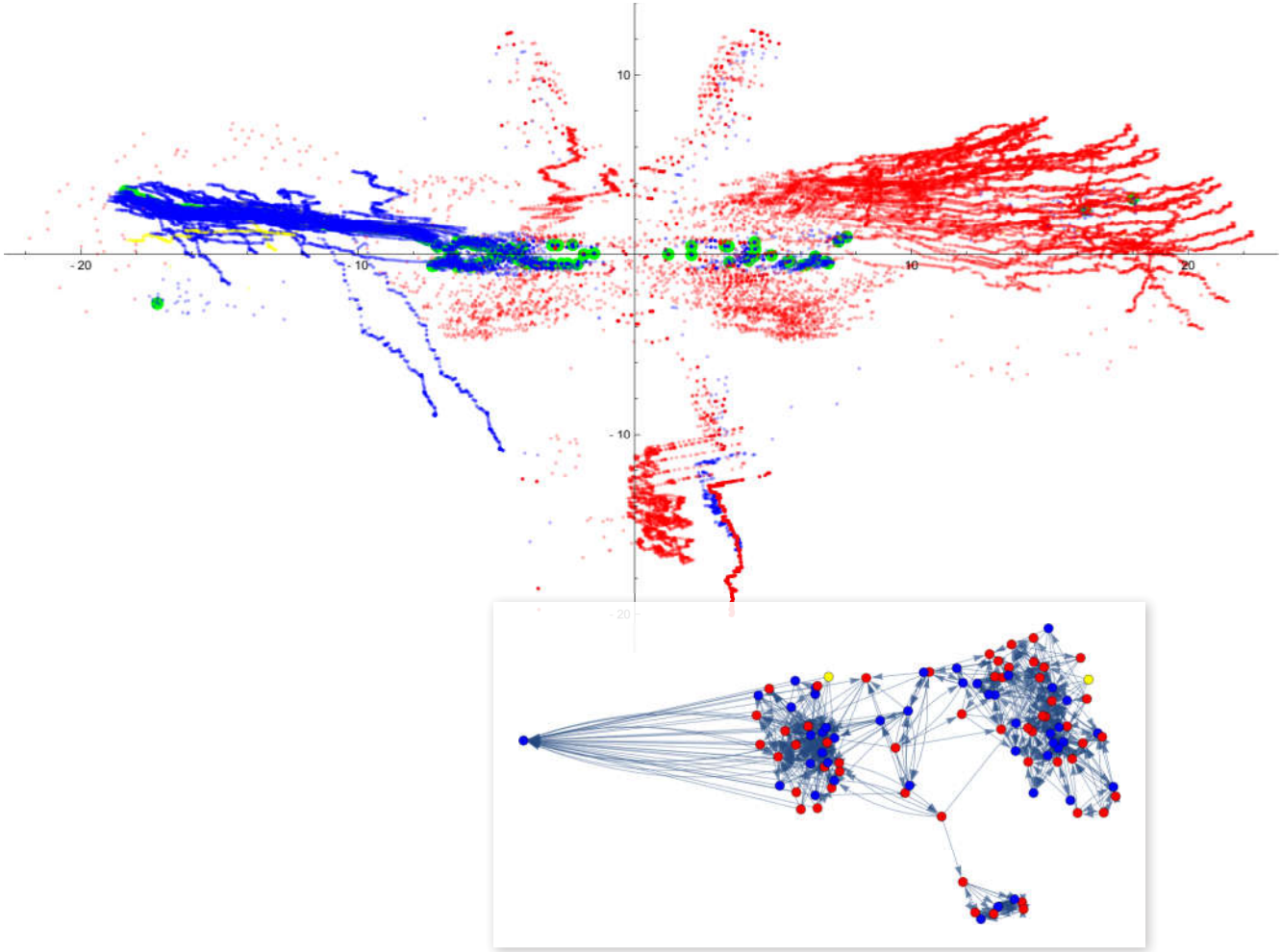
A multiparadigm approach requires a broad, flexible computational toolkit that incorporates all aspects of a project into one start-to-finish workflow. The Wolfram technology stack does exactly this, enabling you to take data from hundreds of formats, carry out a full spectrum of analysis and visualization, and immediately share or publish your results—all using the world's largest collection of algorithms and computable knowledge.

A simulation of information diffusion in a social network using density heat maps to analyze connectivity and nearness in a small-world network.



