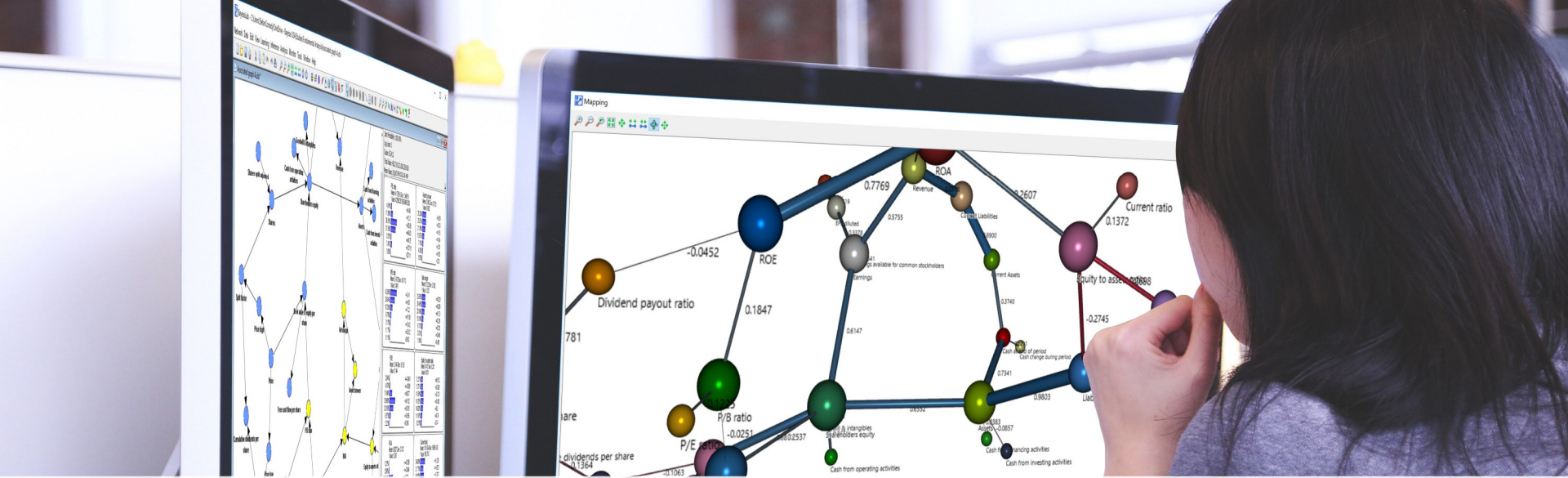


BAYESIALAB

Analyzing Exchange-Traded Funds

Knowledge Discovery with Bayesian Networks

The webinar will start at:

13:00:00

The current time is:

13:00:51

Central Daylight Time, UTC-5

Your BayesiaLab Team Today

stefan.conrady@bayesia.us

stacey.blodgett@bayesia.us

clare.gora@bayesia.us

Today's Program

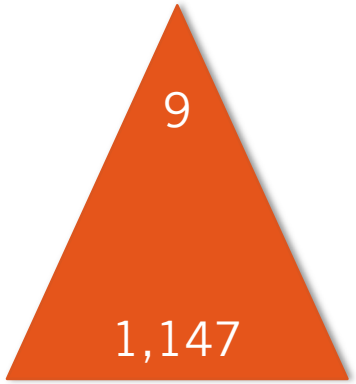
Introduction

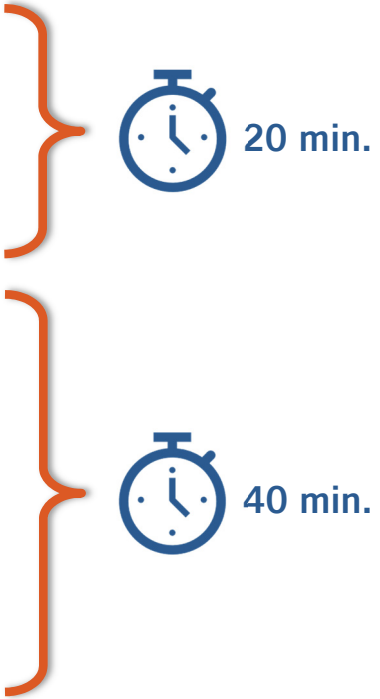
Motivation & Theory

- Alien Knowledge vs. Deep Understanding
- Bayesian Networks as Modeling Framework

Analyzing Exchange-Traded Funds

- Example: ETF Flows by Investment Focus
- Unsupervised Learning
    - Daily Flows by Investment Focus
    - Daily AUM Change by Ticker Symbol
- 2D/3D Mapping & VR





Disambiguation

BAYESIA
Your Decision Partner

Our Company

BAYESIALAB

Our Product

The Paradigm

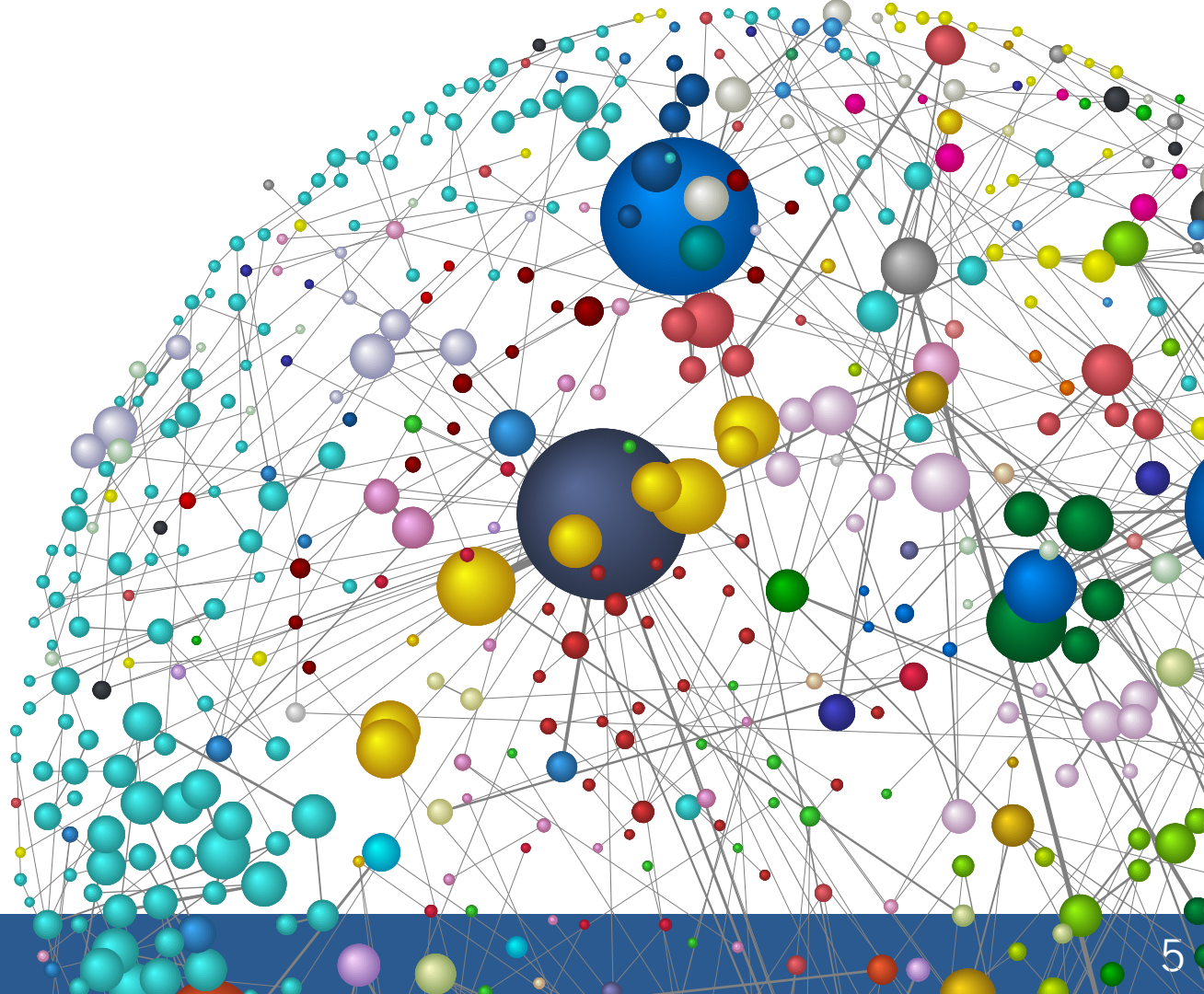
BAYESIAN NETWORKS*

Judea Pearl
Cognitive Systems Laboratory
Computer Science Department
University of California, Los Angeles, CA 90024
judea@cs.ucla.edu

Bayesian networks were developed in the late 1970's to model distributed processing in reading comprehension, where both semantical expectations and perceptual evidence must be combined to form a coherent interpretation. The ability to coordinate bi-directional inferences filled a void in expert systems technology of the early 1980's, and Bayesian networks have emerged as a general representation scheme for uncertain knowledge [Pearl, 1988, Heckerman *et al.*, 1995, Jensen, 1996, Castillo *et al.*, 1997].

BAYESIA
Your Decision Partner

Co-founded in 2001
by Dr. Lionel Jouffe &
Dr. Paul Munteanu



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BayesiaLa
Academic Editi
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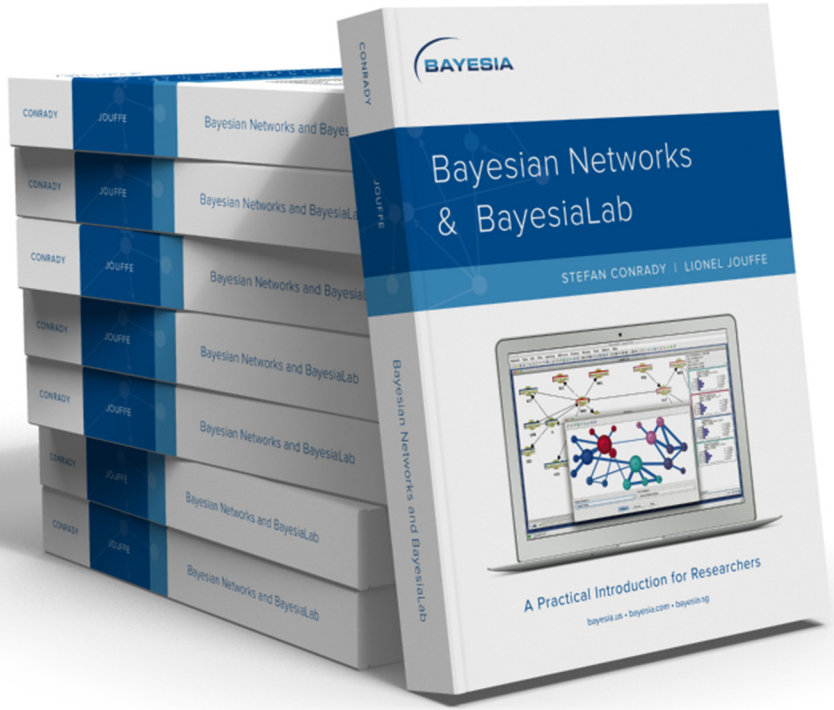
Bayesian Networks & BayesiaLab

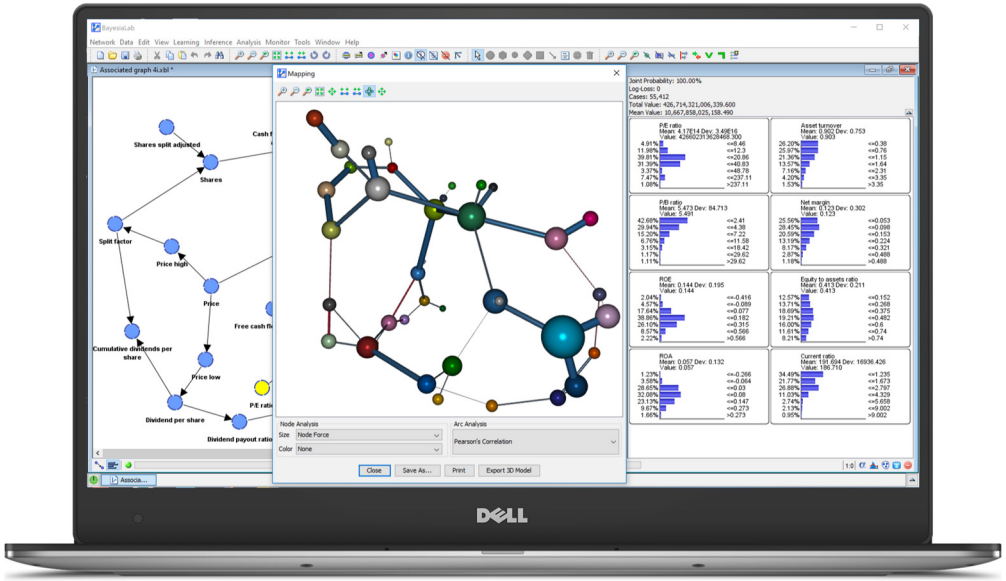
A Practical Introduction for Researchers

- Free download:
  www.bayesia.com/book
- Hardcopy available on Amazon:
  http://amzn.com/0996533303

15,000
Downloads



BAYESIALAB

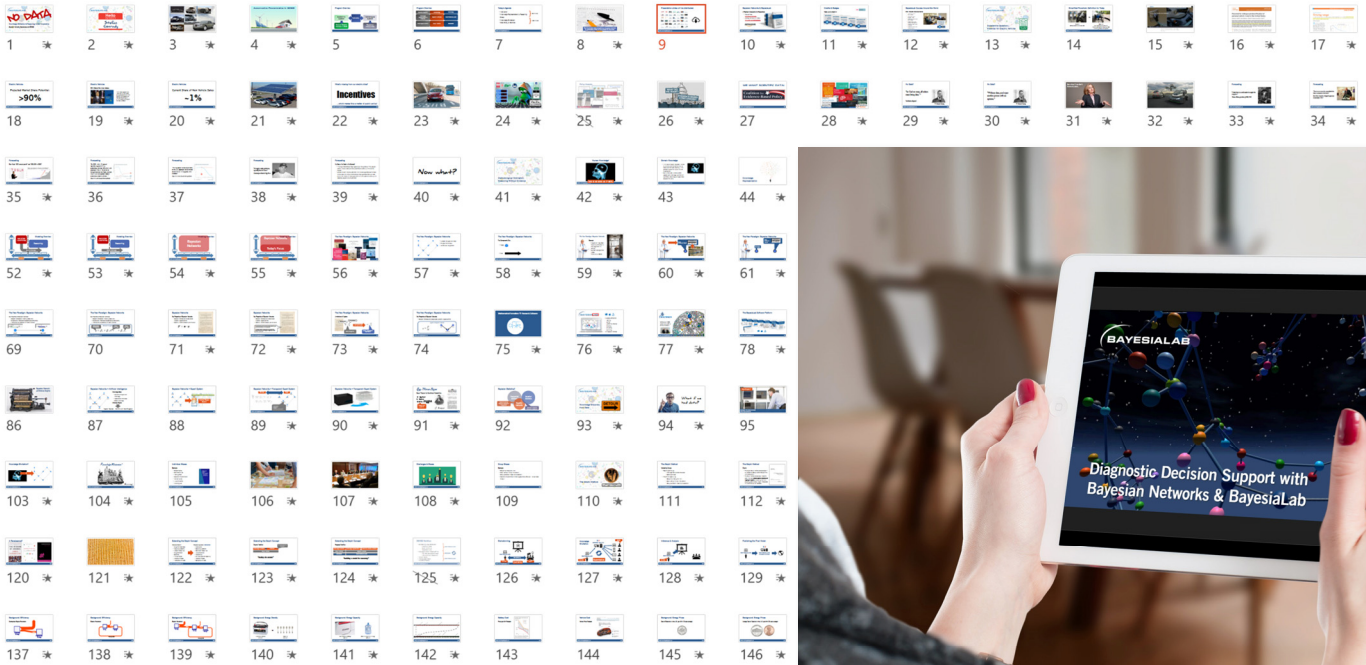


A desktop software for:

- encoding
- learning
- editing
- performing inference
- analyzing
- simulating
- optimizing

with Bayesian networks.

Webinar Slides, Data, and Recording Available

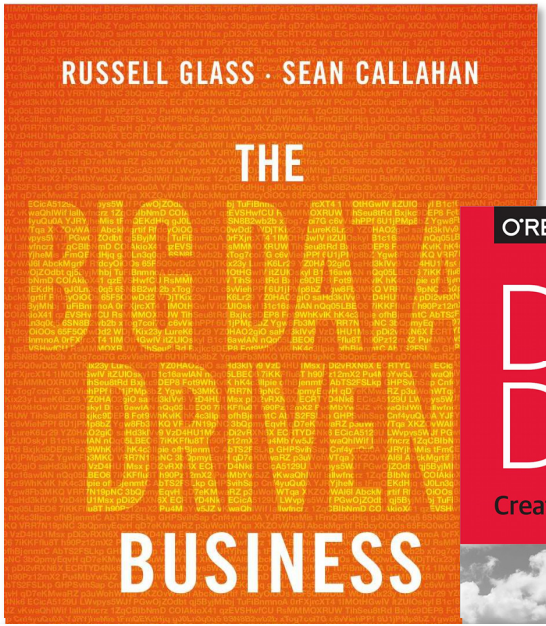


Motivation: Understanding ETFs

Motivation & Background

Naïve Questions:

- How does capital flow between Exchange-Traded Funds?
- Are there specific sectors and industry that compete for capital?
- Which funds compete?
- How do risks compare between difference funds and sectors?

