Mapping features onto categories

Unsupervised Competitive (neural) Learning - USCL.
Aim: Apply USCL in order to detect correspondances among Western Eurasian countries.

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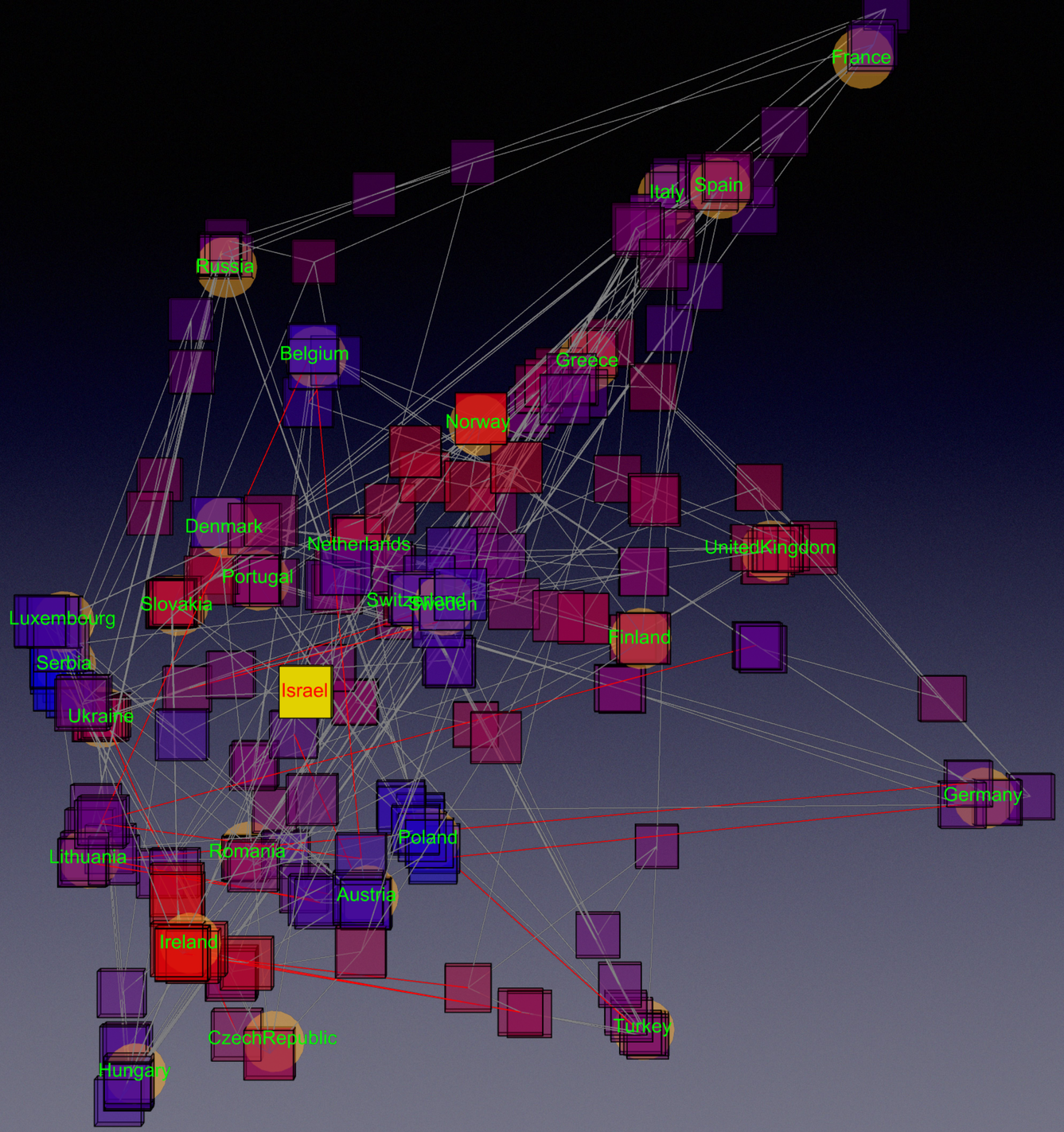
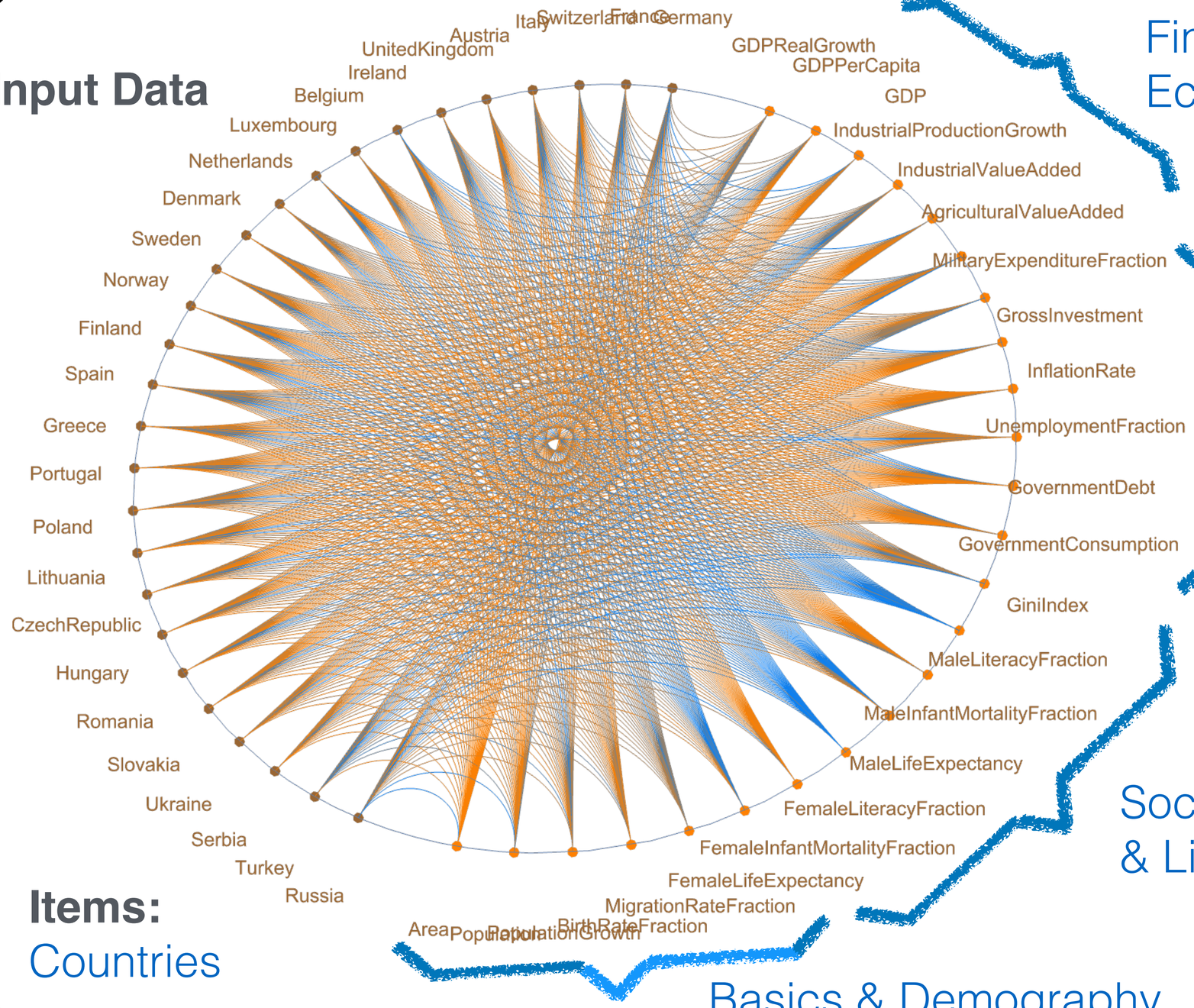