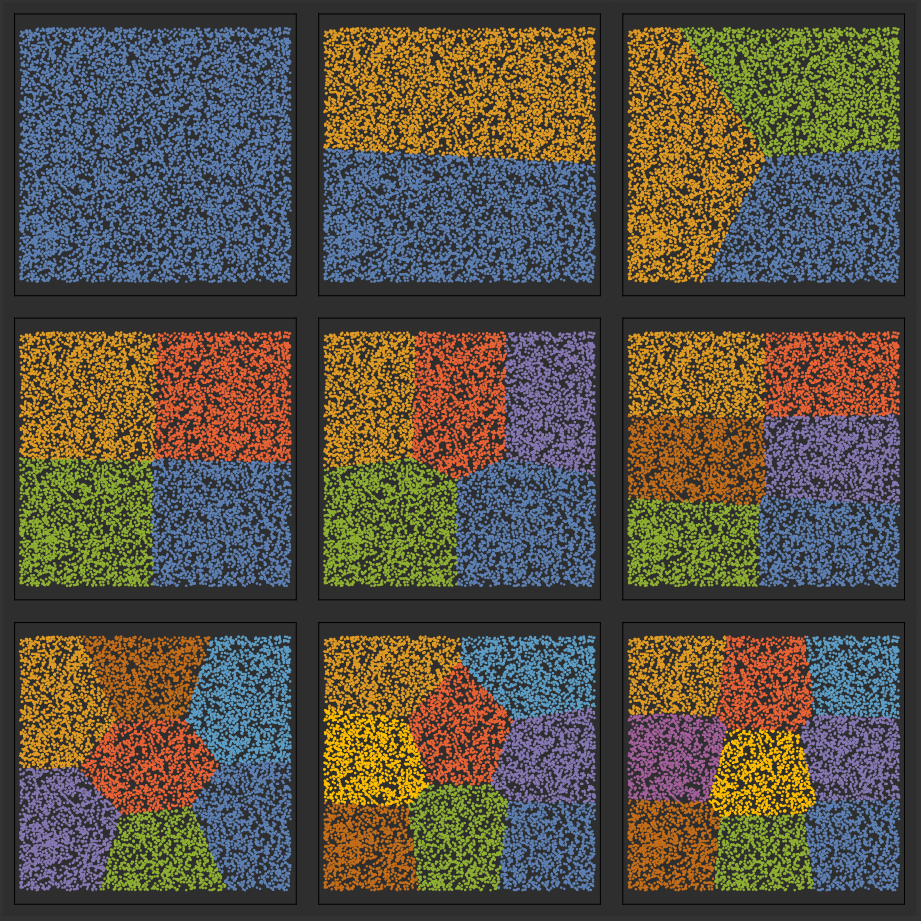
The built-in **GlobalClusteringCoefficient** function efficiently analyzes large datasets from **SocialMediaData**, using **ColorData** and **Grid** for easy visual interpretation of the results. **wolfr.am/mpds-gc**

Predictions of US Senate voting behavior and increasing political partisanship based on a nearest-neighbor analysis, providing computational insight into multidimensional data.



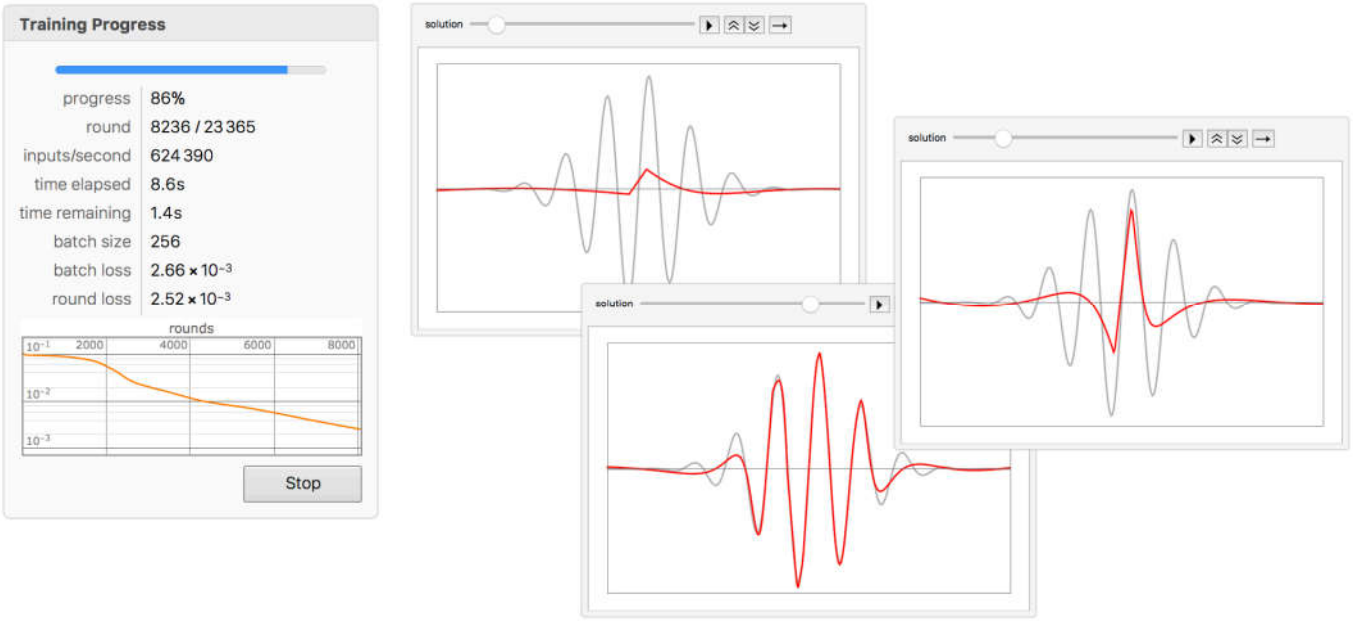
NearestNeighborGraph quickly computes proximity measures in images, text and numerical and geoposition data. **wolfr.am/mpds-nn**

Visualizing unstructured datasets with automatic partitioning and dimensional analysis—facilitated by high-level data semantics and unsupervised machine learning.