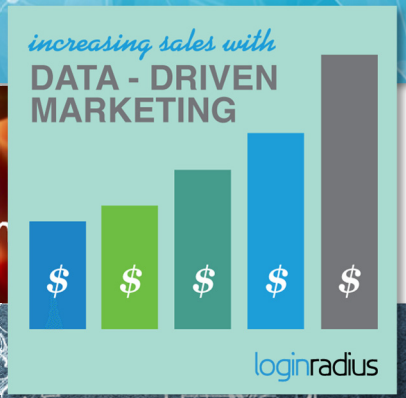

RUSSELL GLASS · SEAN CALLAHAN
THE
BUSINESS

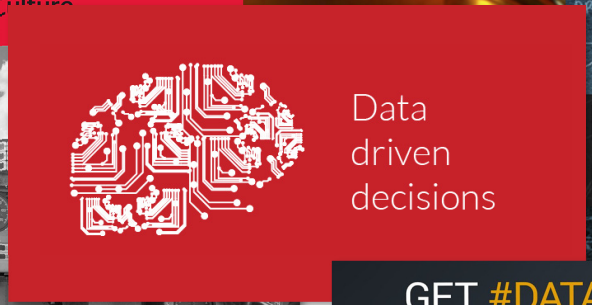

DATA
DRIVEN


Data-Driven
Decision-Making


O'REILL
Data
Driven
Creating a Data C


5 Steps To Powering
Data Driven Decision Makin

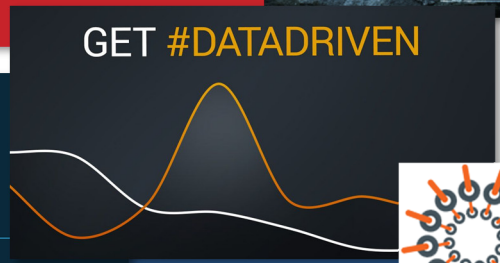

increasing sales with
DATA - DRIVEN
MARKETING
$ $ $ $ $
loginradius


Data
driven
decisions


DATA-DRIVEN decisions in a
FORTUNE 500


MAKING
DATA-DRIVEN
DECISIONS
with
+ tableau +


THE DATA-DRIVEN
FUTURE


GET #DATADRIVEN


Data-Driven
Marketing

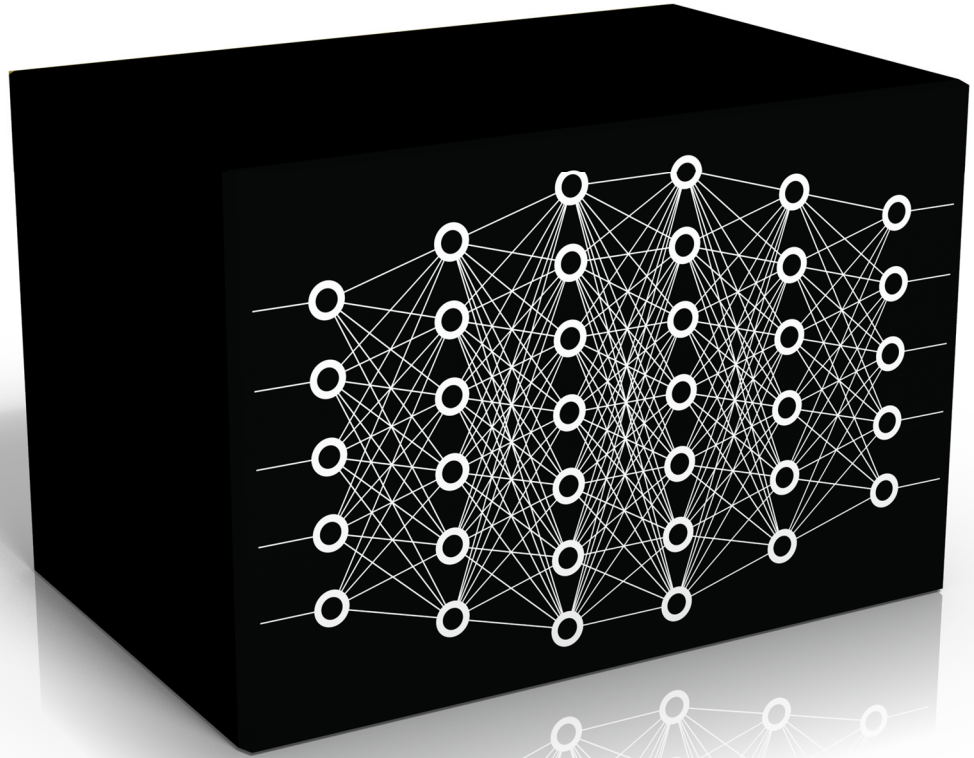

DataDriven
Business

WIRED

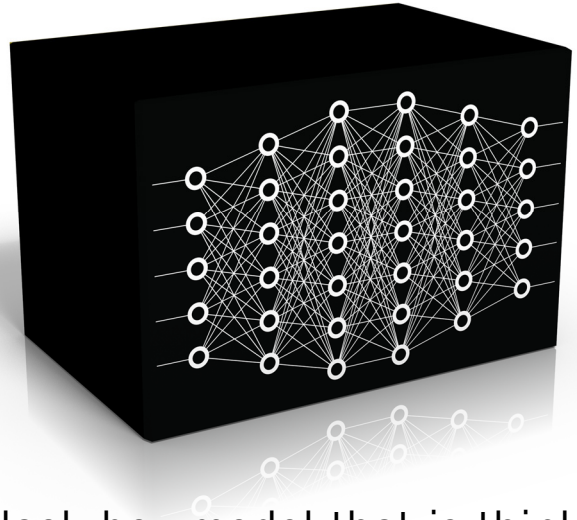
DAVID WEINBERGER BACKCHANNEL 04.18.17 08:22 PM

OUR MACHINES NOW HAVE KNOWLEDGE WE'LL NEVER UNDERSTAND

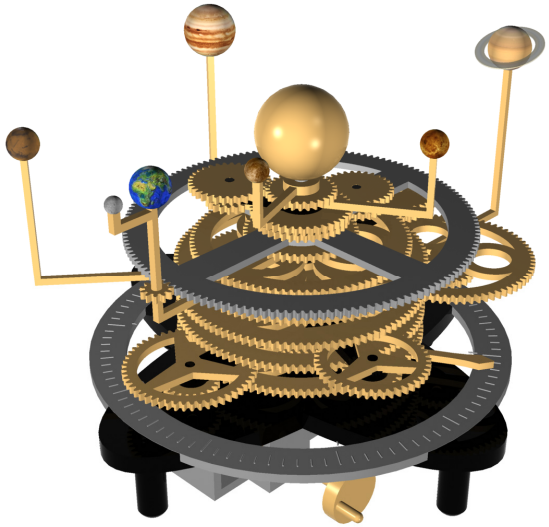

WIRED
ALIEN KNOWLEDGE
WHEN MACHINES JUSTIFY KNOWLEDGE



Today's Objective

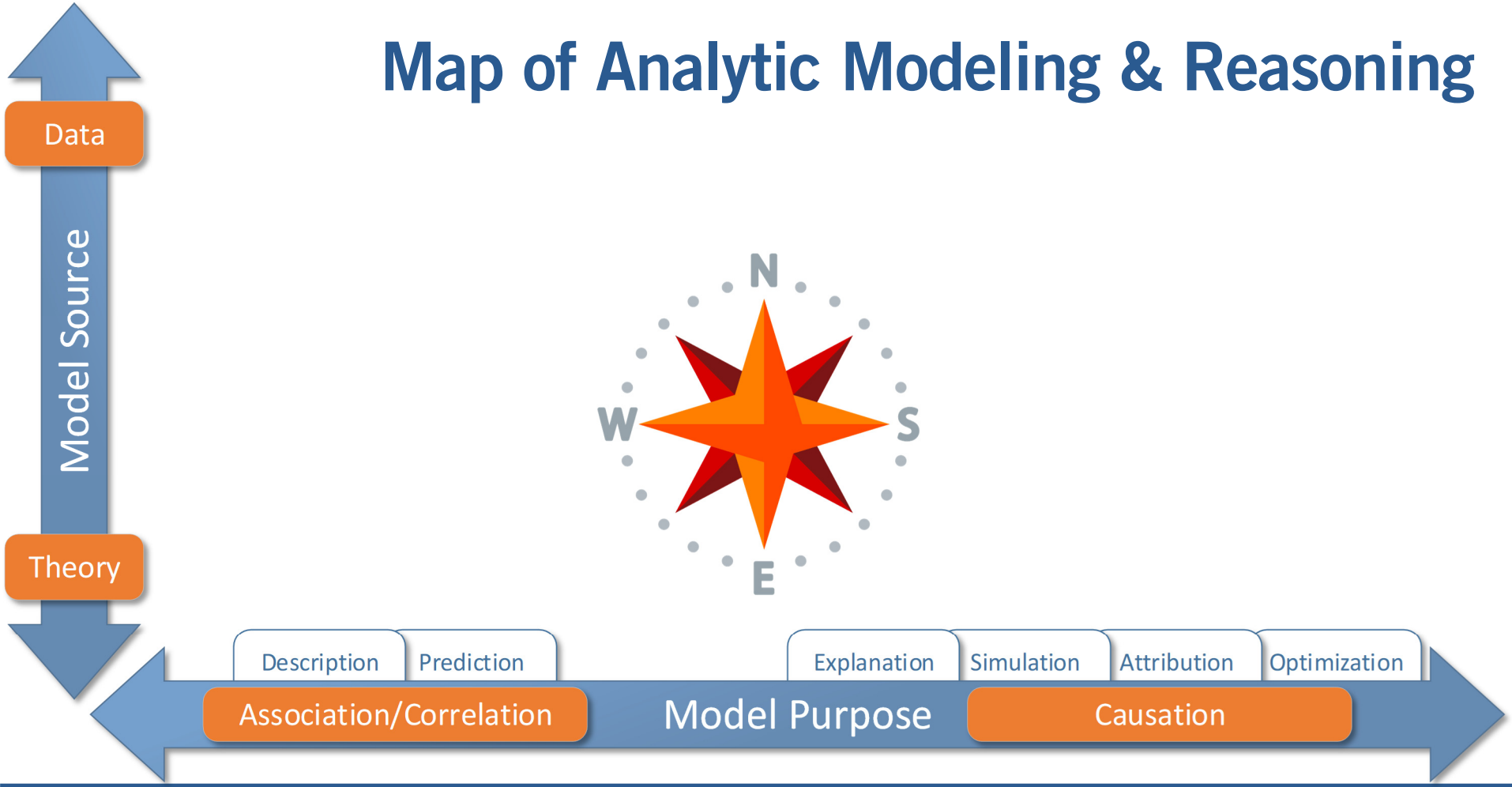


A black-box model that is thinking and reasoning on your behalf.

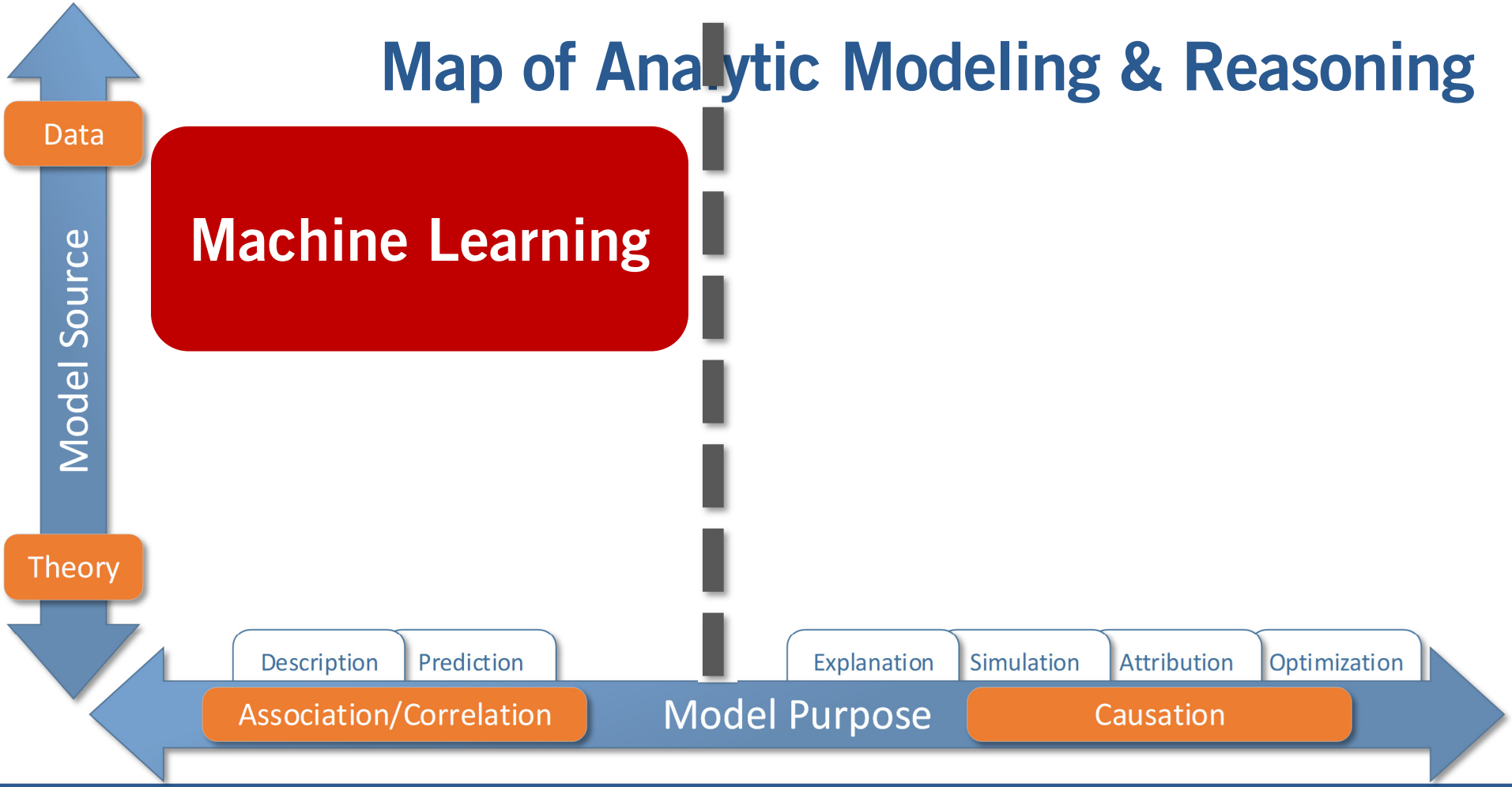


A model to help you understand, think, and reason.