Input Data



Items:
Countries

Finance & Economics

Government & Politics

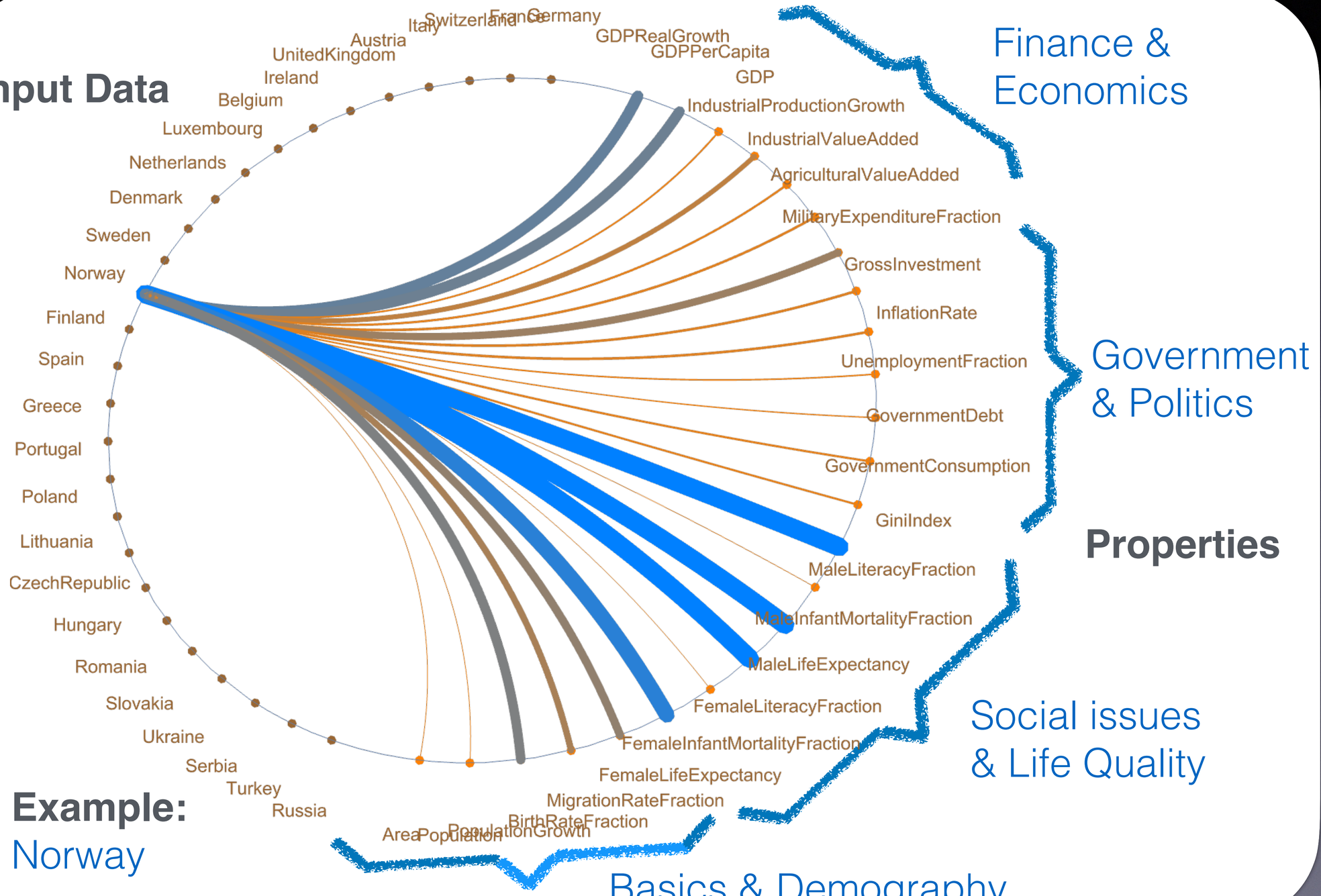
Properties

Social issues & Life Quality

Basics & Demography

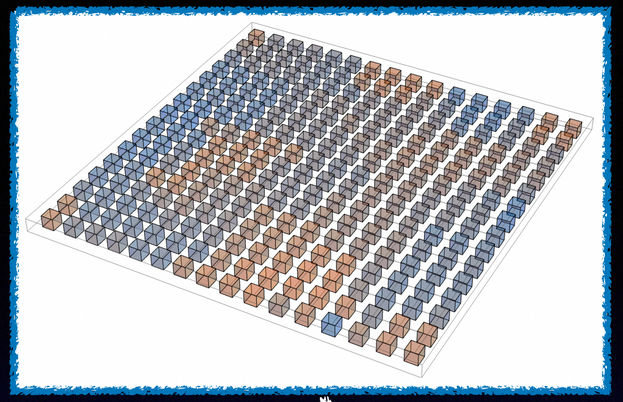
Wolfram Socioeconomic & Demographic Dataset