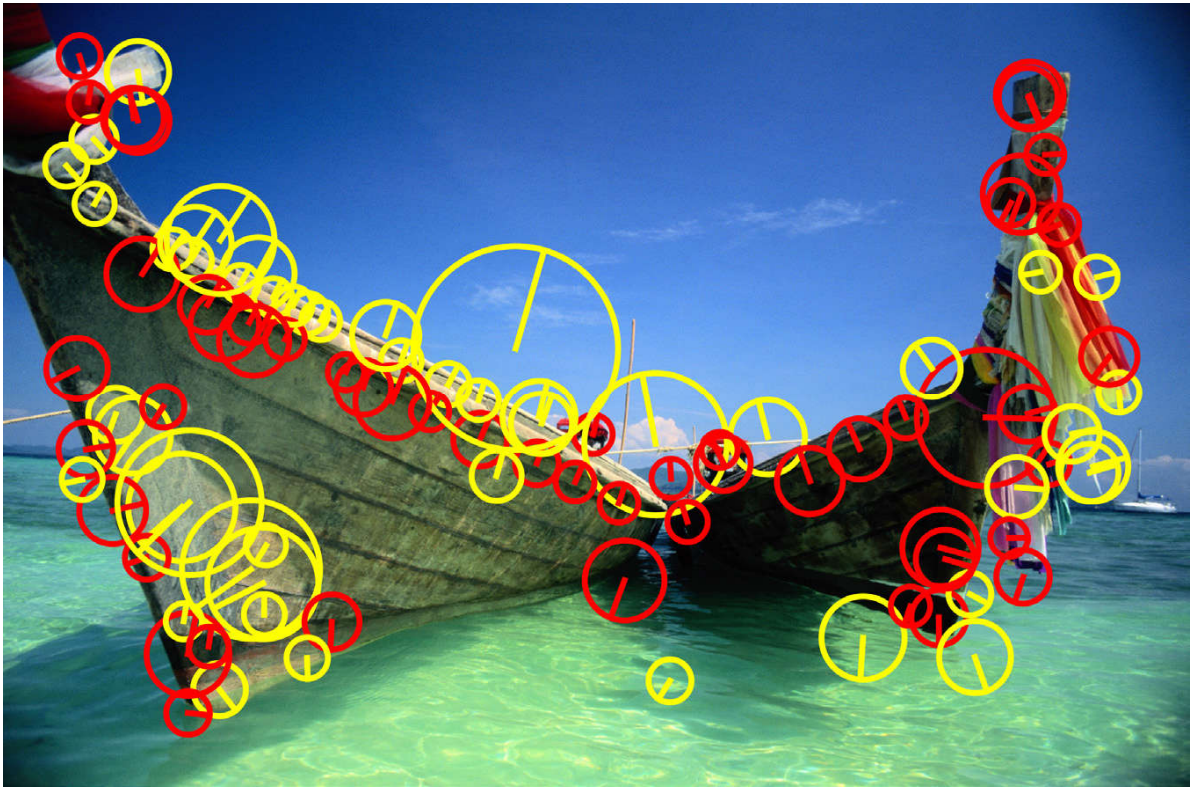
FindClusters automatically groups similar items for a variety of data types, imported using **SemanticImport** and immediately visualized using **ListPlot**. wolfr.am/mpds-fc

Visually tracking the progress and performance of dataset training in a neural network with interactive status monitors and automated background computations.



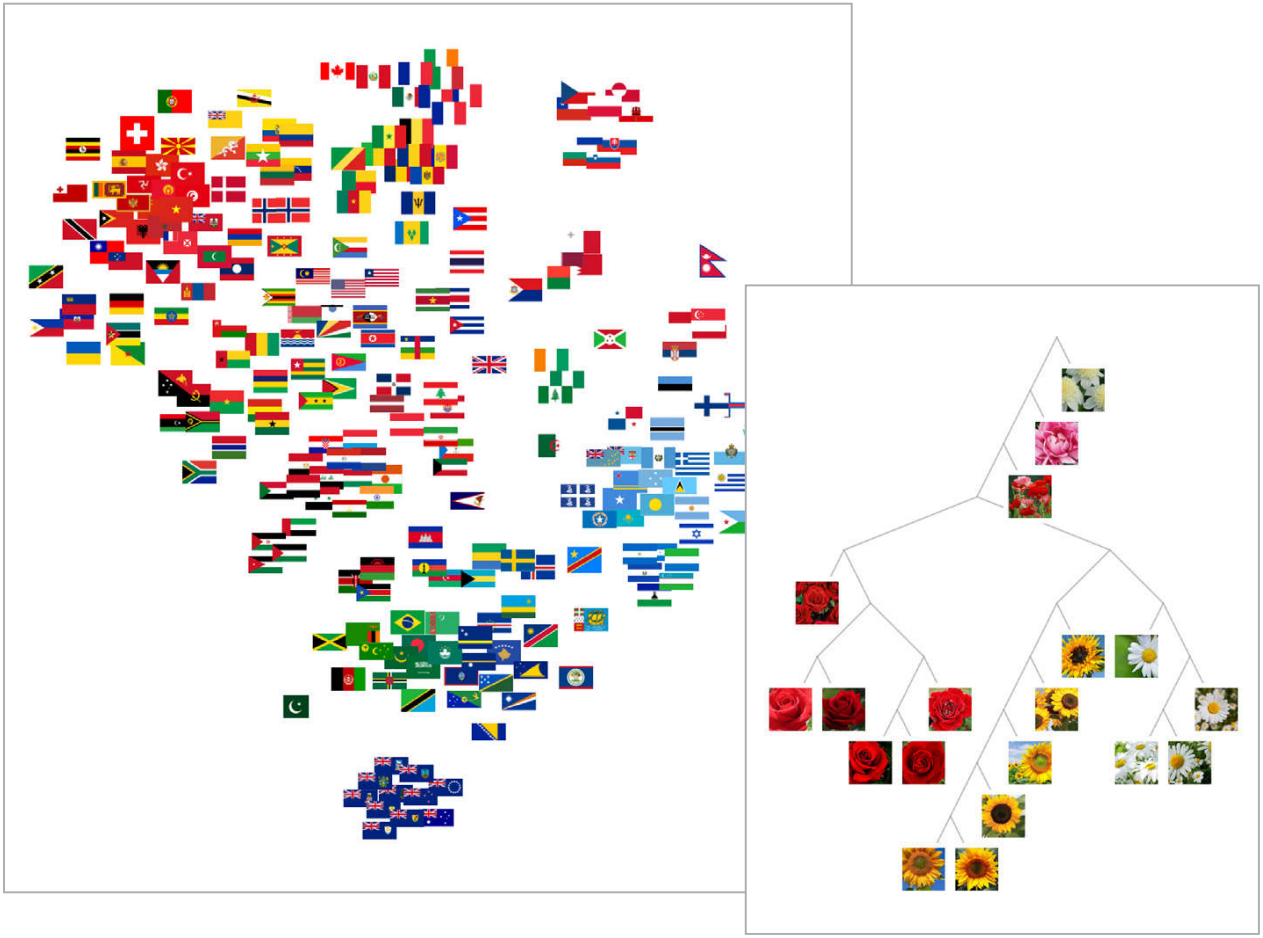
TrainingProgressReporting and **TrainingProgressFunction** provide several methods for the monitoring of neural network training. **wolfr.am/mpds-tp**

High-level computer vision automatically examines and tracks visual features using pre-built machine learning models, with advanced options for exploring specific parameters.