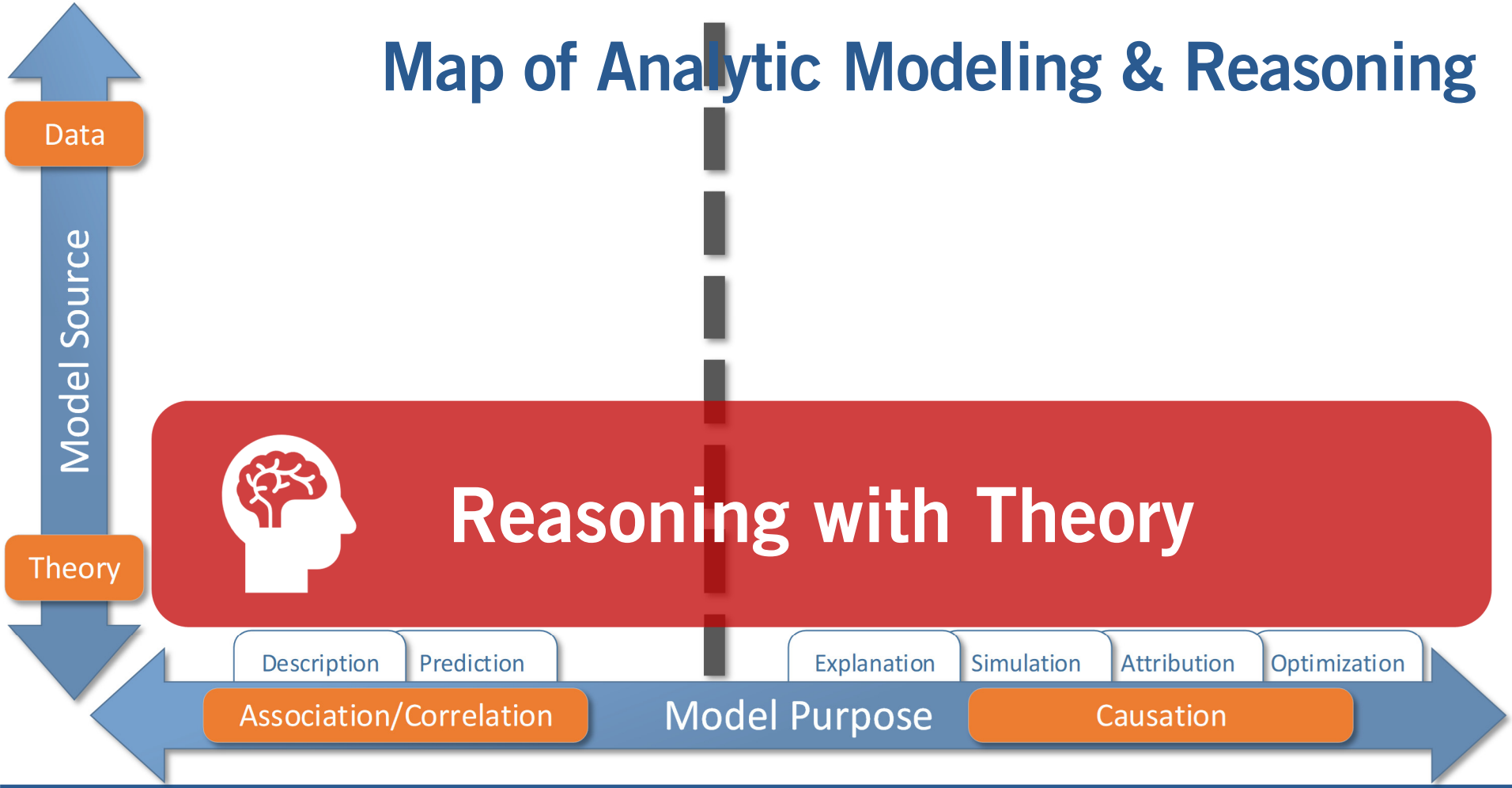
Map of Analytic Modeling & Reasoning



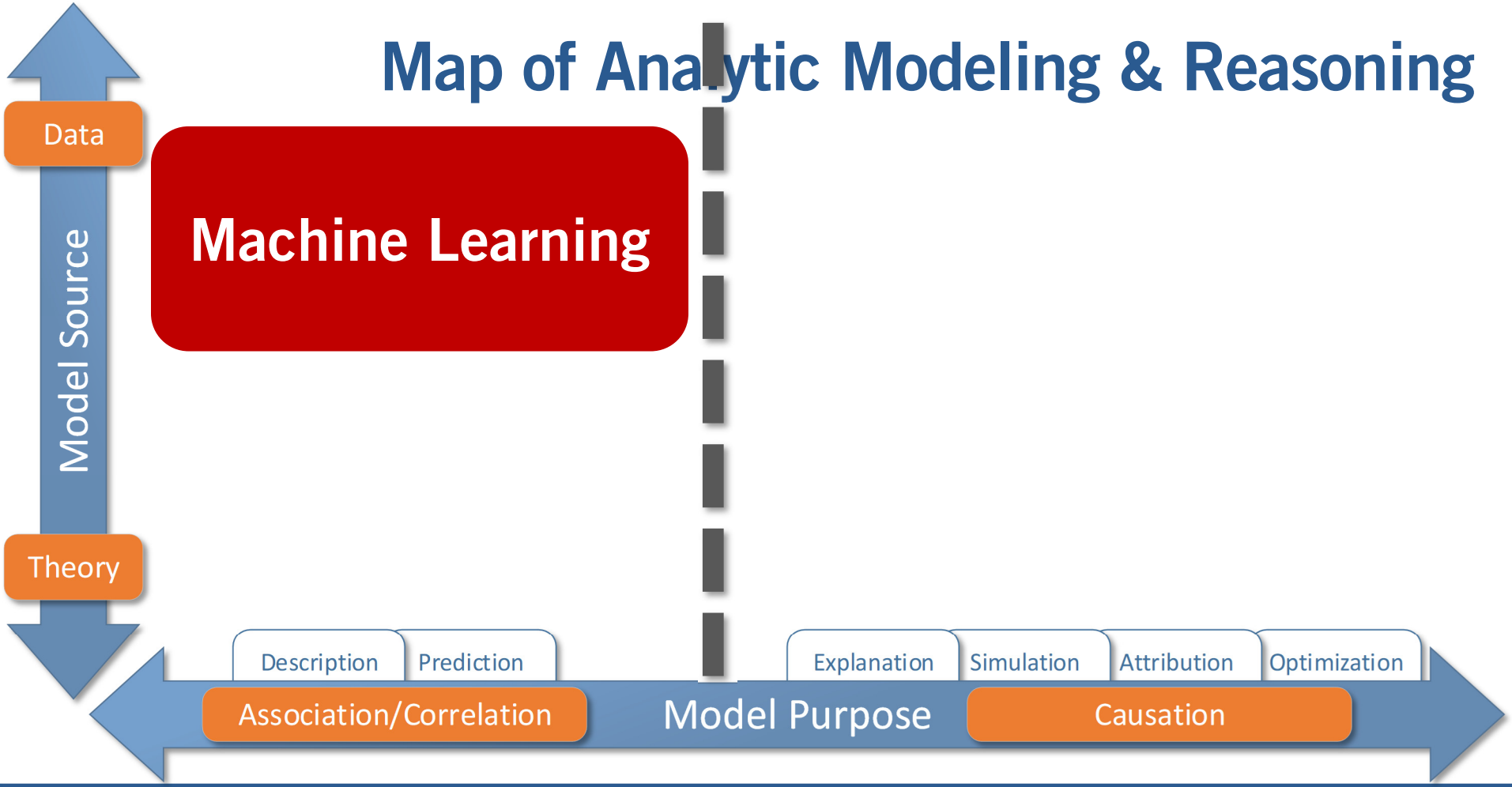
Map of Analytic Modeling & Reasoning



Map of Analytic Modeling & Reasoning



Map of Analytic Modeling & Reasoning



Map of Analytic Modeling & Reasoning

Data

Model Source

Theory

Machine Learning

No Causality with Machine Learning!

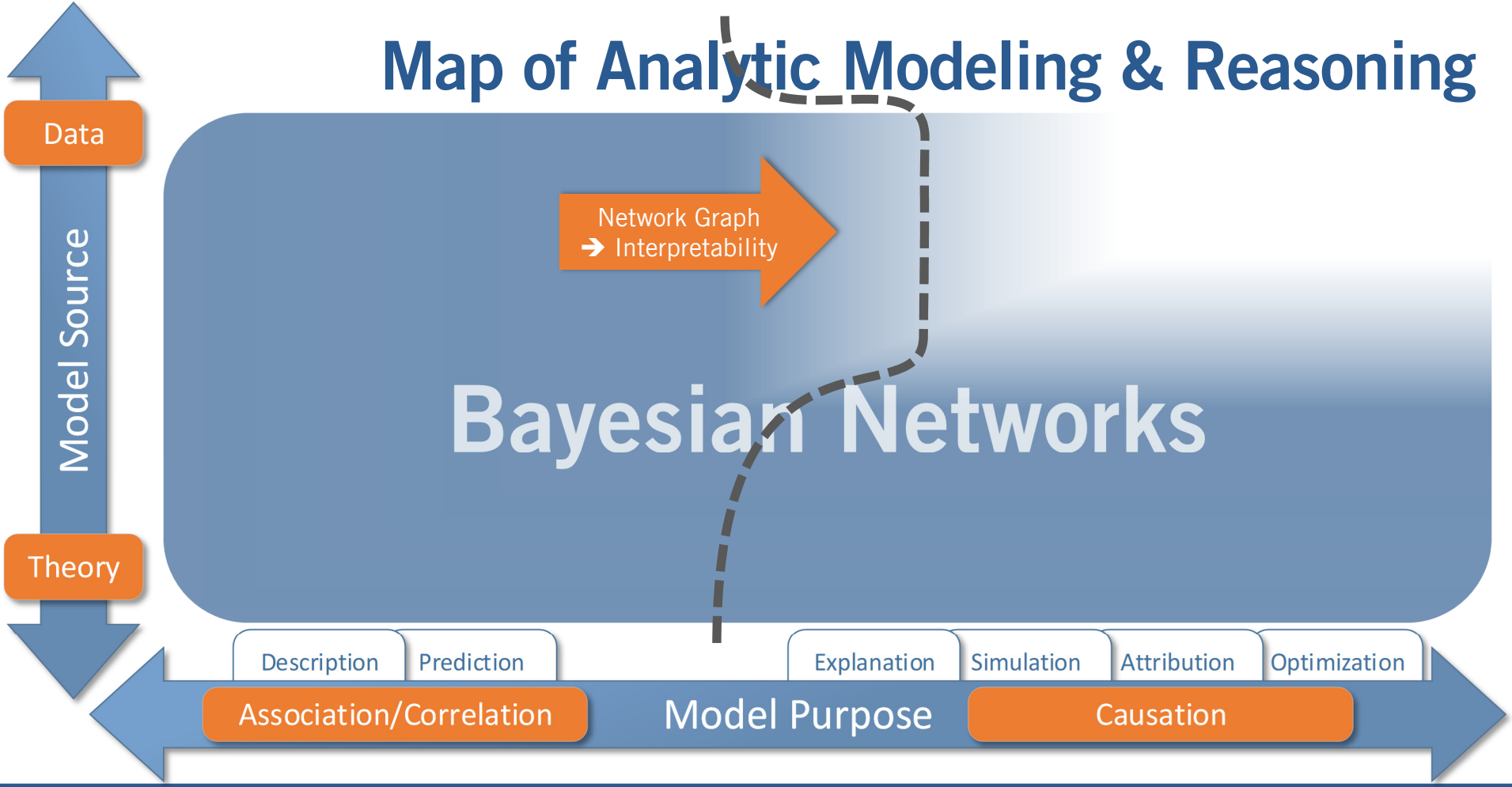
Description | Prediction | Explanation | Simulation | Attribution | Optimization

Association/Correlation

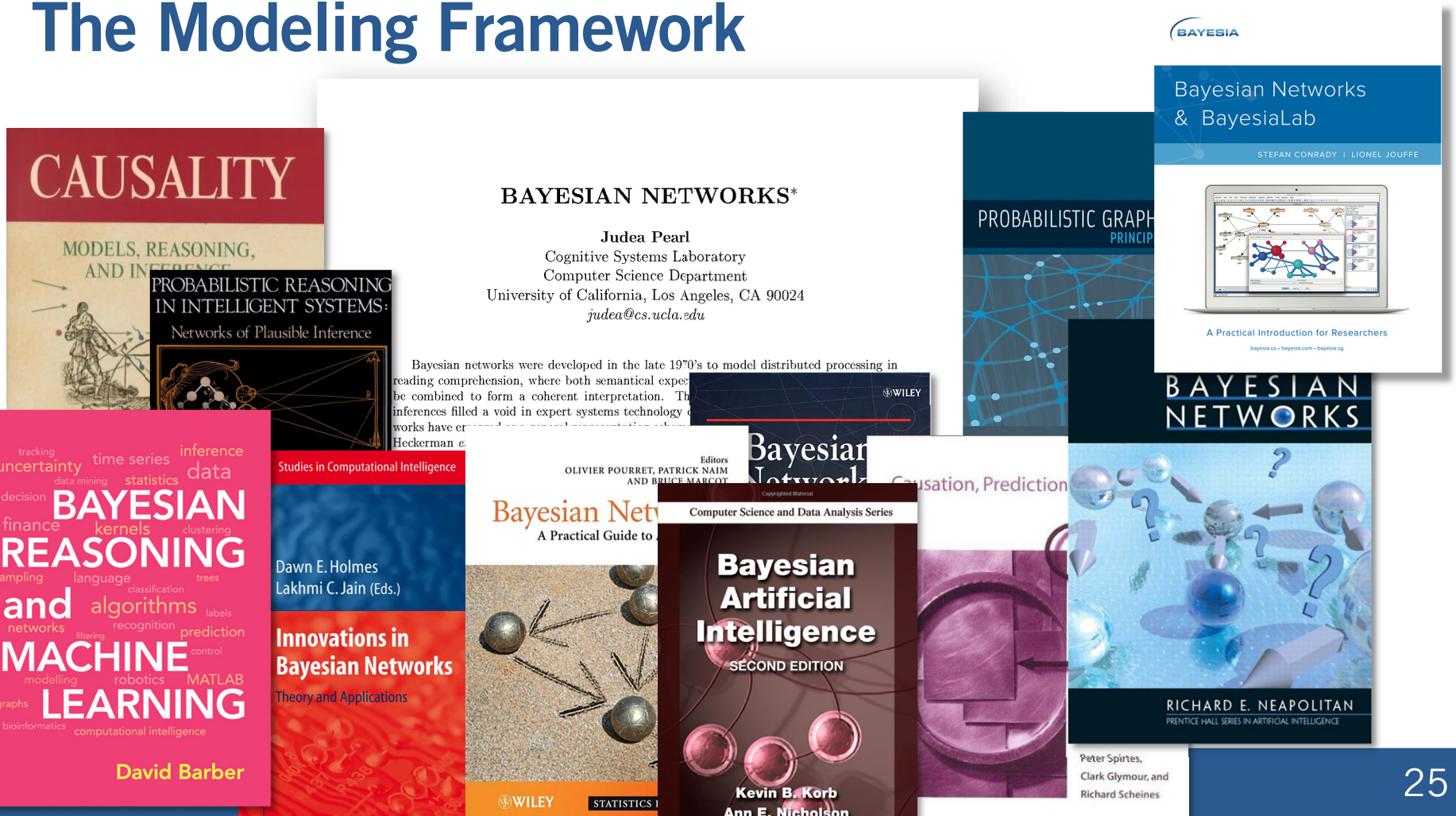
Model Purpose

Causation

Map of Analytic Modeling & Reasoning



The Modeling Framework



Analyzing Exchange-Traded Funds

Knowledge Discovery & Interpretation

Exchange-Traded Funds

Today's Workflow

- Examples with an increasing number of variables:

9 < 51 < 1,147

Conceptual illustration of Bayesian networks representing a joint probability distribution.

Machine learning a Bayesian network with BayesiaLab.

Exchange-Traded Funds

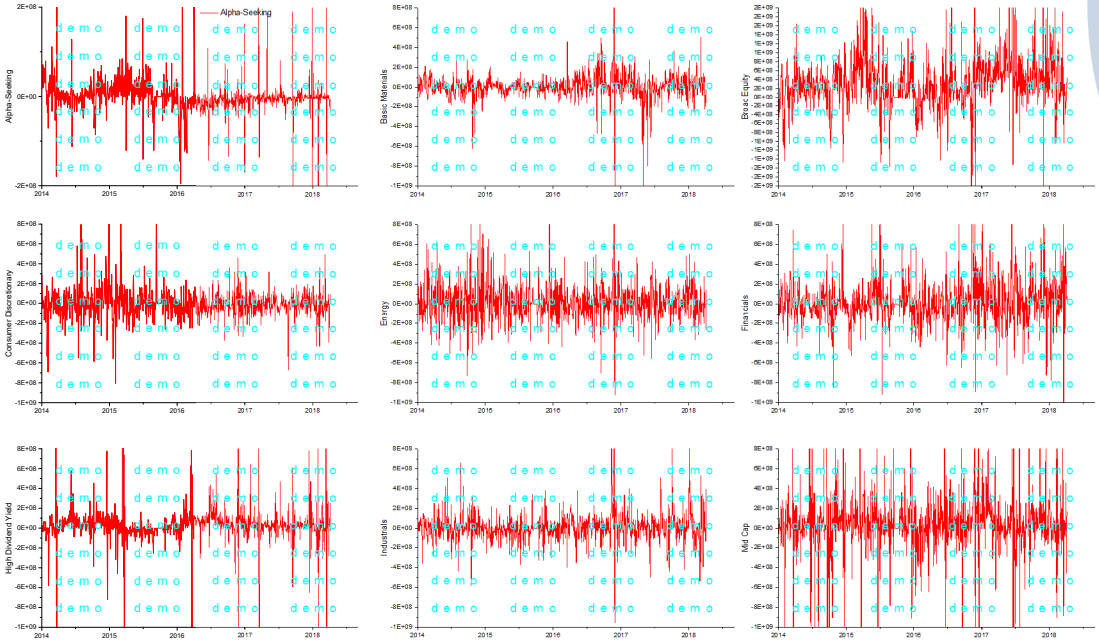
Data Available for Analysis

Source: ETF Global LLC via Quandly

- 1,147 Exchange-Traded Funds
- Timeframe: January 2014 – April 2018
- Variables
    - Assets under Management
    - Daily Flow
    - Net Asset Value
    - Asset Class (e.g., Equity, Commodities, Fixed Income, Currency, etc.)
    - Investment Focus/Theme (e.g., Broad Equity, Technology, High Yield, etc.)
    - Geographic Focus (e.g., Asia-Pacific, North America, Global, etc.)
    - Development Level (e.g., Developed Markets, Emerging Markets, Frontier Markets, etc.)

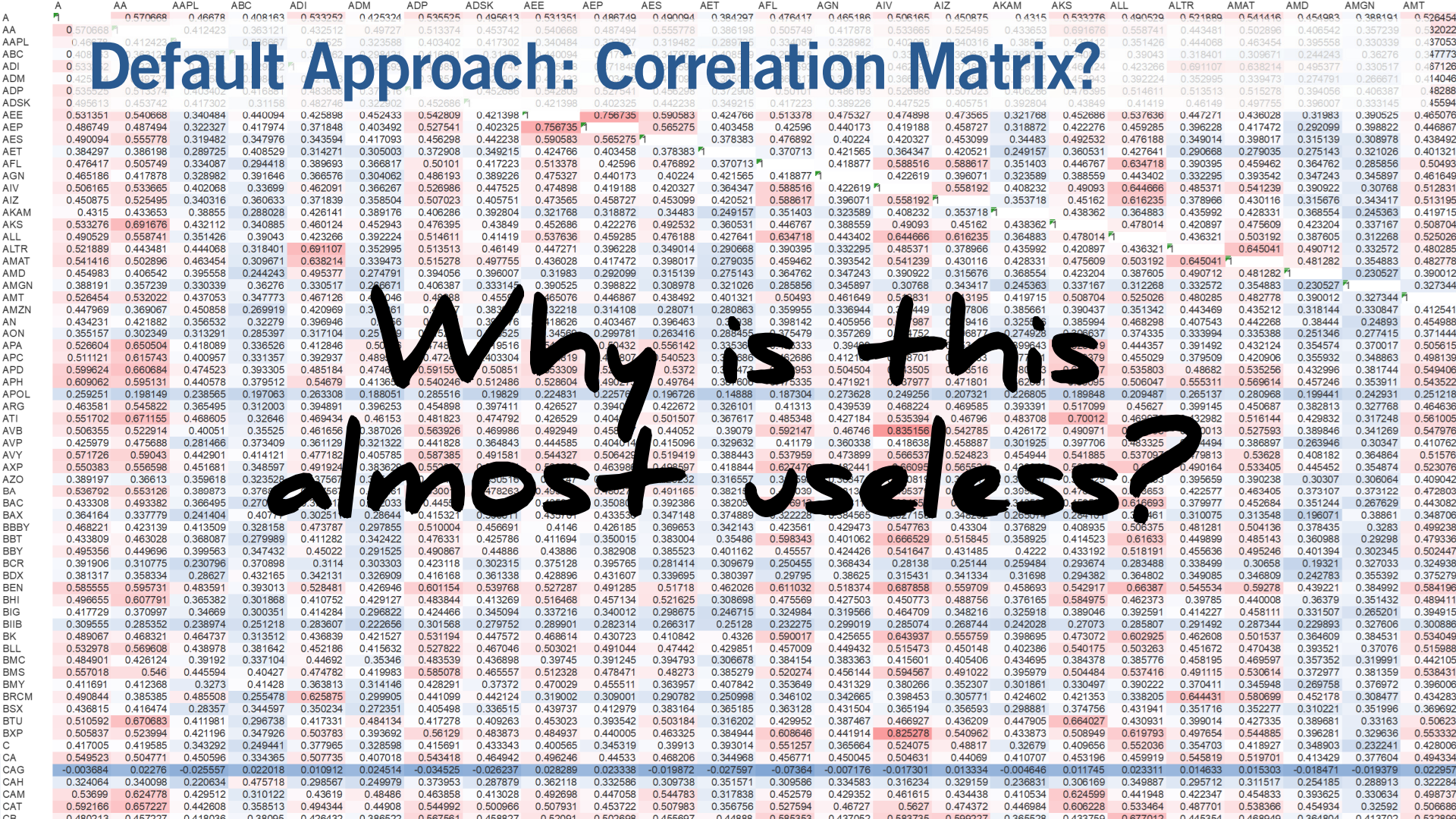
Example: ETF Flows by Investment Focus

9 Investment Focus Areas, e.g., Industrials, Energy, Alpha-Seeking, etc.



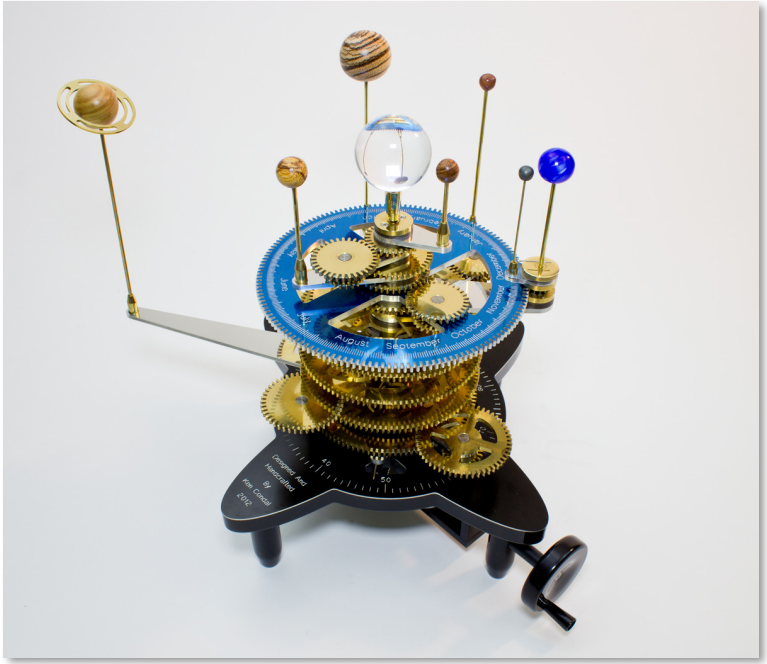
- Daily Flow in U.S. Dollars
- Jan. 2014–Apr. 2018


Deep
Understanding


Default Approach: Correlation Matrix?
Why is this almost useless?