Input Data

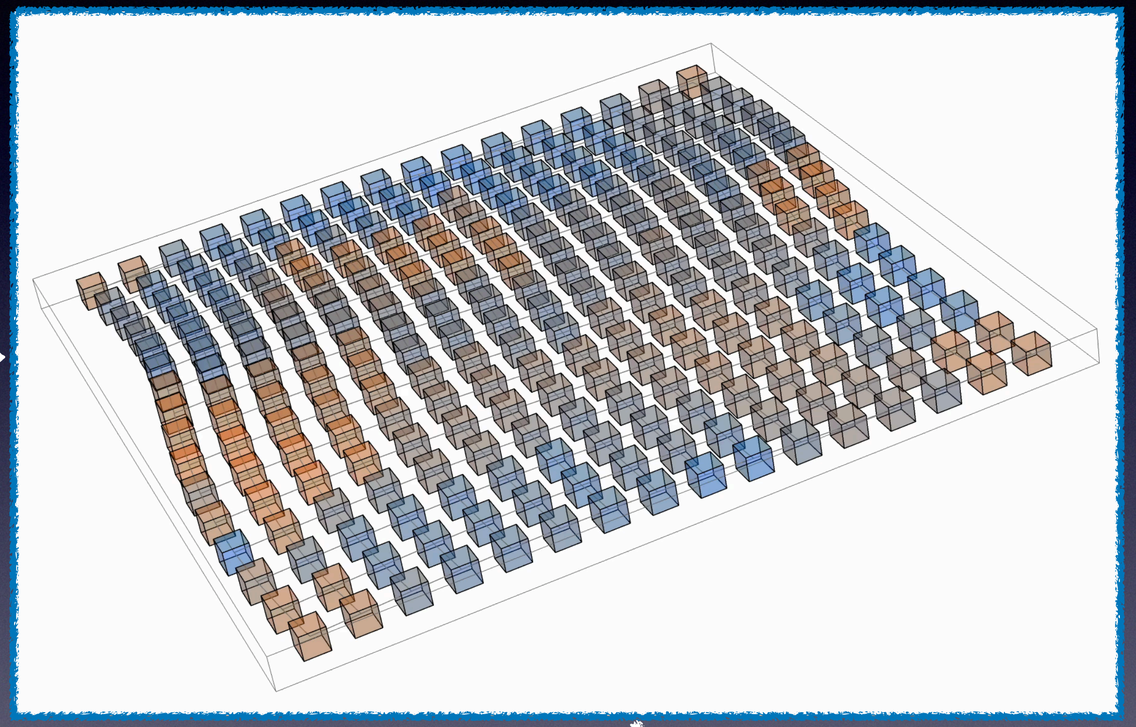


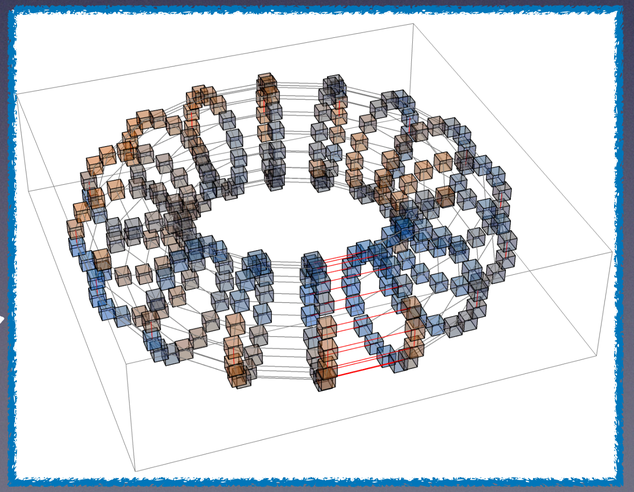
Example:
Norway

Wolfram Socioeconomic & Demographic Dataset