Manually examine points of interest in images using **ImageKeypoints**, or instantly identify objects in images with **ImageIdentify**. **wolfr.am/mpds-ii**

Automatic categorization of built-in images using advanced feature extraction and dimension reduction, displayed using a variety of plot and graph visualizations.



FeatureSpacePlot and **ClusteringTree** construct hierarchical visualizations from extracted features of all kinds of datasets, including data from the Wolfram Knowledgebase. **wolfr.am/mpds-fp**

Predicting the next move in rock-paper-scissors or the next word in a sentence with built-in predictors and linguistic data, with advanced options for tweaking performance.

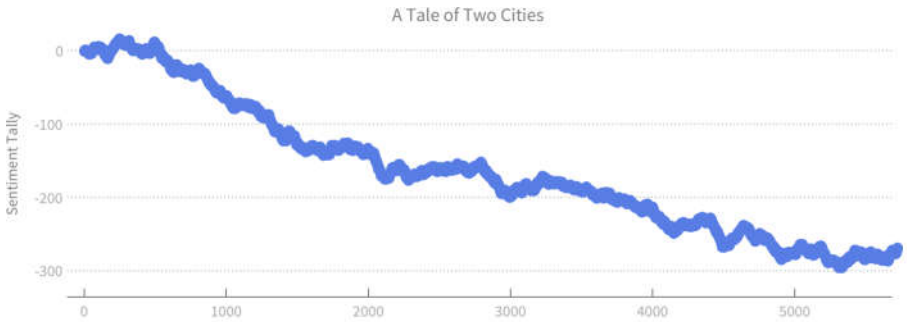
```
sp = SequencePredict[{{✊, ✋}, {✊, ✋, ✊}, {✋, ✊, ✌}, {✋, ✊}}]
SequencePredictorFunction[ Input type: NominalSequence  Method: Markov ]

sp[{✋, ✊}, "Probabilities"]
⟨| ✋ → 0.422177, ✌ → 0.370295, ✊ → 0.207528 |⟩
```

```
sp = SequencePredict["English"]
SequencePredictorFunction[ Input type: Text  Method: Markov ]

sp["the sky is green", "SequenceLogProbability"]
-26.255

spf = SequencePredict["French"]
SequencePredictorFunction[ Input type: Text  Method: Markov ]

spf["le ciel est vert", "SequenceLogProbability"]
-26.8061
```

```
spr = SequencePredict["Russian"]
SequencePredictorFunction[ Input type: Text  Method: Markov ]

spr["небо зеленое", "SequenceLogProbability"]
-29.4609

spc = SequencePredict["Chinese"]
SequencePredictorFunction[ Input type: Text  Method: Markov ]

spc["天空是绿色的", "SequenceLogProbability"]
-28.0844
```

SequencePredict uses automatically selected algorithms to infer sequences from a variety of data types, with linguistic support in seven languages and cross-platform compatibility for hundreds of data formats. **wolfr.am/mpds-sp**

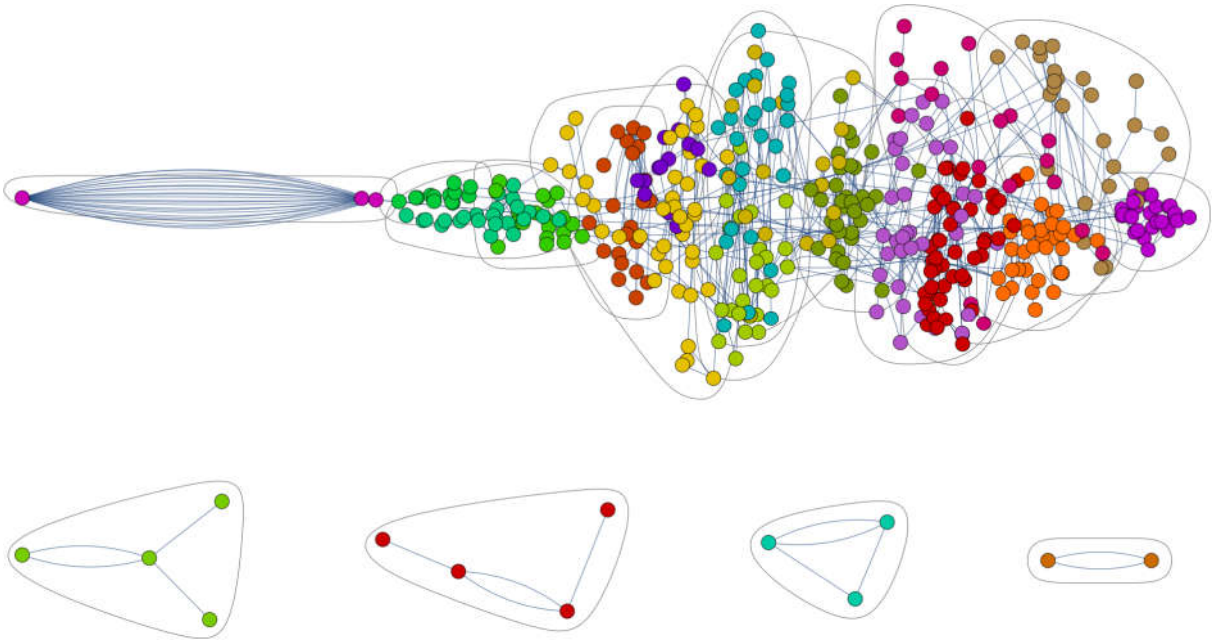
Analyzing the changes of mood throughout the complete text of *A Tale of Two Cities* using automated text processing and pre-trained classifiers on a curated data resource.