Deep Understanding

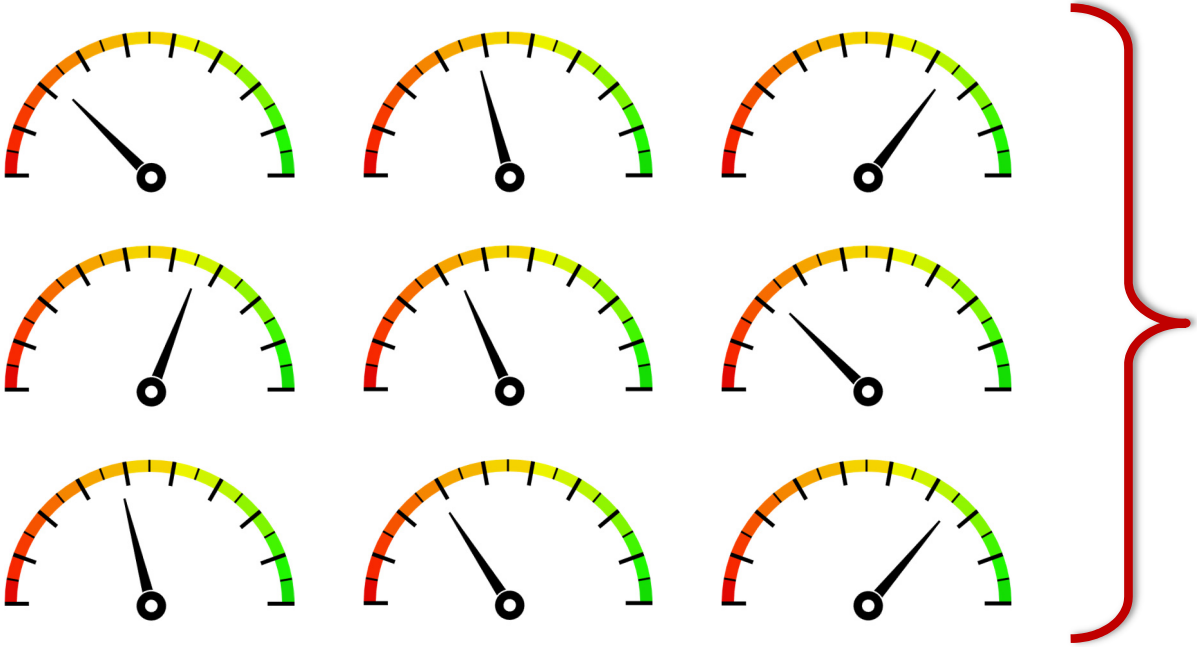
"Deep understanding means knowing, not merely how things behaved yesterday, but also how things will behave under new hypothetical circumstances..."
Judea Pearl, Causality (2009), Cambridge University Press



What if the stars were aligned in a certain way?

Joint Probability Distribution

Capturing the Joint Distribution of 9 Flow Variables:



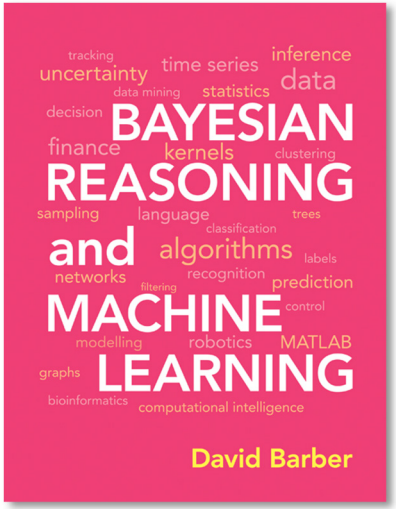
For 9 variables with only 3 states each (negative, zero, positive), we would need a table with 19,682 cells.

Not tractable for dozens, hundreds or thousands of variables!

The New Paradigm: Bayesian Networks

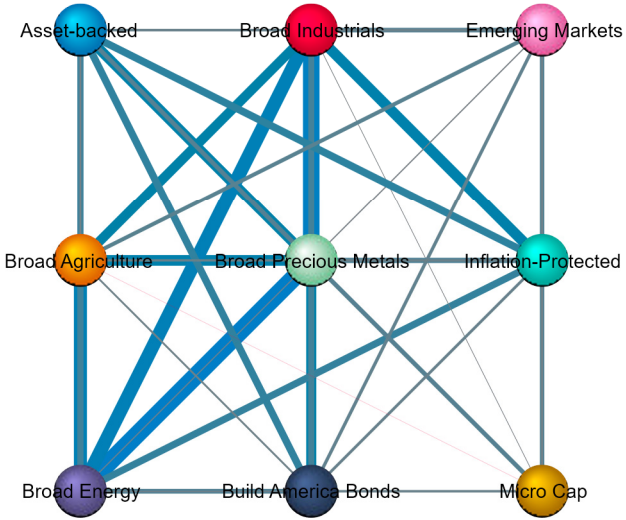
Probabilistic Inference in Structured Distributions

Naively specifying all the entries of a table $p(x_1,\ldots,x_N)$ over binary variables x_i takes $O(2^N)$ space. We will need to deal with large numbers of variables in machine learning and related application areas, with distributions on potentially hundreds if not millions of variables. *The only way to deal with such large distributions is to constrain the nature of the variable interactions in some manner, both to render specification and ultimately inference in such systems tractable. The key idea is to specify which variables are independent of others, leading to a structured factorisation of the joint probability distribution.* Belief Networks are a convenient framework for representing such factorisations into local conditional distributions.

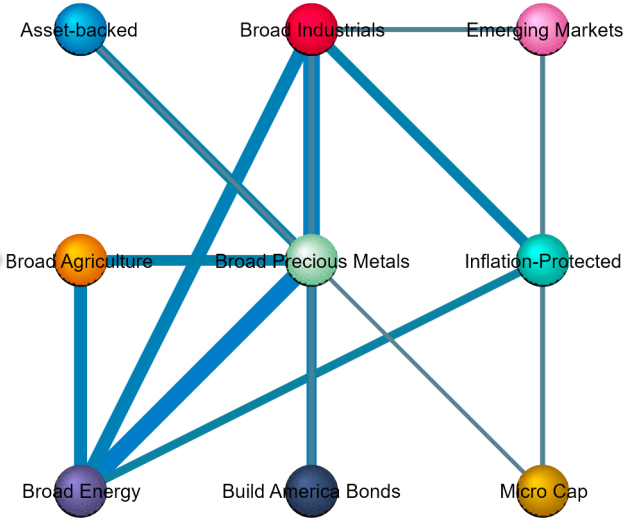


The New Paradigm: Bayesian Networks

Representing the Joint Probability Distribution as a Bayesian Network



Leveraging Independencies



Fully-connected network*
Perfect representation, but **intractable**.

"Learned" network*
Approximate representation, but **tractable**.

*Arc directions are omitted for visual clarity

The New Paradigm: Bayesian Networks

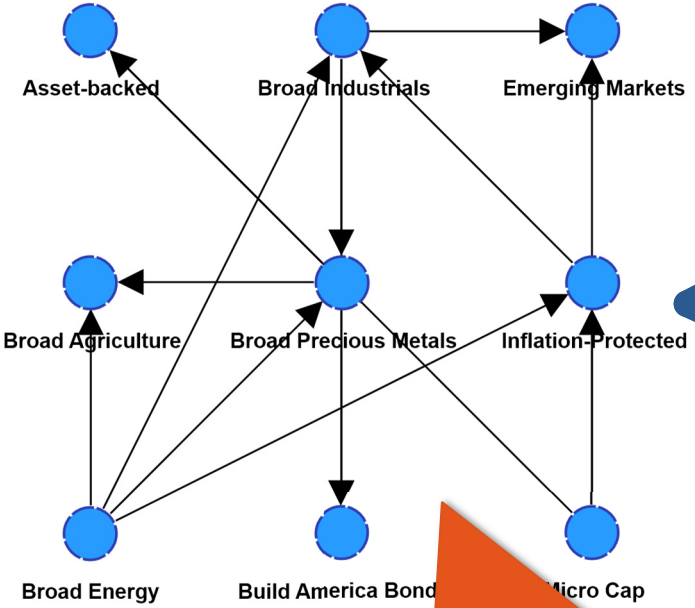
Compare Learning a Bayesian Network to Image Compression

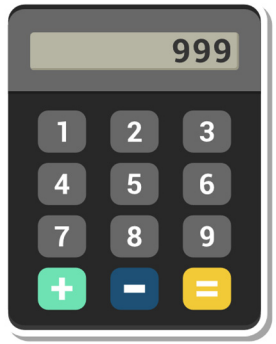
Perfect representation,
but **unmanageably large**.

Approximate representation,
but **tractable**.

The New Paradigm: Bayesian Networks

Benefits of Bayesian Network Representation





Computational Inference

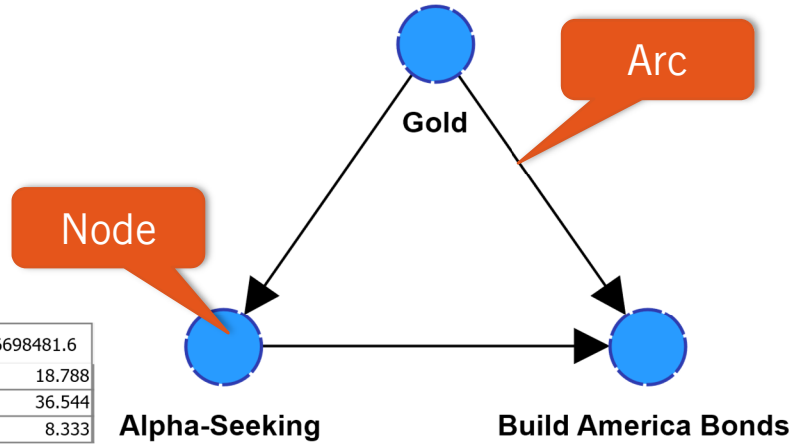
Human Comprehension

Except for the arc directions, this network is directly interpretable.

The New Paradigm: Bayesian Networks

"The Mechanics"

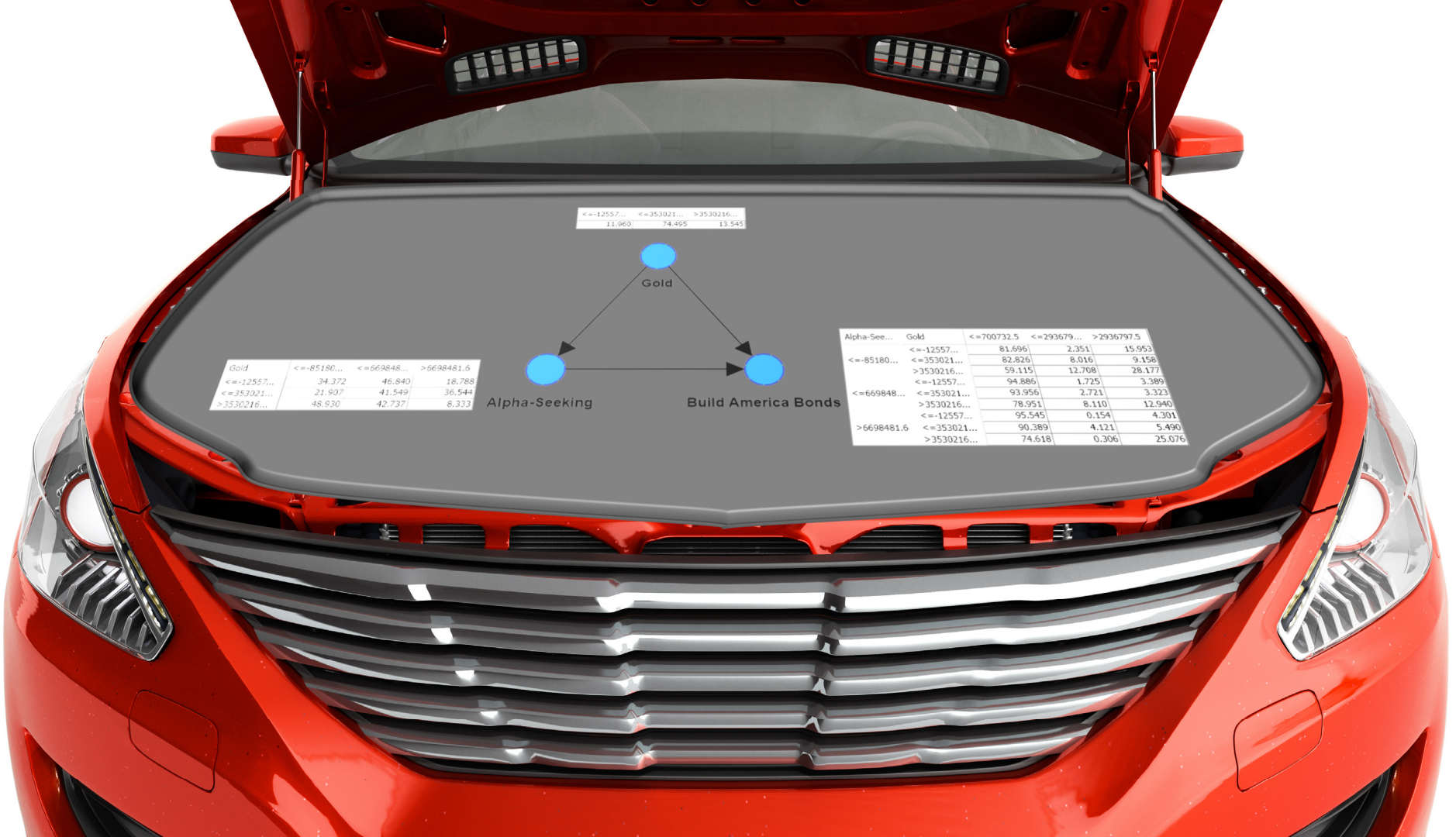
<=-12557...	<=353021...	>3530216...
11.960	74.495	13.545



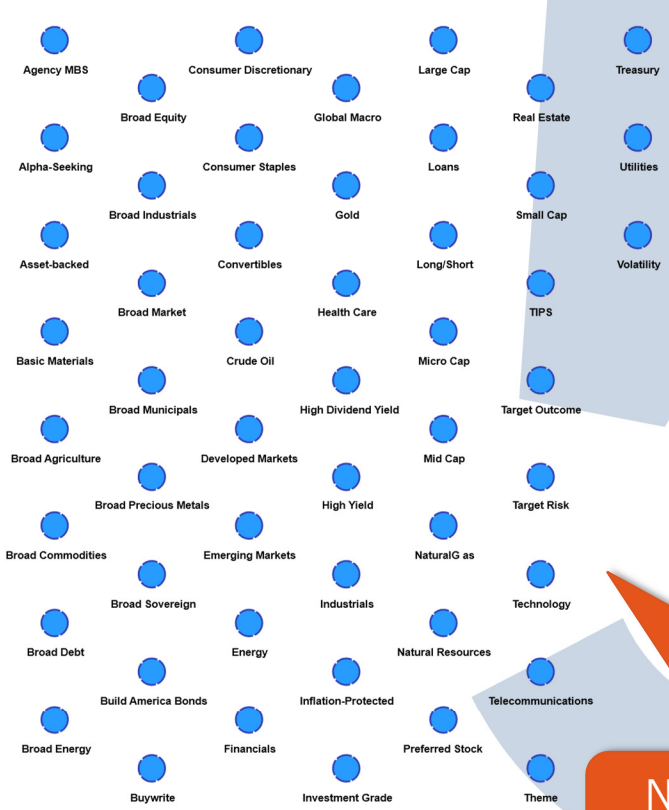
Gold	<=-85180...	<=669848...	>6698481.6
<=-12557...	34.372	46.840	18.788
<=353021...	21.907	41.549	36.544
>3530216...	48.930	42.737	8.333

Conditional Probability Table

Alpha-See...	Gold	<=700732.5	<=293679...	>2936797.5
<=-85180...	<=-12557...	81.696	2.351	15.953
	<=353021...	82.826	8.016	9.158
	>3530216...	59.115	12.708	28.177
<=669848...	<=-12557...	94.886	1.725	3.389
	<=353021...	93.956	2.721	3.323
	>3530216...	78.951	8.110	12.940
>6698481.6	<=-12557...	95.545	0.154	4.301
	<=353021...	90.389	4.121	5.490
	>3530216...	74.618	0.306	25.076


<=-12557... <=353021... >3530216...
11.960 74.495 13.545
Gold
Alpha-Seeking
Build America Bonds
Gold <=-85180... <=669848... >6698481.6
<=-12557... 34.372 46.840 18.788
<=353021... 21.907 41.549 36.544
>3530216... 48.930 42.737 8.333
Alpha-See... Gold <=700732.5 <=293679... >2936797.5
<=-12557... 81.696 2.351 15.953
<=-85180... <=353021... 82.826 8.016 9.158
>3530216... 59.115 12.708 28.177
<=-12557... 94.886 1.725 3.389
<=669848... <=353021... 93.956 2.721 3.323
>3530216... 78.951 8.110 12.940
<=-12557... 95.545 0.154 4.301
>6698481.6 <=353021... 90.389 4.121 5.490
>3530216... 74.618 0.306 25.076

Bayesian Network Learning



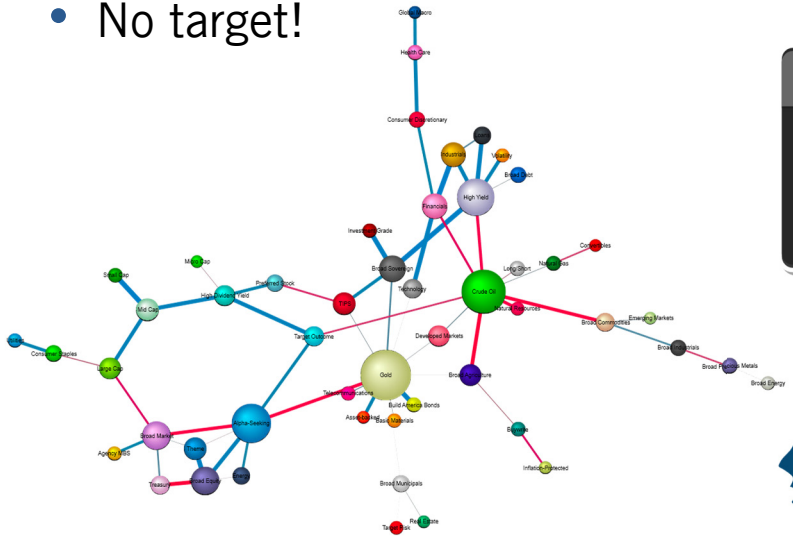
Daily ETF Flow
By Investment Focus

No distinction between dependent and independent variables

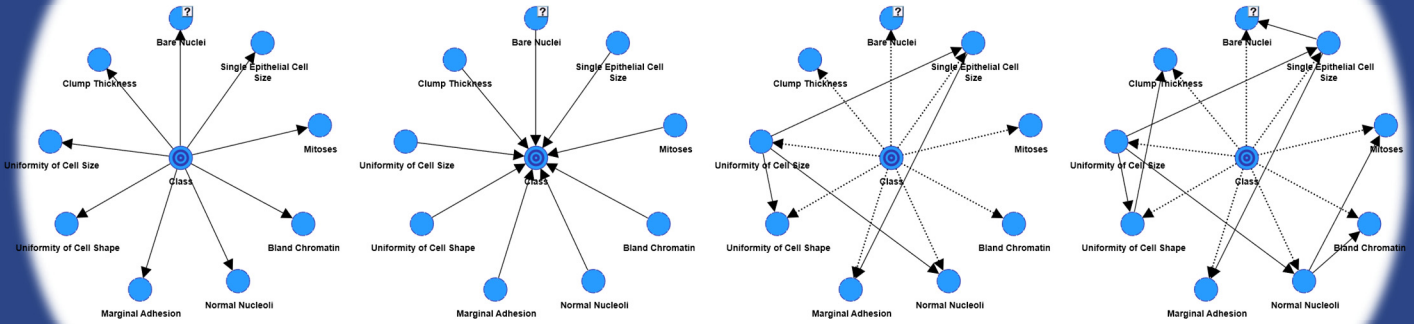
Bayesian Network Learning

Objective

- Learn single model for all 51 variables.
- No target!