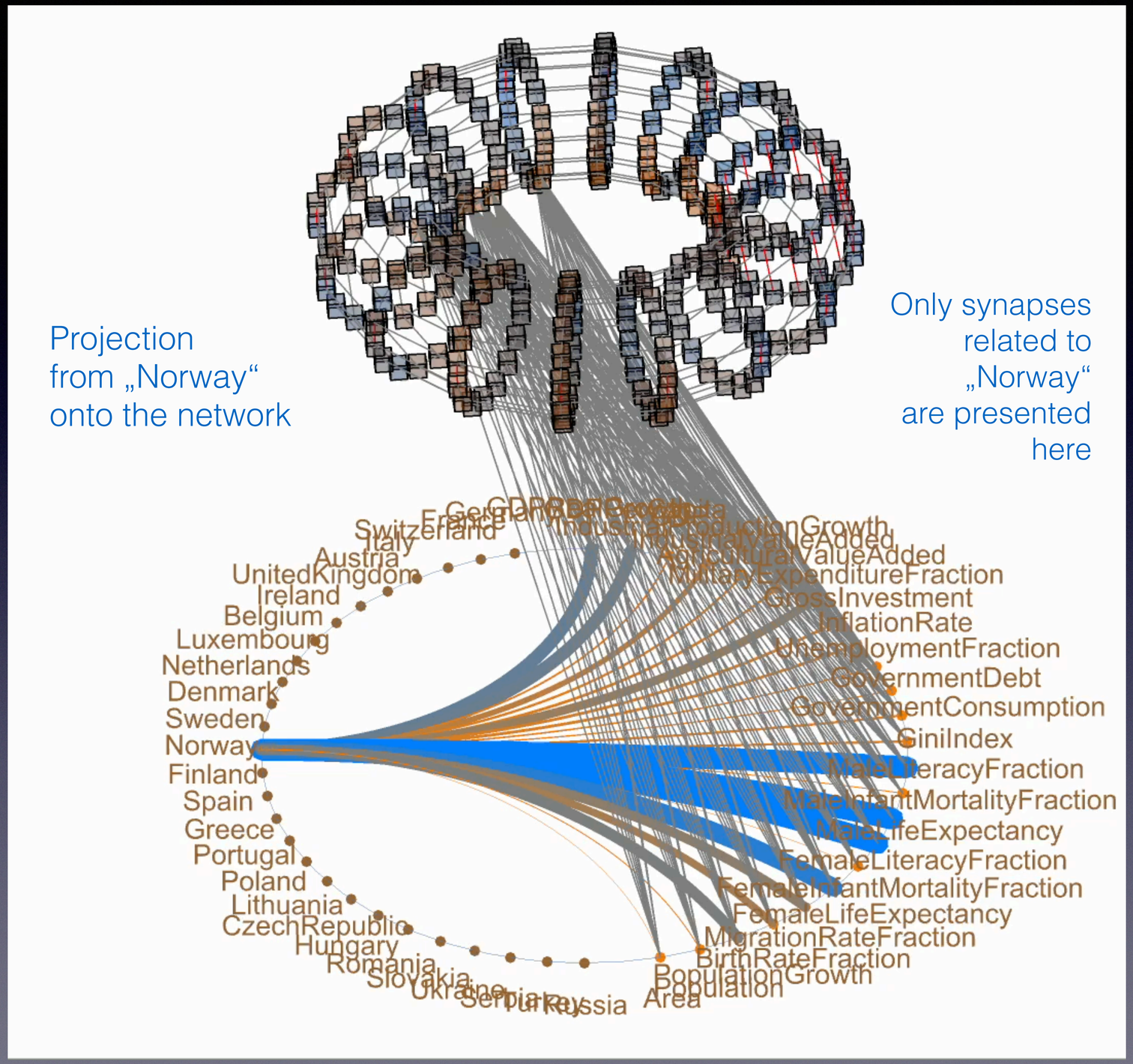


USCL works on a neural network, indeed a square of „neurons“, that is continuously morphed into a torus.