The Period It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us, we were all going direct to Heaven, we were all going direct the other way–– in short, the period was so far like the present period, that some of its noisiest authorities insisted on its being received, for good or for evil, in the superlative degree of comparison only.	Positive
There were a king with a large jaw and a queen with a plain face, on the throne of England; there were a king with a large jaw and a queen with a fair face, on the throne of France.	Neutral
In both countries it was clearer than crystal to the lords of the State preserves of loaves and fishes, that things in general were settled for ever.	Neutral
⋮	
I see the blots I threw upon it, faded away.	Negative
I see him, fore–most of just judges and honoured men, bringing a boy of my name, with a forehead that I know and golden hair, to this place––then fair to look upon, with not a trace of this day's disfigurement––and I hear him tell the child my story, with a tender and a faltering voice.	Negative
"It is a far, far better thing that I do, than I have ever done; it is a far, far better rest that I go to than I have ever known."	Negative

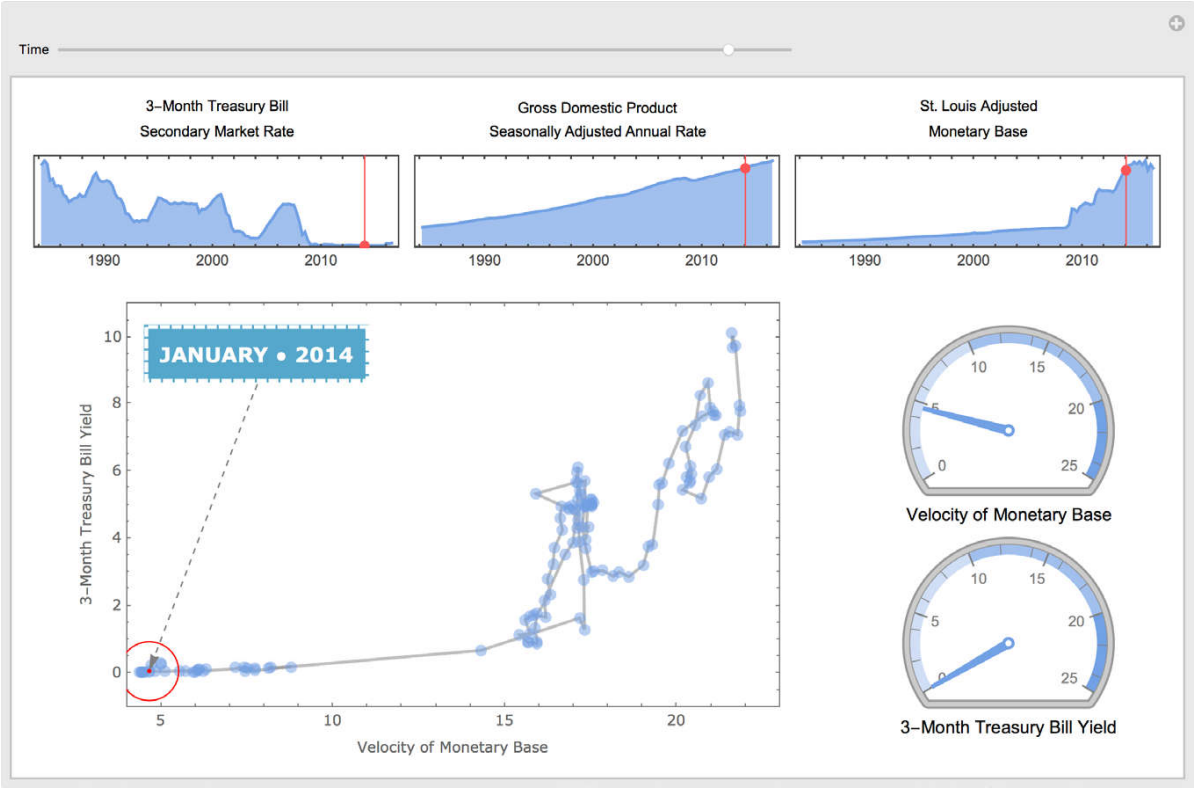
Classify uses machine learning to determine contextual sentiment values of a **ResourceObject** imported from the Wolfram Data Repository and parsed using **TextSentences**. **wolfr.am/mpds-sa**

A community analysis graph of a Reddit AMA shows connections among machine-learned clusters of related questions, using textual data imported through a curated service connection.



FindGraphCommunities and **CommunityGraphPlot** use performance-optimized machine learning algorithms to analyze and display clusters in data retrieved with **ServiceConnect**. **wolfr.am/mpds-cg**

A financial dashboard displays multiple visualization types from live financial data for rapid analysis of key indicators and predictive models.