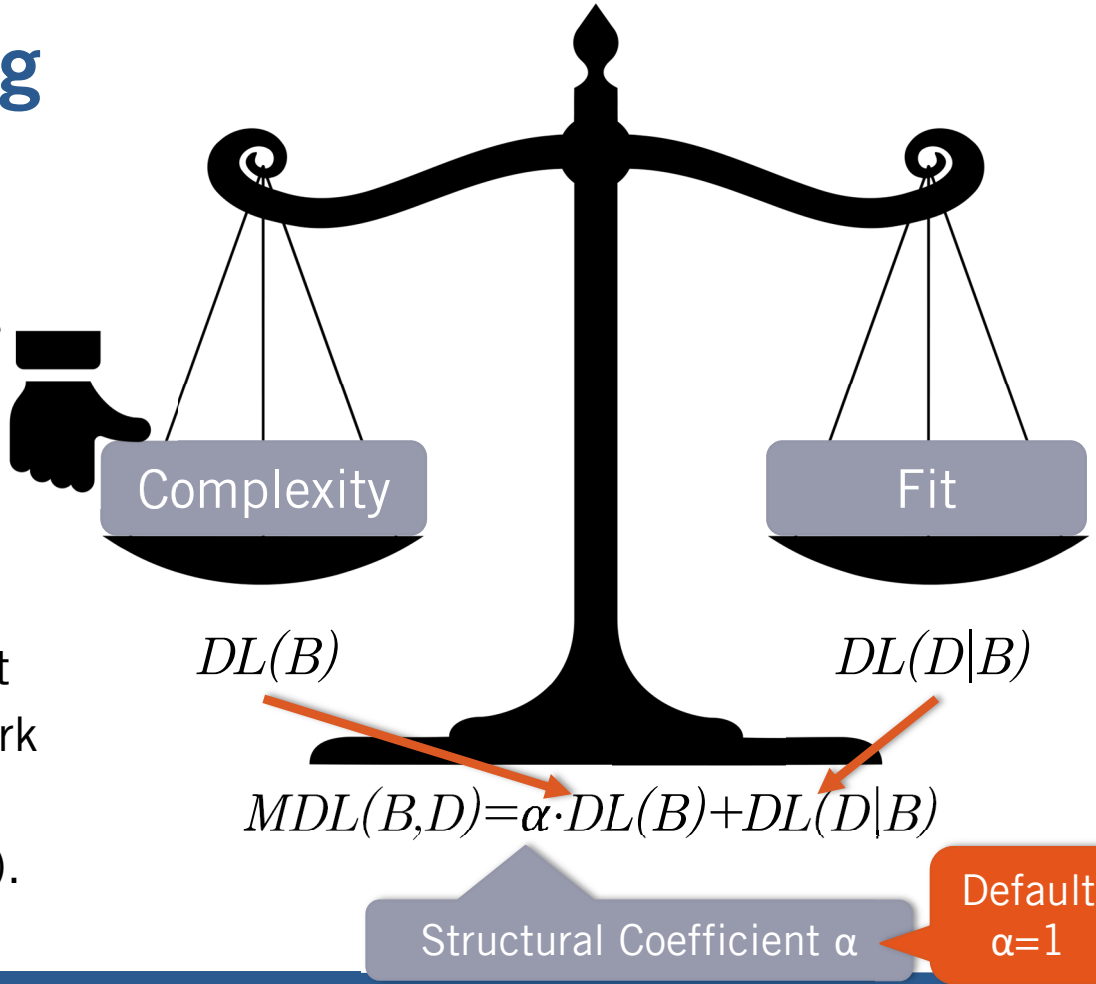
Learning=Searching



Learning=Searching

Minimum Description Length

- $DL(B)$ is the number of bits to represent the Bayesian network B (graph and probabilities), and
- $DL(D|B)$ is the number of bits to represent the dataset D given the Bayesian network B (likelihood of the data given the Bayesian network).



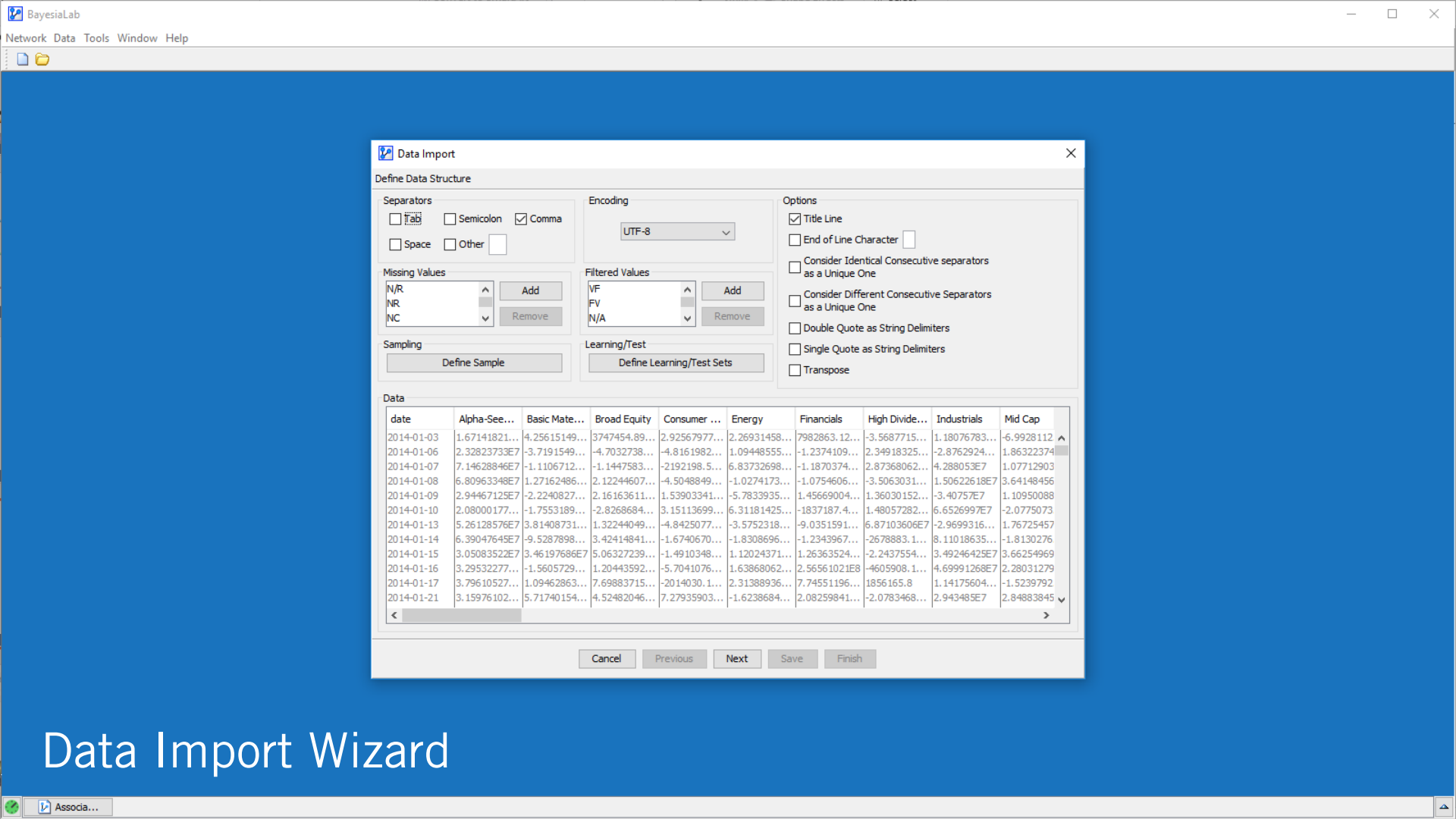
Exchange-Traded Funds

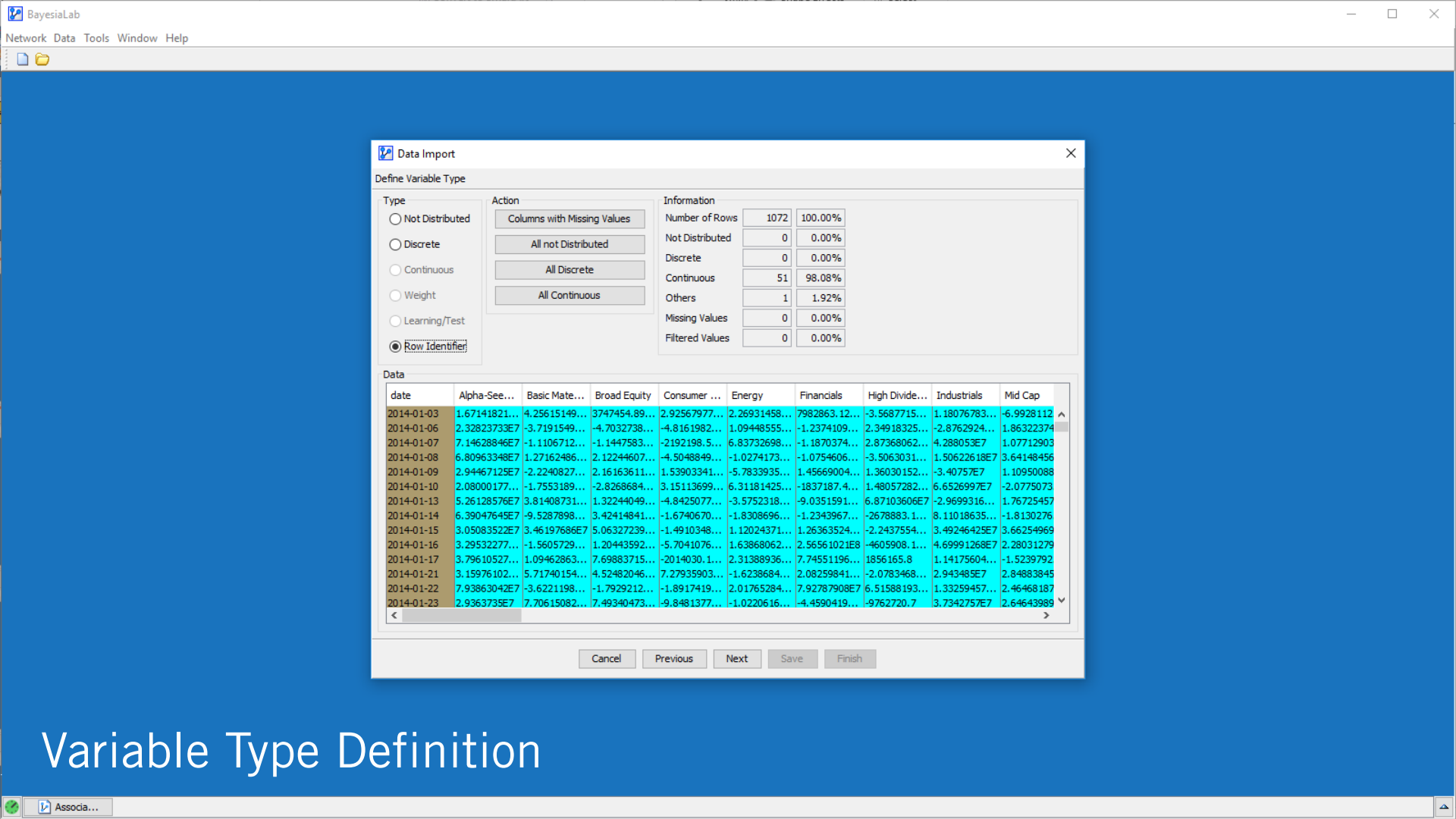
Unsupervised Learning

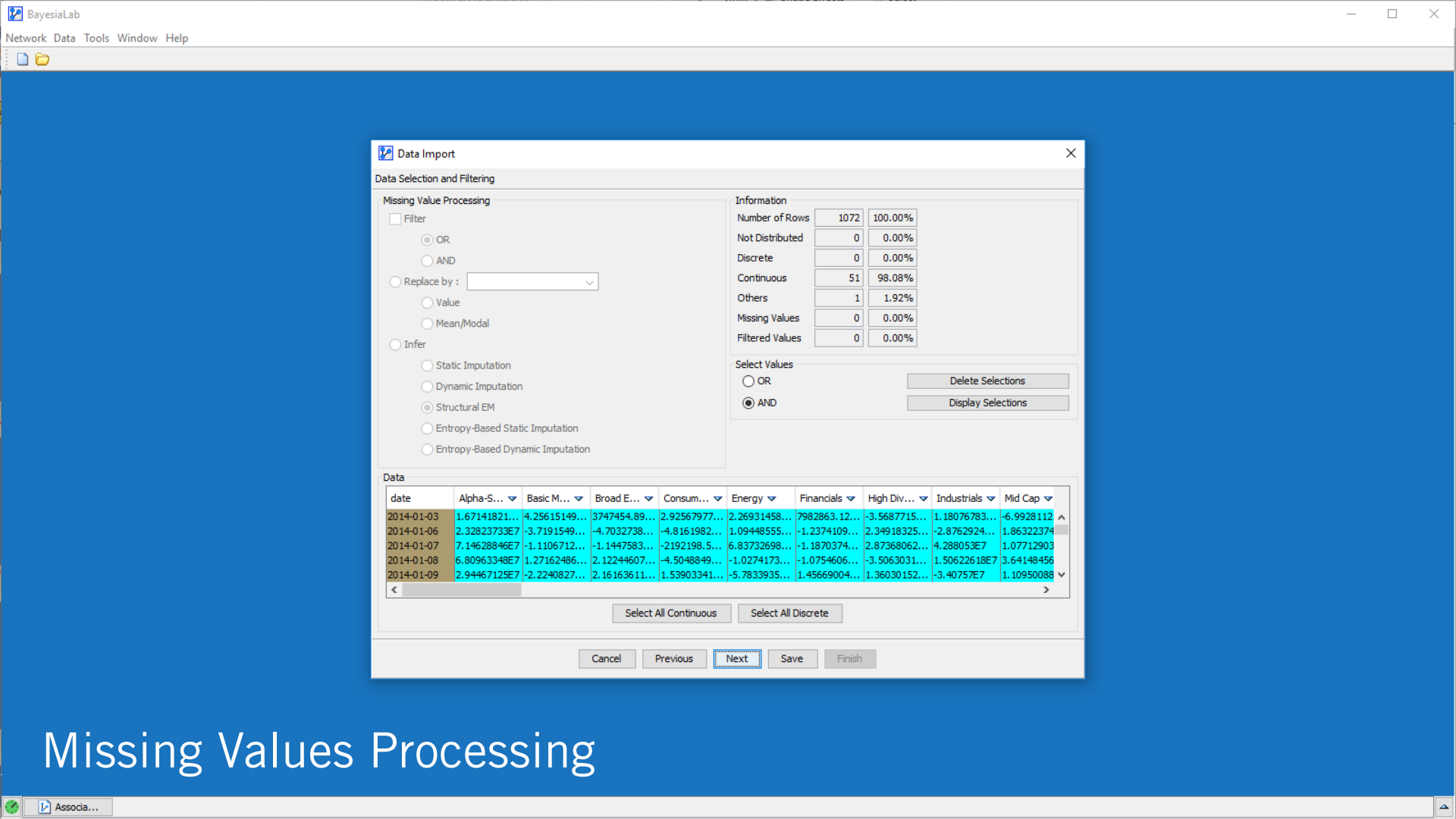
- Analysis of Daily Flow by Investment Focus
    - 51 variables
    - EQ Learning
- Analysis of Daily AUM Change (Assets Under Management) by Ticker Symbol
    - 1,147 Variables
    - Maximum Weight Spanning Tree Learning

51

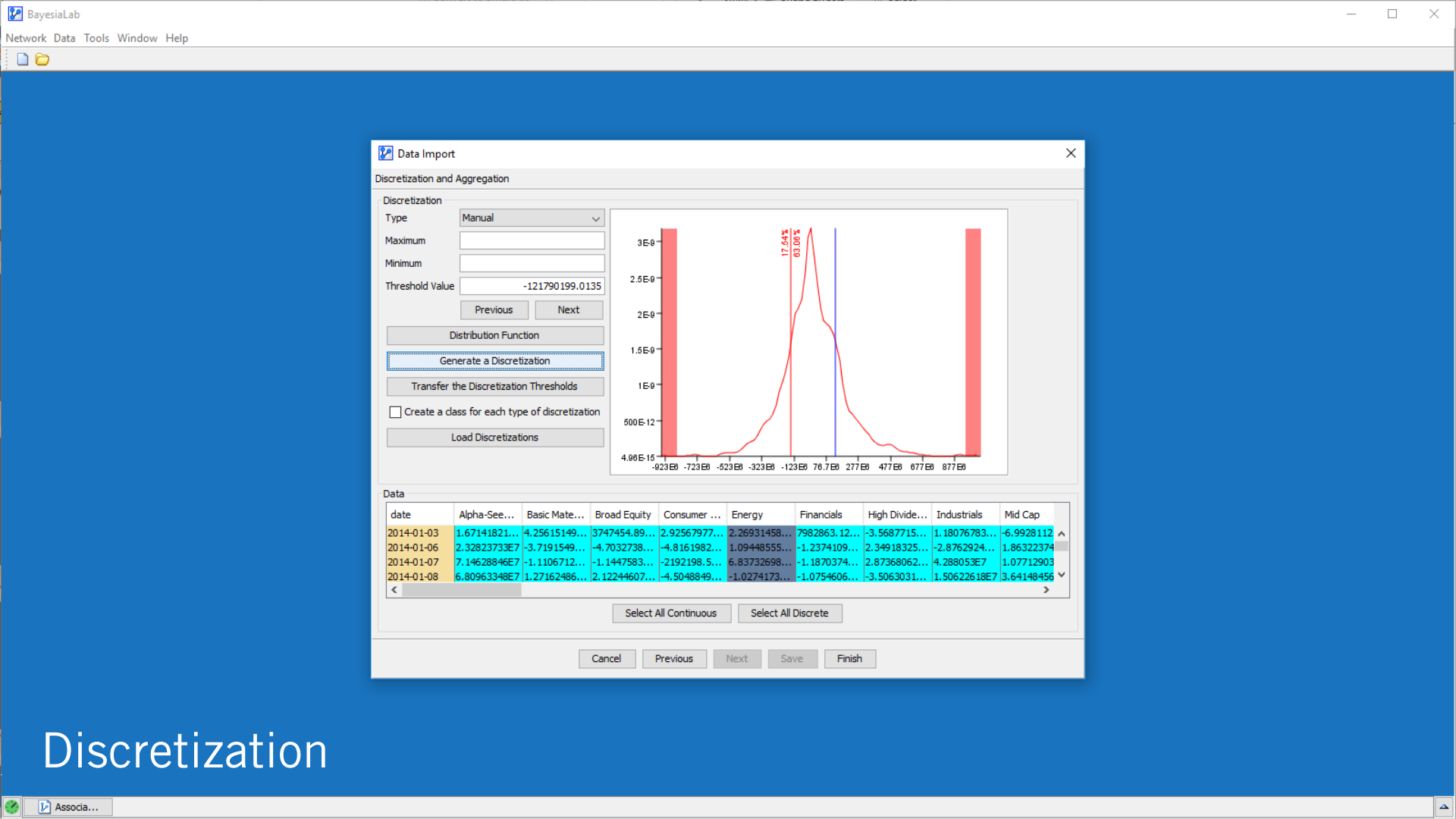
1,147

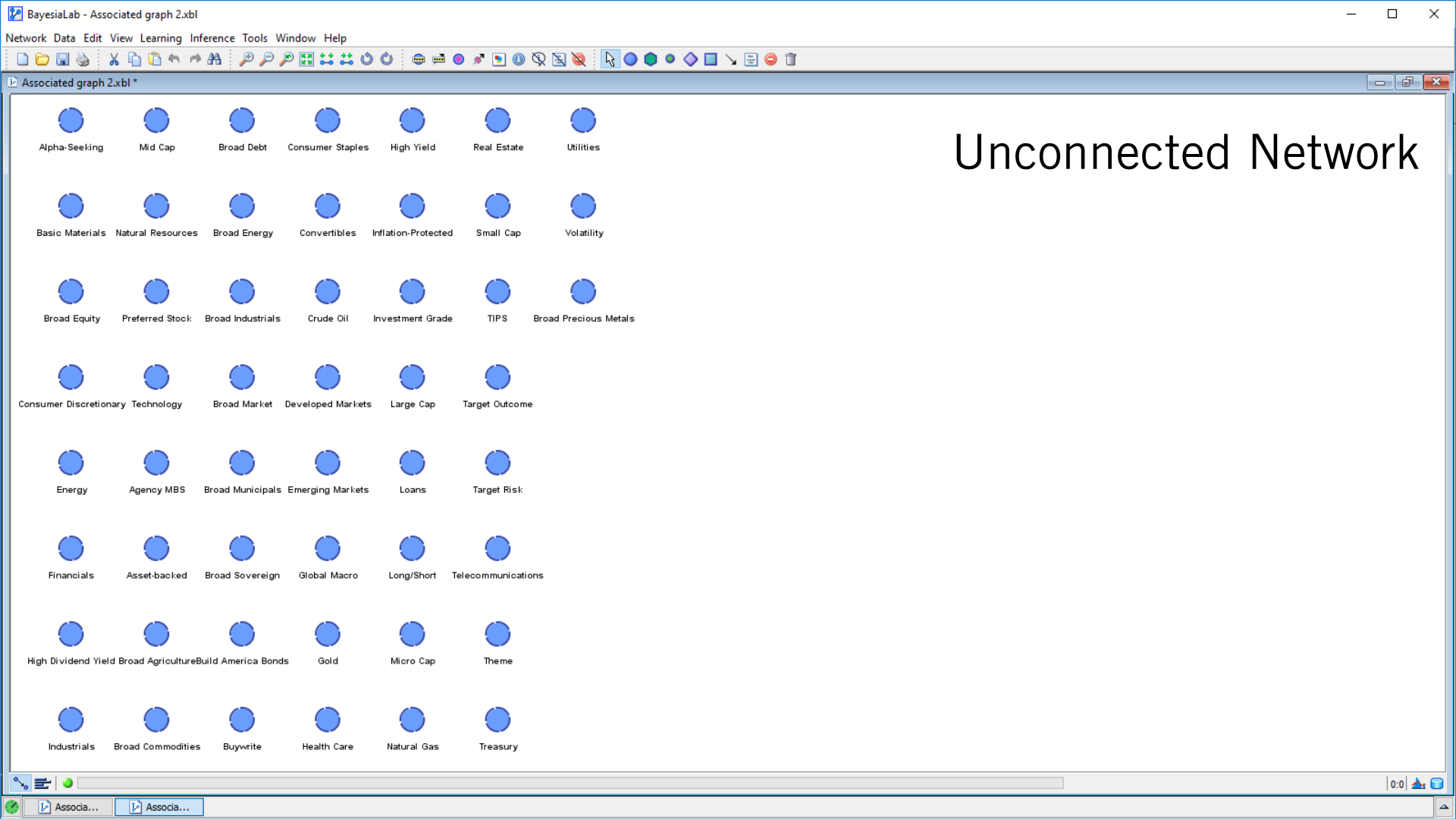

BayesiaLab
Network Data Tools Window Help
Data Import
Define Data Structure
Separators
Tab
Semicolon
Comma
Space
Other
Encoding
UTF-8
Options
Title Line
End of Line Character
Consider Identical Consecutive separators as a Unique One
Consider Different Consecutive Separators as a Unique One
Double Quote as String Delimiters
Single Quote as String Delimiters
Transpose
Missing Values
N/R
NR
NC
Add
Remove
Filtered Values
VF
FV
N/A
Add
Remove
Sampling
Define Sample
Learning/Test
Define Learning/Test Sets
Data
date
Alpha-See...
Basic Mate...
Broad Equity
Consumer ...
Energy
Financials
High Divide...
Industrials
Mid Cap
2014-01-03 1.67141821... 4.25615149... 3747454.89... 2.92567977... 2.26931458... 7982863.12... -3.5687715... 1.18076783... -6.9928112
2014-01-06 2.32823733E7 -3.7191549... -4.7032738... -4.8161982... 1.09448555... -1.2374109... 2.34918325... -2.8762924... 1.86322374
2014-01-07 7.14628846E7 -1.1106712... -1.1447583... -2192198.5... 6.83732698... -1.1870374... 2.87368062... 4.288053E7 1.07712903
2014-01-08 6.80963348E7 1.27162486... 2.12244607... -4.5048849... -1.0274173... -1.0754606... -3.5063031... 1.50622618E7 3.64148456
2014-01-09 2.94467125E7 -2.2240827... 2.16163611... 1.53903341... -5.7833935... 1.45669004... 1.36030152... -3.40757E7 1.10950088
2014-01-10 2.08000177... -1.7553189... -2.8268684... 3.15113699... 6.31181425... -1837187.4... 1.48057282... 6.6526997E7 -2.0775073
2014-01-13 5.26128576E7 3.81408731... 1.32244049... -4.8425077... -3.5752318... -9.0351591... 6.87103606E7 -2.9699316... 1.76725457
2014-01-14 6.39047645E7 -9.5287898... 3.42414841... -1.6740670... -1.8308696... -1.2343967... -2678883.1... 8.11018635... -1.8130276
2014-01-15 3.05083522E7 3.46197686E7 5.06327239... -1.4910348... 1.12024371... 1.26363524... -2.2437554... 3.49246425E7 3.66254969
2014-01-16 3.29532277... -1.5605729... 1.20443592... -5.7041076... 1.63868062... 2.56561021E8 -4605908.1... 4.69991268E7 2.28031279
2014-01-17 3.79610527... 1.09462863... 7.69883715... -2014030.1... 2.31388936... 7.74551196... 1856165.8 1.14175604... -1.5239792
2014-01-21 3.15976102... 5.71740154... 4.52482046... 7.27935903... -1.6238684... 2.08259841... -2.0783468... 2.943485E7 2.84883845
Cancel
Previous
Next
Save
Finish
Data Import Wizard
Associa...

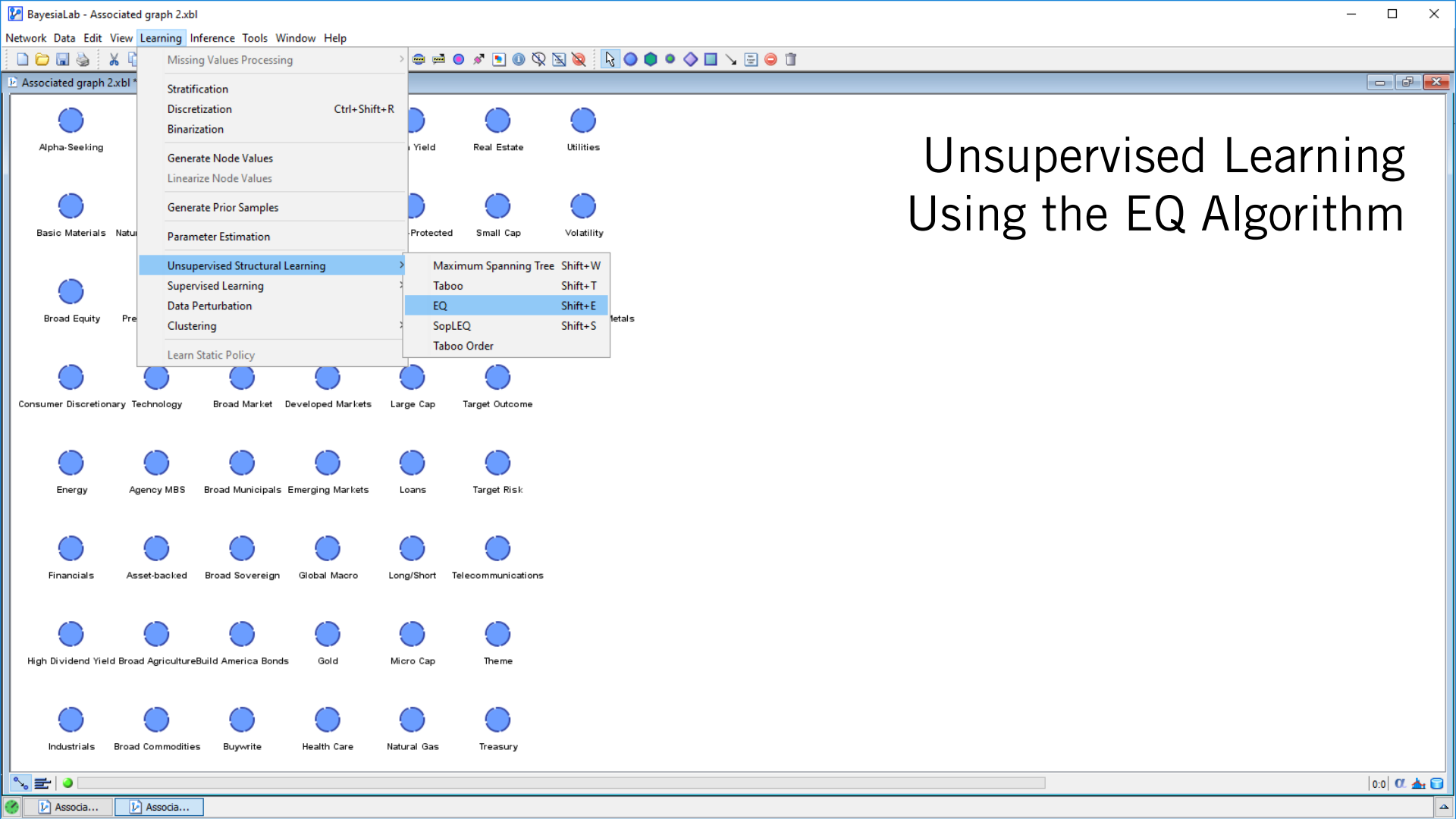

BayesiaLab
Network Data Tools Window Help
Data Import
Define Variable Type
Type
Not Distributed
Discrete
Continuous
Weight
Learning/Test
Row Identifier
Action
Columns with Missing Values
All not Distributed
All Discrete
All Continuous
Information
Number of Rows 1072 100.00%
Not Distributed 0 0.00%
Discrete 0 0.00%
Continuous 51 98.08%
Others 1 1.92%
Missing Values 0 0.00%
Filtered Values 0 0.00%
Data
date Alpha-See... Basic Mate... Broad Equity Consumer ... Energy Financials High Divide... Industrials Mid Cap
2014-01-03 1.67141821... 4.25615149... 3747454.89... 2.92567977... 2.26931458... 7982863.12... -3.5687715... 1.18076783... -6.9928112
2014-01-06 2.32823733E7 -3.7191549... -4.7032738... -4.8161982... 1.09448555... -1.2374109... 2.34918325... -2.8762924... 1.86322374
2014-01-07 7.14628846E7 -1.1106712... -1.1447583... -2192198.5... 6.83732698... -1.1870374... 2.87368062... 4.288053E7 1.07712903
2014-01-08 6.80963348E7 1.27162486... 2.12244607... -4.5048849... -1.0274173... -1.0754606... -3.5063031... 1.50622618E7 3.64148456
2014-01-09 2.94467125E7 -2.2240827... 2.16163611... 1.53903341... -5.7833935... 1.45669004... 1.36030152... -3.40757E7 1.10950088
2014-01-10 2.08000177... -1.7553189... -2.8268684... 3.15113699... 6.31181425... -1837187.4... 1.48057282... 6.6526997E7 -2.0775073
2014-01-13 5.26128576E7 3.81408731... 1.32244049... -4.8425077... -3.5752318... -9.0351591... 6.87103606E7 -2.9699316... 1.76725457
2014-01-14 6.39047645E7 -9.5287898... 3.42414841... -1.6740670... -1.8308696... -1.2343967... -2678883.1... 8.11018635... -1.8130276
2014-01-15 3.05083522E7 3.46197686E7 5.06327239... -1.4910348... 1.12024371... 1.26363524... -2.2437554... 3.49246425E7 3.66254969
2014-01-16 3.29532277... -1.5605729... 1.20443592... -5.7041076... 1.63868062... 2.56561021E8 -4605908.1... 4.69991268E7 2.28031279
2014-01-17 3.79610527... 1.09462863... 7.69883715... -2014030.1... 2.31388936... 7.74551196... 1856165.8 1.14175604... -1.5239792
2014-01-21 3.15976102... 5.71740154... 4.52482046... 7.27935903... -1.6238684... 2.08259841... -2.0783468... 2.943485E7 2.84883845
2014-01-22 7.93863042E7 -3.6221198... -1.7929212... -1.8917419... 2.01765284... 7.92787908E7 6.51588193... 1.33259457... 2.46468187
2014-01-23 2.9363735E7 7.70615082... 7.49340473... -9.8481377... -1.0220616... -4.4590419... -9762720.7 3.7342757E7 2.64643989
Cancel
Previous
Next
Save
Finish
Variable Type Definition
Associa...



Missing Values Processing


BayesiaLab
Network Data Tools Window Help
Data Import
Discretization and Aggregation
Discretization
Type
Manual
Maximum
Minimum
Threshold Value
-121790199.0135
Previous
Next
Distribution Function
Generate a Discretization
Transfer the Discretization Thresholds
Create a class for each type of discretization
Load Discretizations
3E-9
2.5E-9
2E-9
1.5E-9
1E-9
500E-12
4.96E-15
17.64%
63.00%
-923E0 -723E0 -523E0 -323E0 -123E0 76.7E0 277E0 477E0 677E0 877E0
Data
date
Alpha-See...
Basic Mate...
Broad Equity
Consumer ...
Energy
Financials
High Divide...
Industrials
Mid Cap
2014-01-03
1.67141821...
4.25615149...
3747454.89...
2.92567977...
2.26931458...
7982863.12...
-3.5687715...
1.18076783...
-6.9928112
2014-01-06
2.32823733E7
-3.7191549...
-4.7032738...
-4.8161982...
1.09448555...
-1.2374109...
2.34918325...
-2.8762924...
1.86322374
2014-01-07
7.14628846E7
-1.1106712...
-1.1447583...
-2192198.5...
6.83732698...
-1.1870374...
2.87368062...
4.288053E7
1.07712903
2014-01-08
6.80963348E7
1.27162486...
2.12244607...
-4.5048849...
-1.0274173...
-1.0754606...
-3.5063031...
1.50622618E7
3.64148456
Select All Continuous
Select All Discrete
Cancel
Previous
Next
Save
Finish
Discretization
Associa...