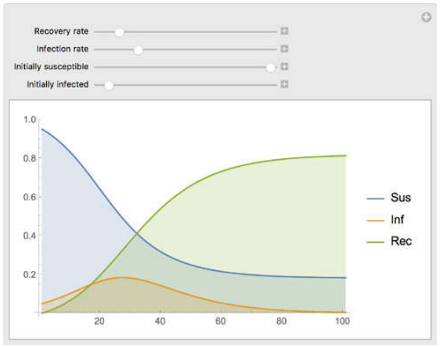


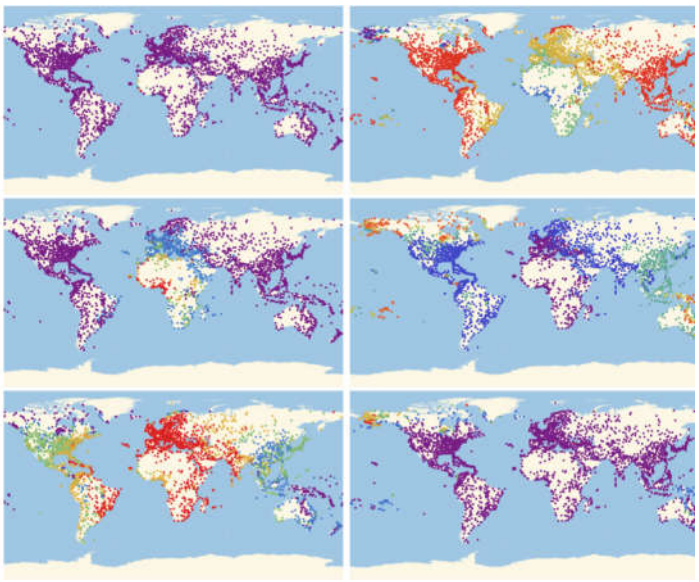
FinancialData provides historic financial information for immediate visualization with **ListPlot** and **AngularGauge**, using **Manipulate** for interactive controls. **wolfr.am/mpds-db**

Immediate geovisualization of Runkeeper statistics from IoT data automatically accumulated and processed in the cloud.

Collect and parse **GeoPosition** data with the Wolfram Data Drop, import as a **TimeSeries** and generate a map with **GeoGraphics**. **wolfr.am/mpds-gp**

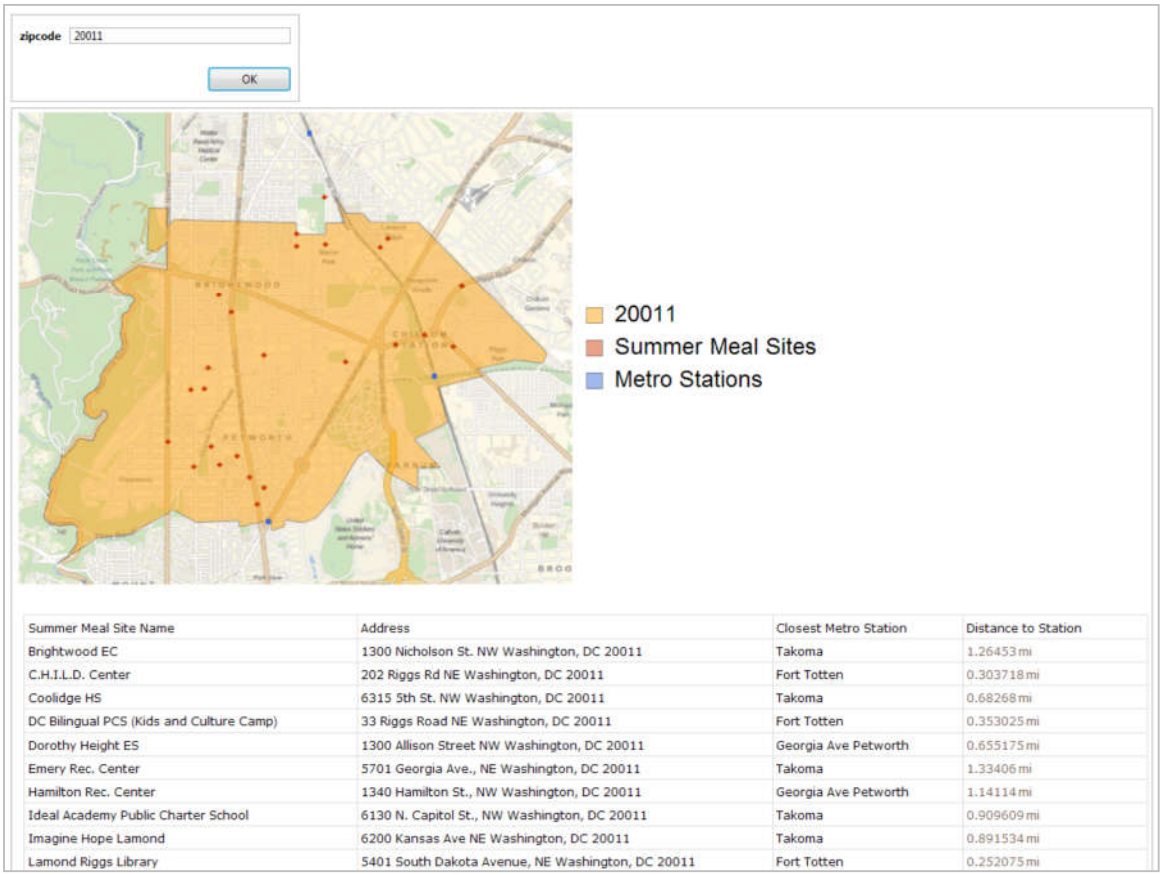
Modeling and predicting the spread of an outbreak with a suite of visualizations, seamlessly combining public health data with computable geographic data.





SemanticImport parses incoming data, combining it with built-in geographic entities and tuning visualizations with options such as **GeoBackground**, **GeoProjection** and **GeoRange**.
wolfr.am/mpds-si

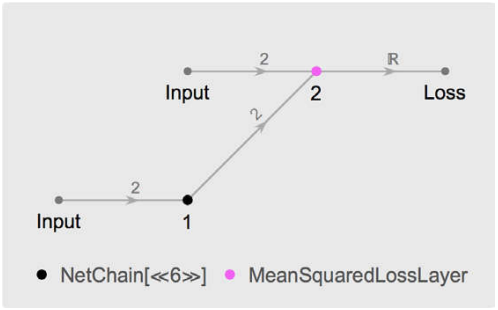
Displaying maps and locations of summer meal sites by ZIP code through a public web form to help students in need.

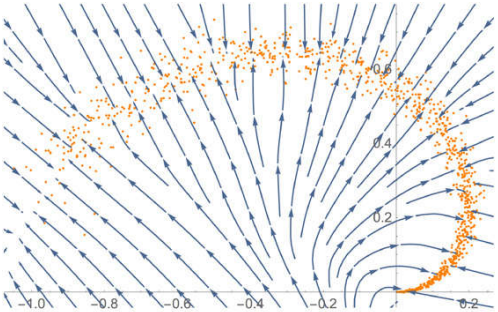


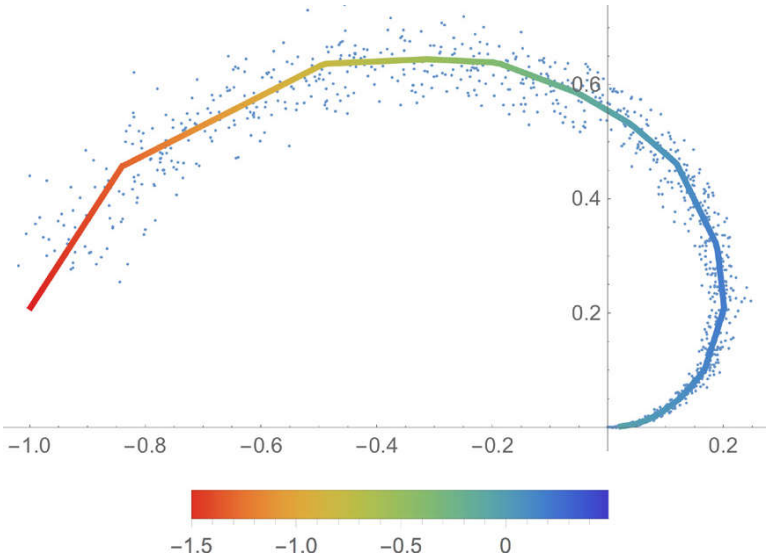
Summer Meal Site Name	Address	Closest Metro Station	Distance to Station
Brightwood EC	1300 Nicholson St. NW Washington, DC 20011	Takoma	1.26453 mi
C.H.I.L.D. Center	202 Riggs Rd NE Washington, DC 20011	Fort Totten	0.303718 mi
Coolidge HS	6315 5th St. NW Washington, DC 20011	Takoma	0.68268 mi
DC Bilingual PCS (Kids and Culture Camp)	33 Riggs Road NE Washington, DC 20011	Fort Totten	0.353025 mi
Dorothy Height ES	1300 Allison Street NW Washington, DC 20011	Georgia Ave Petworth	0.655175 mi
Emery Rec. Center	5701 Georgia Ave., NE Washington, DC 20011	Takoma	1.33406 mi
Hamilton Rec. Center	1340 Hamilton St., NW Washington, DC 20011	Georgia Ave Petworth	1.14114 mi
Ideal Academy Public Charter School	6130 N. Capitol St., NW Washington, DC 20011	Takoma	0.909609 mi
Imagine Hope Lamond	6200 Kansas Ave NE Washington, DC 20011	Takoma	0.891534 mi
Lamond Riggs Library	5401 South Dakota Avenue, NE Washington, DC 20011	Fort Totten	0.252075 mi

Import **ResourceData** for direct use in a **GeoListPlot** visualization, and deploy it to the web as an interactive **FormPage** using **CloudDeploy**. **wolfr.am/mpds-rd**

A multidimensional dataset is parametrized using a neural network with custom layers, reducing it to a scalar manifold for intuitive analysis and visualization.