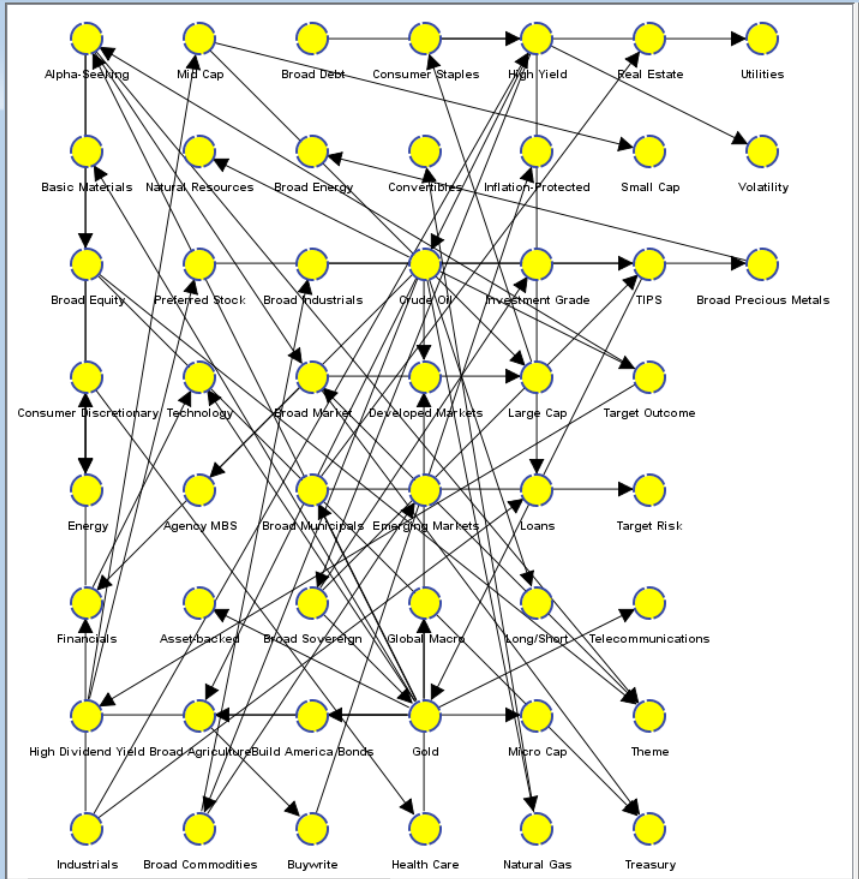

BayesiaLab - Associated graph 2.xbl
Network Data Edit View Learning Inference Tools Window Help
Associated graph 2.xbl *
Alpha-Seeking
Mid Cap
Broad Debt
Consumer Staples
High Yield
Real Estate
Utilities
Basic Materials
Natural Resources
Broad Energy
Convertibles
Inflation-Protected
Small Cap
Volatility
Broad Equity
Preferred Stock
Broad Industrials
Crude Oil
Investment Grade
TIPS
Broad Precious Metals
Consumer Discretionary
Technology
Broad Market
Developed Markets
Large Cap
Target Outcome
Energy
Agency MBS
Broad Municipals
Emerging Markets
Loans
Target Risk
Financials
Asset-backed
Broad Sovereign
Global Macro
Long/Short
Telecommunications
High Dividend Yield
Broad Agriculture
Build America Bonds
Gold
Micro Cap
Theme
Industrials
Broad Commodities
Buywrite
Health Care
Natural Gas
Treasury
Unconnected Network
0:0


BayesiaLab - Associated graph 2.xbl
Network Data Edit View Learning Inference Tools Window Help
Missing Values Processing
Stratification
Discretization Ctrl+Shift+R
Binarization
Generate Node Values
Linearize Node Values
Generate Prior Samples
Parameter Estimation
Unsupervised Structural Learning
Supervised Learning
Data Perturbation
Clustering
Learn Static Policy
Maximum Spanning Tree Shift+W
Taboo Shift+T
EQ Shift+E
SopLEQ Shift+S
Taboo Order
Unsupervised Learning
Using the EQ Algorithm

BayesiaLab - Associated graph 2.xbl

Network Data Edit View Learning Inference Analysis Monitor Tools Window Help

Associated graph 2.xbl *



Joint Probability: 100.00%
Log-Loss: 0
Cases: 1,072
Total Value: 1,148,603,364.345
Mean Value: 22,521,634.595

Large Cap
Mean: 2.12E8 Dev: 2.41E9
Value: 212309206.733

25.53%	<=-7792257...
50.16%	<=13078548...
24.32%	>130785482...

Financials
Mean: 2.64E7 Dev: 2.79E8
Value: 26405631.273

18.29%	<=-1259778...
58.58%	<=12898261...
23.13%	>12898261...

Technology
Mean: 1.74E7 Dev: 1.78E8
Value: 17431867.829

17.75%	<=-7263
58.96%	<=98153
23.29%	>981537

Alpha-Seeking
Mean: 620238.203 Dev: 50867986.287
Value: 620238.203

27.15%	<=-8518004.8
42.62%	<=6698481.6
30.23%	>6698481.6

High Dividend Yield
Mean: 3.49E7 Dev: 2.94E8
Value: 34892604.038

13.82%	<=-4924546...
63.59%	<=84228003.2
22.58%	>84228003.2

Agency MBS
Mean: 1.02E7 Dev: 3.99E7
Value: 10154047.087

8.60%	<=-6941
64.80%	<=15723
26.60%	>157230

Basic Materials
Mean: 1.08E7 Dev: 1.33E8
Value: 10772038.206

17.46%	<=-5514674...
63.49%	<=75706016...
19.05%	>75706016....

Industrials
Mean: 9.52E6 Dev: 1.47E8
Value: 9519560.941

27.24%	<=-4683420...
51.48%	<=78970664...
21.28%	>78970664....

Asset-backed
Mean: 157919.909 Dev: 2611205.
Value: 157919.909

94.53%	<=12228
3.29%	<=30347
2.18%	>303470

Broad Equity
Mean: 3.23E8 Dev: 8.49E8
Value: 323302403.974

16.90%	<=-7324353...
69.75%	<=86679947...
13.35%	>866799478...

Mid Cap
Mean: 5.25E7 Dev: 4.40E8
Value: 52524807.362

14.66%	<=-1307263...
61.73%	<=14983082...
23.61%	>149830825...

Broad Agriculture
Mean: -31866.441 Dev: 5302705.
Value: -31866.441

7.04%	<=-2834
86.75%	<=72642
6.22%	>726424

Consumer Discretionary
Mean: 1.05E6 Dev: 1.48E8
Value: 1047617.721

23.99%	<=-6601776...
48.39%	<=51220443...
27.61%	>51220443....

Natural Resources
Mean: 449444.288 Dev: 24318412.510
Value: 449444.288

22.59%	<=-4574185...
52.22%	<=7877495.75
25.19%	>7877495.75

Broad Commodities
Mean: 388939.051 Dev: 22361506
Value: 388939.051

12.52%	<=-5876
74.13%	<=64820
13.36%	>648206

Energy
Mean: 2.27E7 Dev: 1.92E8
Value: 22700681.669

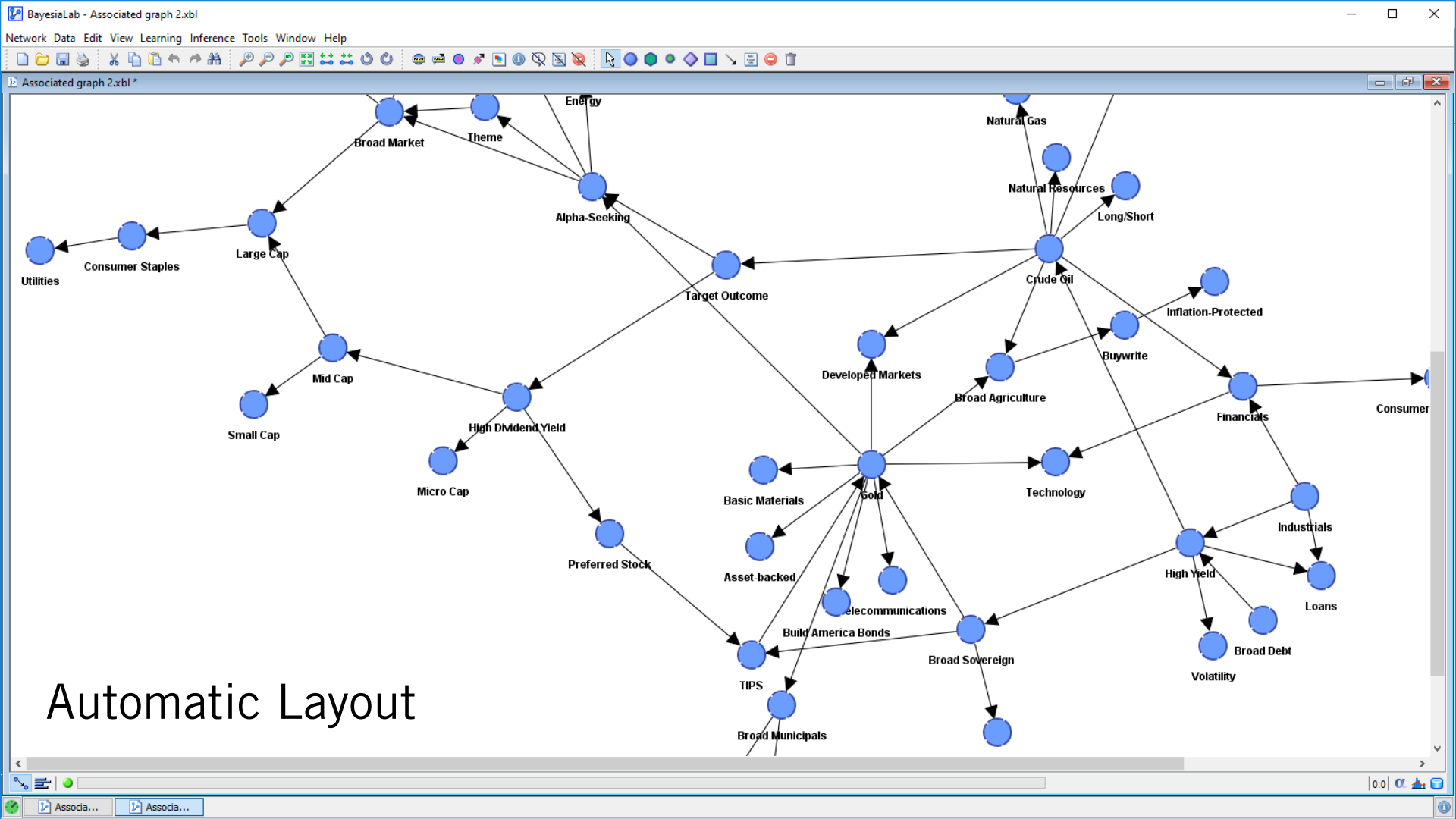
17.55%	<=-1217901...
63.07%	<=15528400...
19.38%	>155284005...

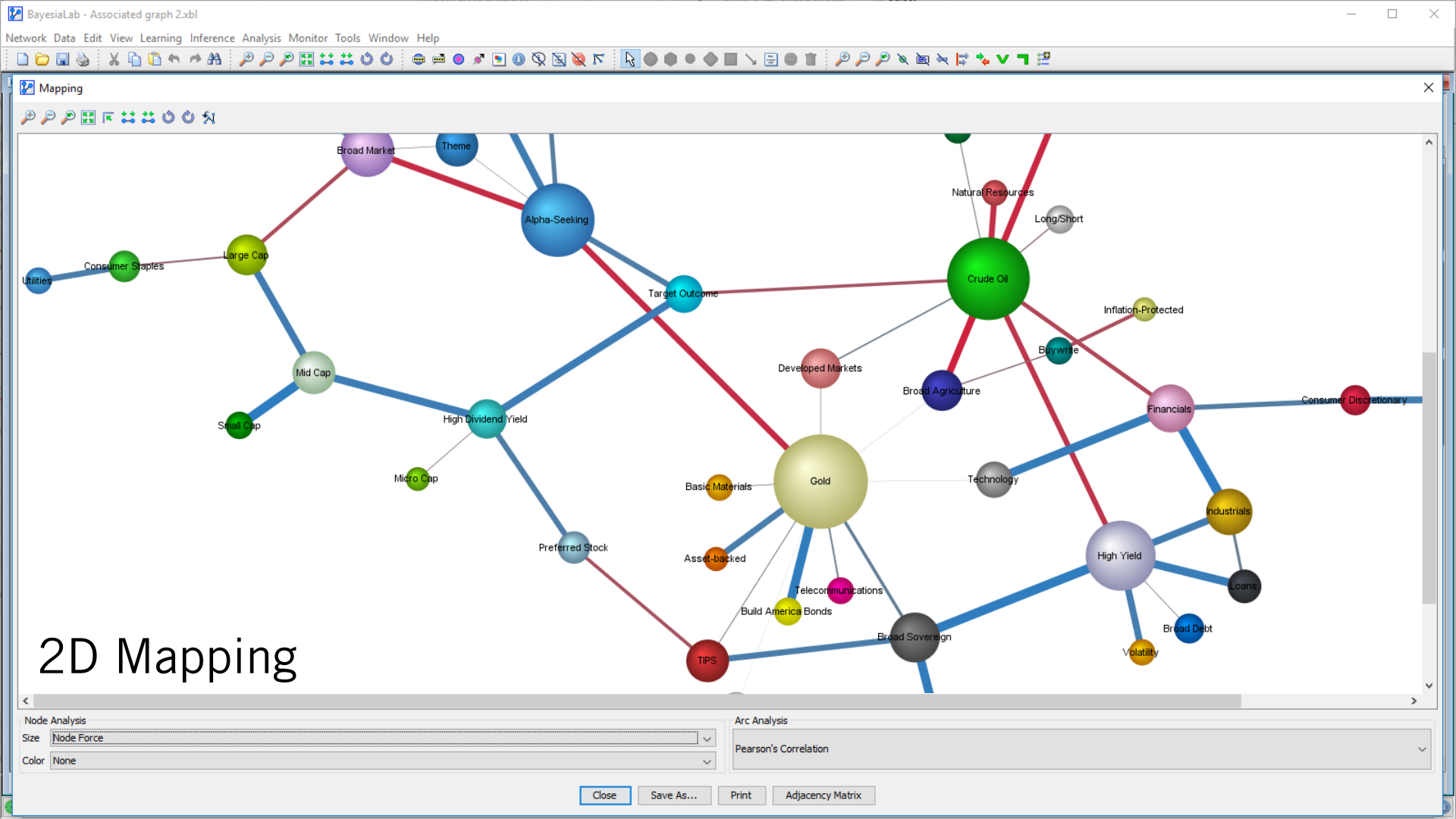
Preferred Stock
Mean: 1.37E7 Dev: 3.59E7
Value: 13705060.425

15.22%	<=-5857240
61.07%	<=29331080
23.70%	>29331080

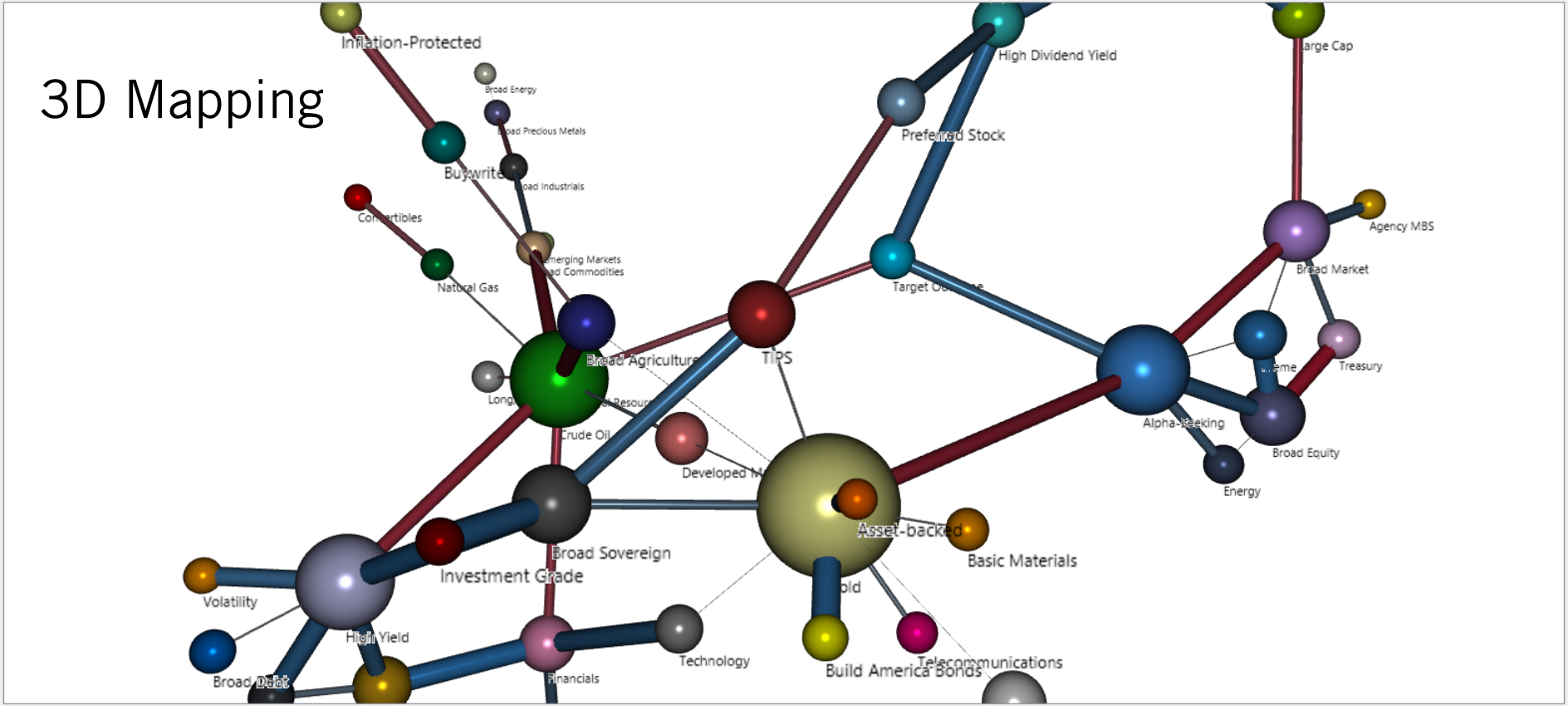
Broad Debt
Mean: 8.25E7 Dev: 1.58E8
Value: 82478142.524

11.21%	<=-1658
63.31%	<=12616
25.47%	>126164


BayesiaLab - Associated graph 2.xbl
Network Data Edit View Learning Inference Tools Window Help
Associated graph 2.xbl *
Energy
Natural Gas
Broad Market
Theme
Natural Resources
Long/Short
Alpha-Seeking
Large Cap
Utilities
Consumer Staples
Target Outcome
Crude Oil
Inflation-Protected
Developed Markets
Buywrite
Broad Agriculture
Mid Cap
Small Cap
High Dividend Yield
Financials
Micro Cap
Basic Materials
Gold
Technology
Industrials
Preferred Stock
Asset-backed
High Yield
Loans
Build America Bonds
Broad Sovereign
Broad Debt
Volatility
TIPS
Broad Municipals
Automatic Layout


BayesiaLab - Associated graph 2.xbl
Network Data Edit View Learning Inference Analysis Monitor Tools Window Help
Mapping
Broad Market
Theme
Alpha-Seeking
Natural Resources
Long/Short
Large Cap
Consumer Staples
Utilities
Target Outcome
Crude Oil
Inflation-Protected
Buywrite
Mid Cap
Developed Markets
Broad Agriculture
Financials
Consumer Discretionary
Small Cap
High Dividend Yield
Micro Cap
Basic Materials
Gold
Technology
Industrials
Preferred Stock
Asset-backed
High Yield
Loans
Telecommunications
Build America Bonds
Broad Debt
Broad Sovereign
Volatility
TIPS
2D Mapping
Node Analysis
Size
Node Force
Color
None
Arc Analysis
Pearson's Correlation
Close
Save As...
Print
Adjacency Matrix

Mapping



Node Analysis

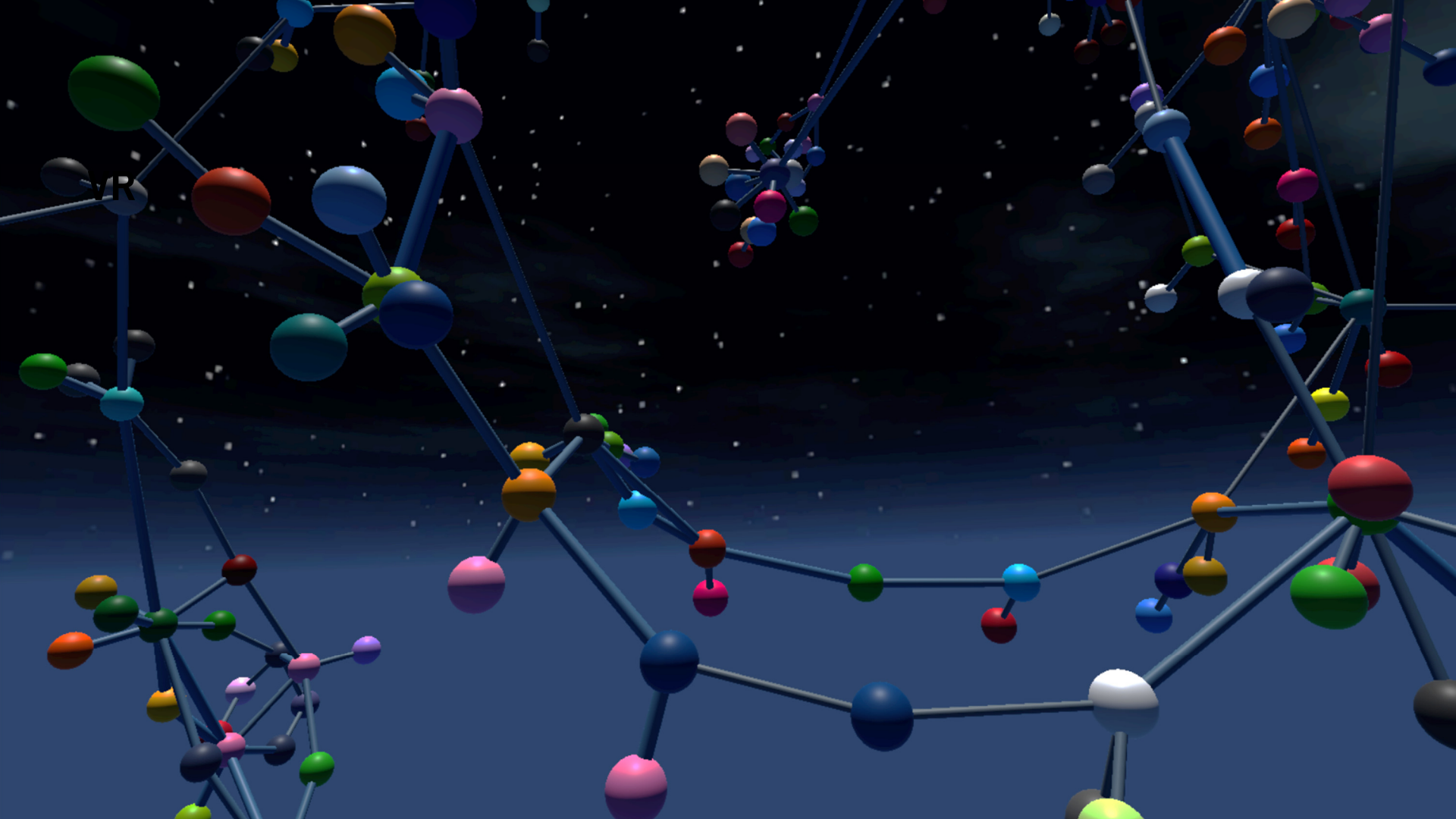
Size: Node Force

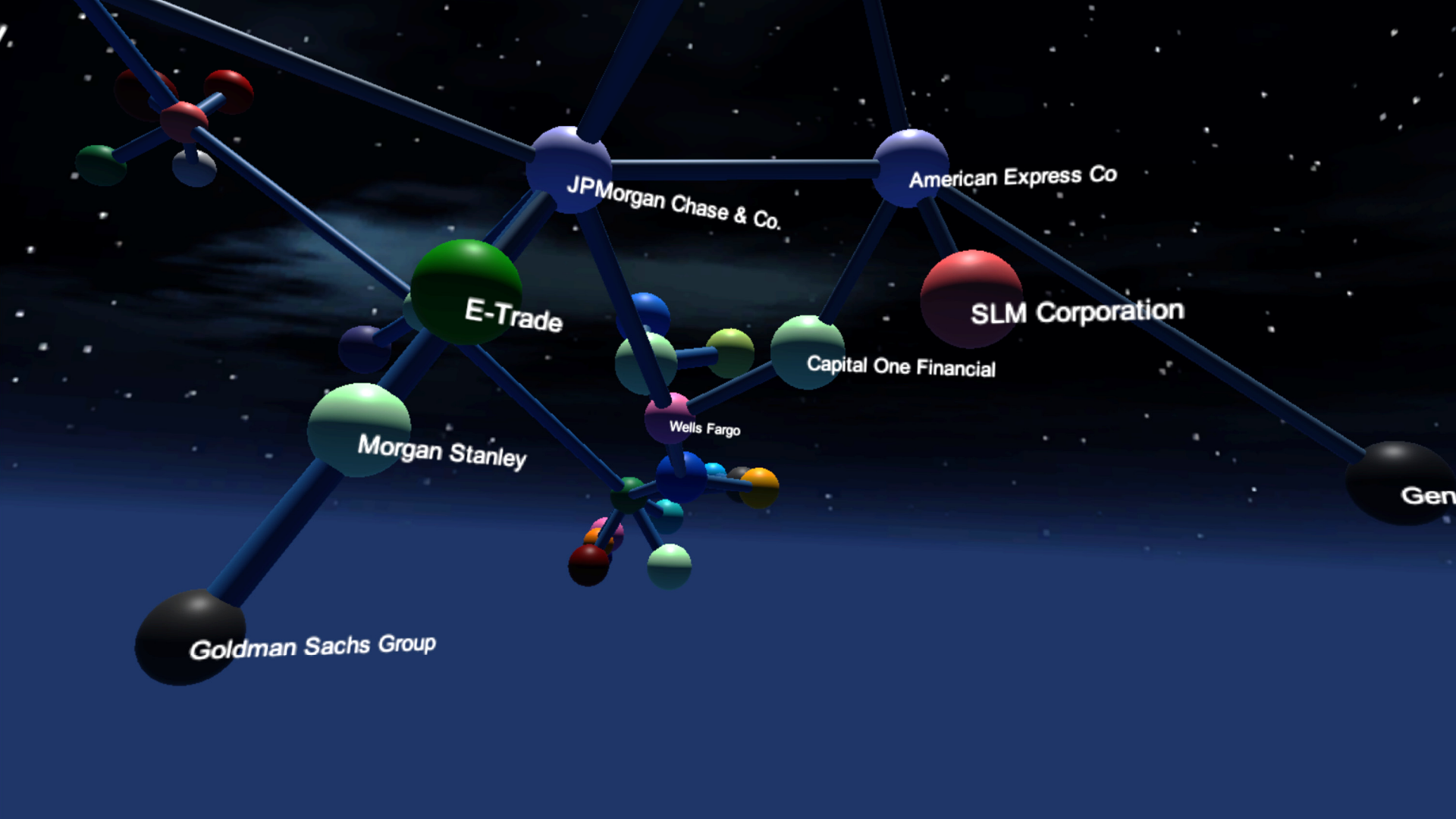
Color: None

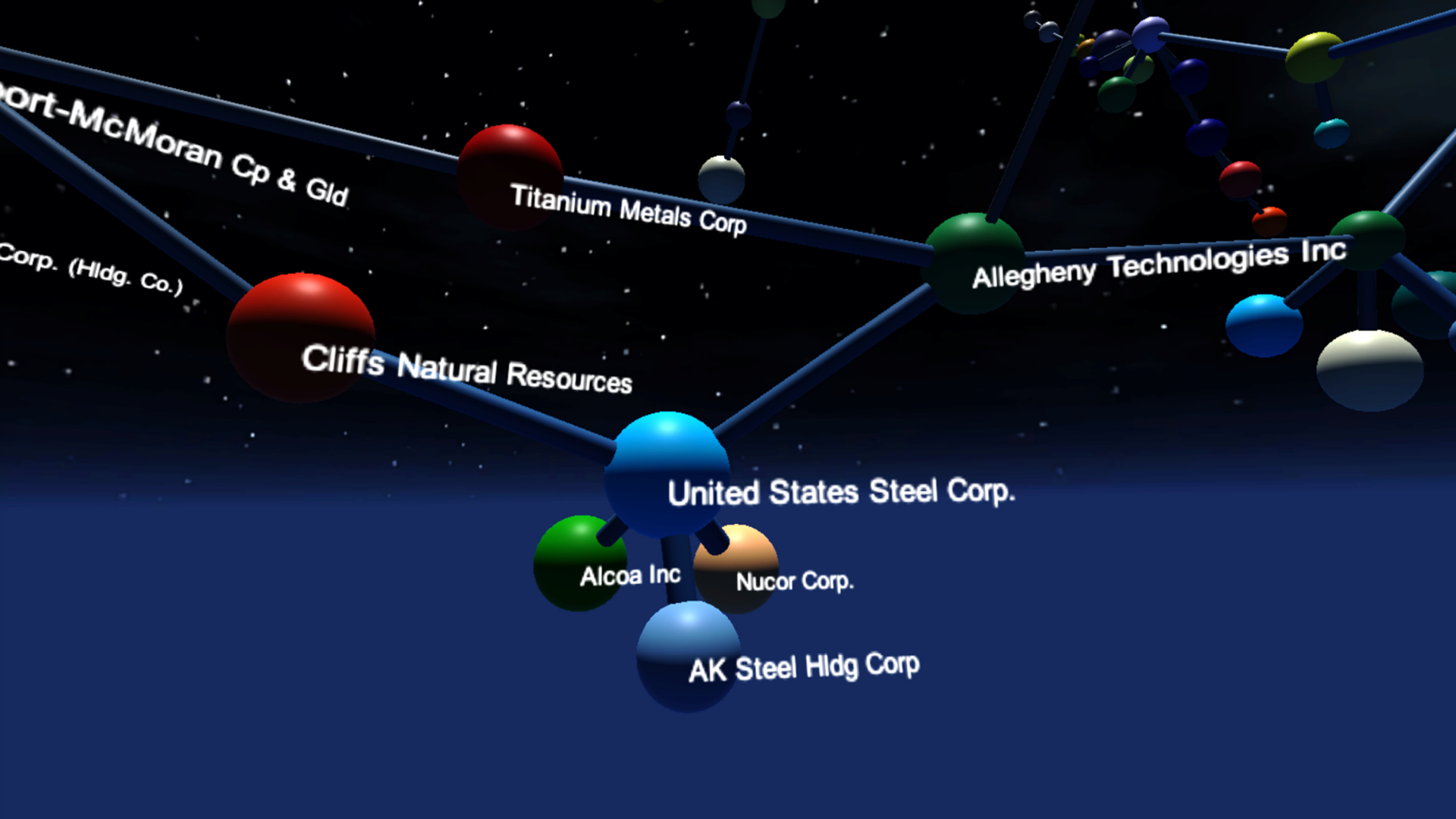
Arc Analysis

Pearson's Correlation

Close | Save As... | Print | Export 3D Model


VR


JPMorgan Chase & Co.
American Express Co
E-Trade
SLM Corporation
Capital One Financial
Wells Fargo
Morgan Stanley
Goldman Sachs Group


ort-McMoran Cp & Gld
Titanium Metals Corp
Allegheny Technologies Inc
Corp. (Hldg. Co.)
Cliffs Natural Resources
United States Steel Corp.
Alcoa Inc
Nucor Corp.
AK Steel Hldg Corp

In Conclusion…

Webinar Series: Friday at 1 p.m. (Central)

Upcoming Webinars:

- April 20 GIS Mapping with BayesiaLab
- May 3 Key Drivers Analysis of Criminal Sentencing (t.b.c.)

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- May 16–18
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- June 26–28
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- July 23–25
  San Francisco, CA
- August 29–31
  London, UK
- September 26–28
  New Delhi, India
- October 29–31
  Chicago, IL
- December 4–6
  New York, NY

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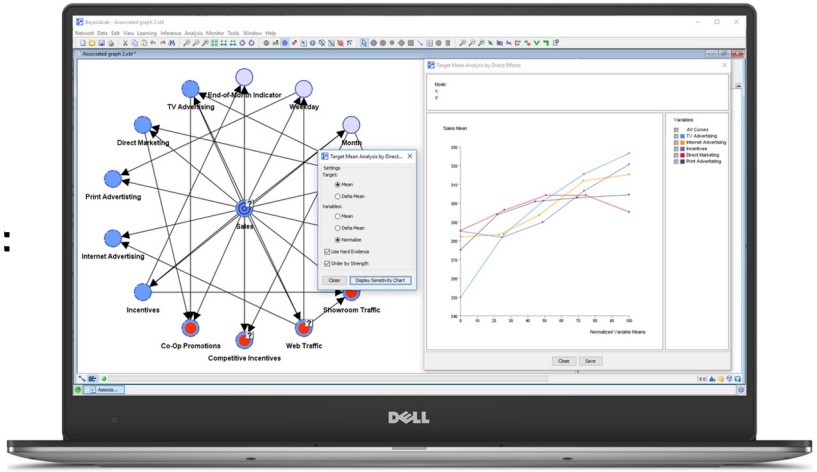
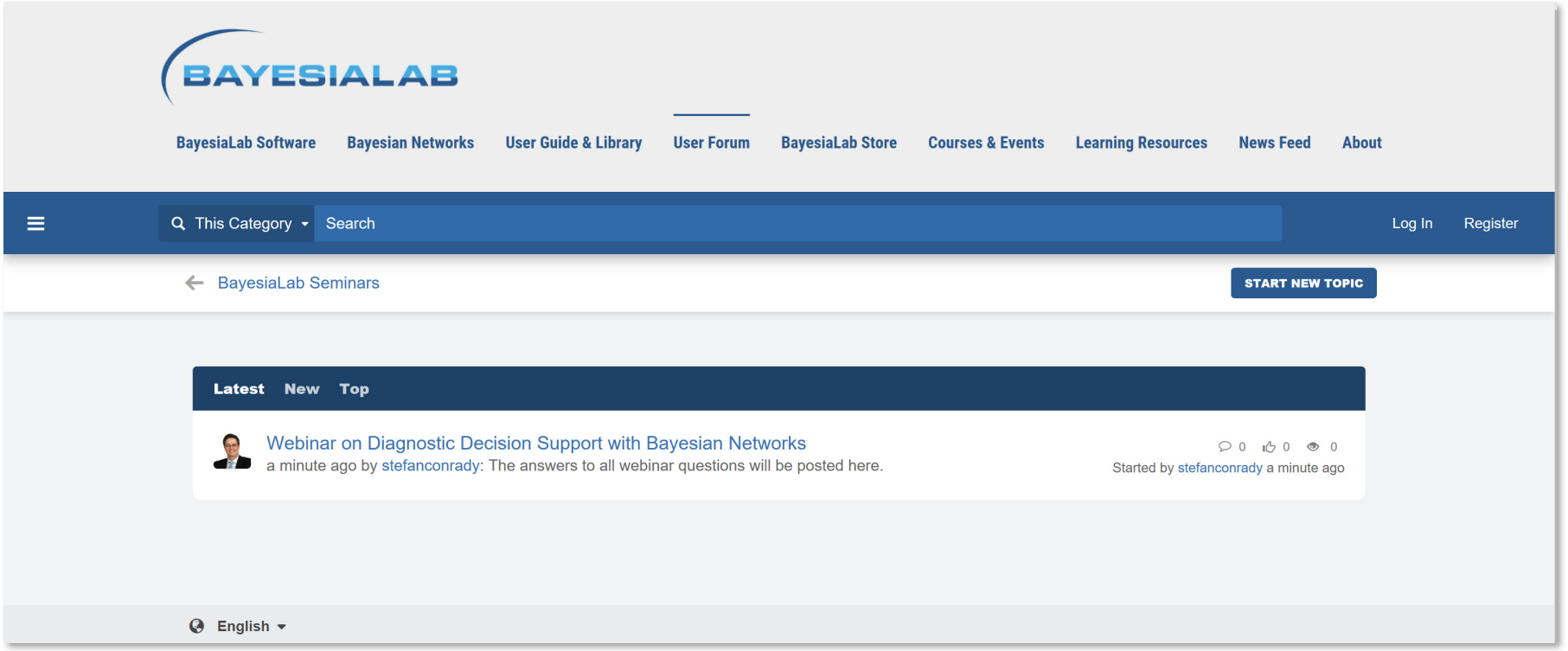


User Forum: bayesia.com/community




6th Annual BayesiaLab Conference in Chicago
November 1–2, 2018

Thank You!

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