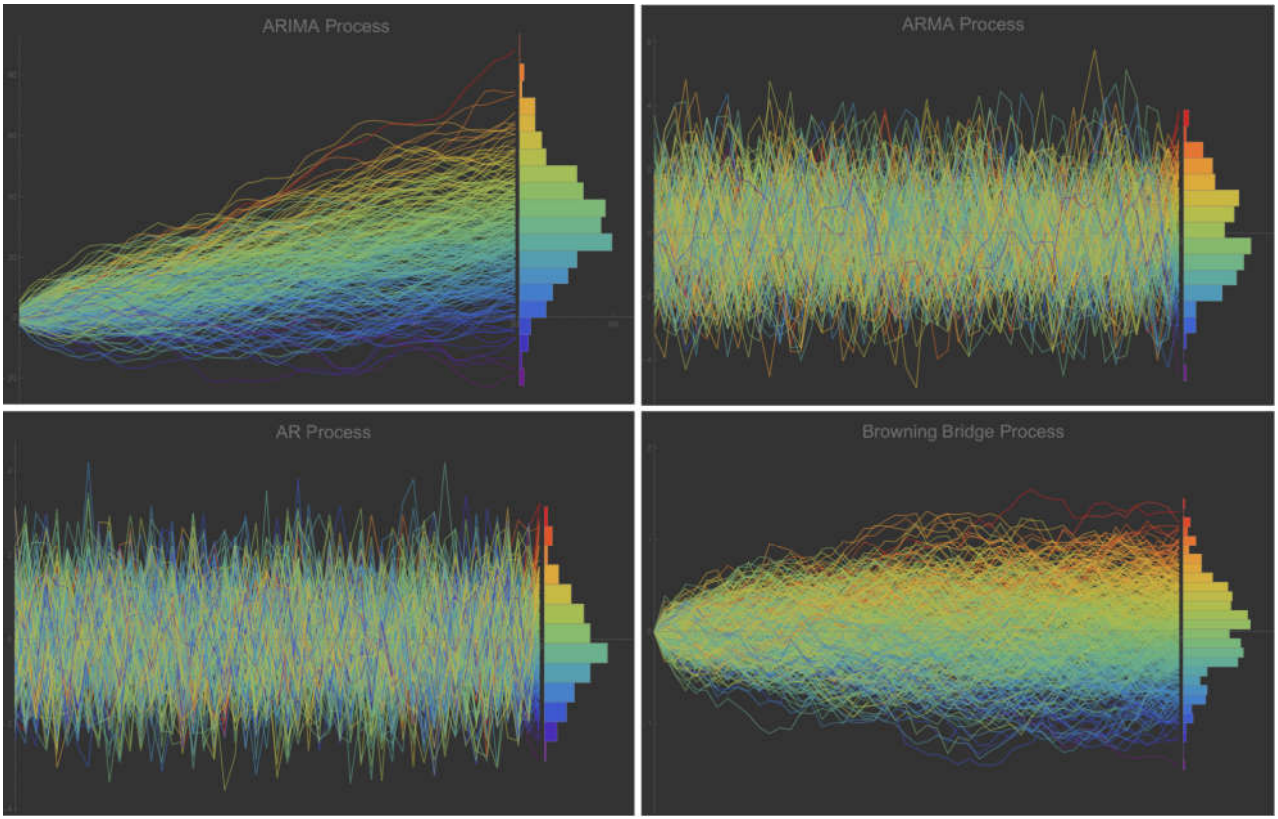






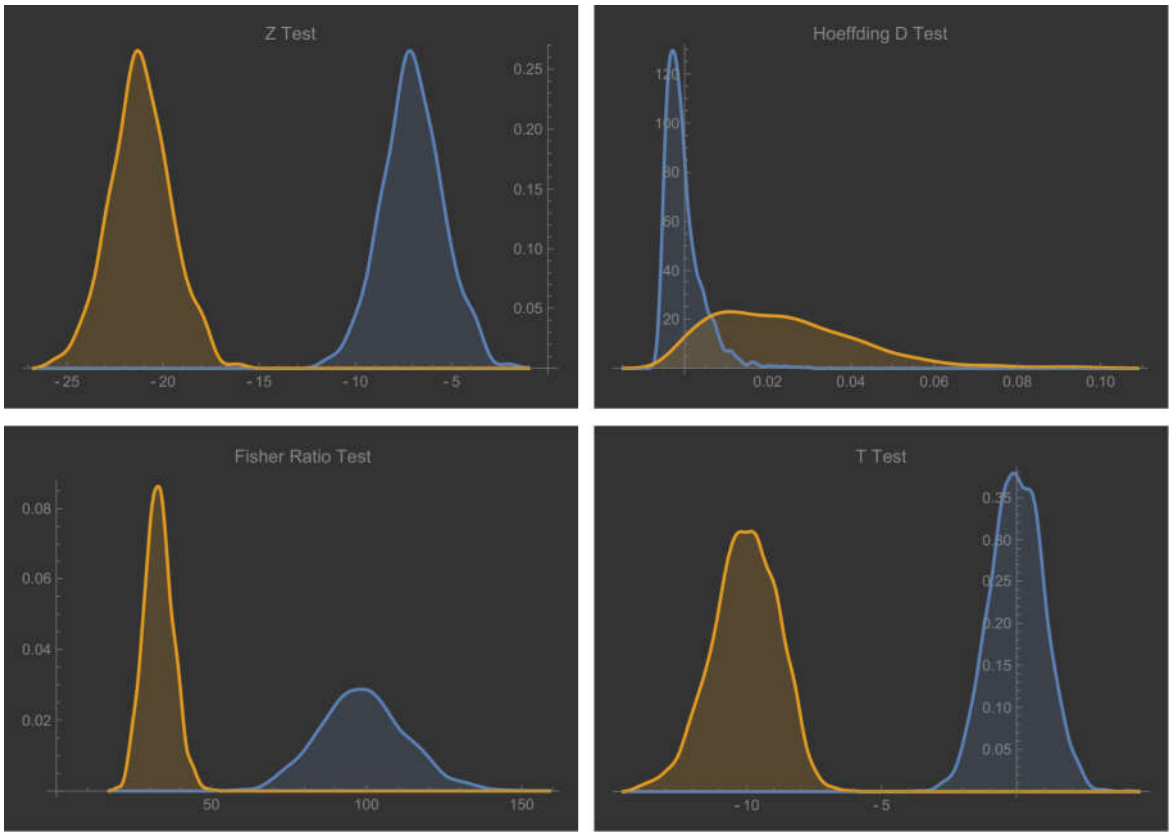
NetChain, **NetGraph** and **NetTrain** reduce dimensions using a **MeanSquaredLossLayer**, with the result visualized using **StreamPlot** and **ListPlot**. **wolfr.am/mpds-dr**

Sophisticated time series functions automatically select from built-in fitting methods for highly accurate forecasting, with options for creating and fitting new classes of hybrid models.



Use **TemporalData** and **TimeSeriesModelFit** to create autoregressive, moving-average and seasonal models in a few lines of code. **wolfr.am/mpds-tt**

Test for variances between populations and differences in proportion with statistical visualizations, automatically fitting your data to any combination of over 150 built-in distributions.



DistributionFitTest checks for various fits using symbolic distributions, guiding selection of the appropriate test distribution for your data. **wolfr.am/mpds-tm**

The Wolfram Language provides the most complete implementation of multiparadigm data science. Browse nearly 5,000 functions to see the full space of data science computations.

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