The colors code the answer of the network to a stimuli, as explained below



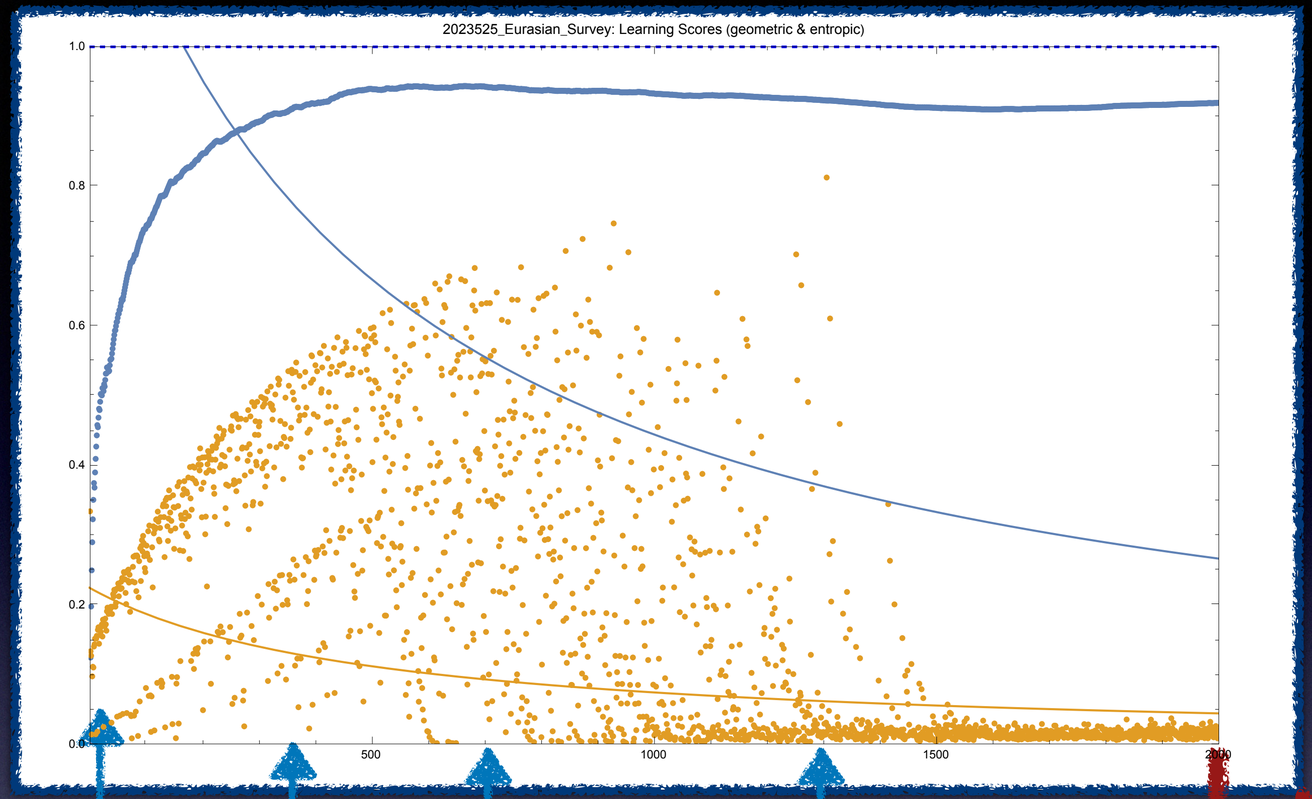
Each neuron is connected to the initial {countries, properties} data set through its synapses. The color of a neuron expresses its sensitivity to a stimulus delivered to its synapses.

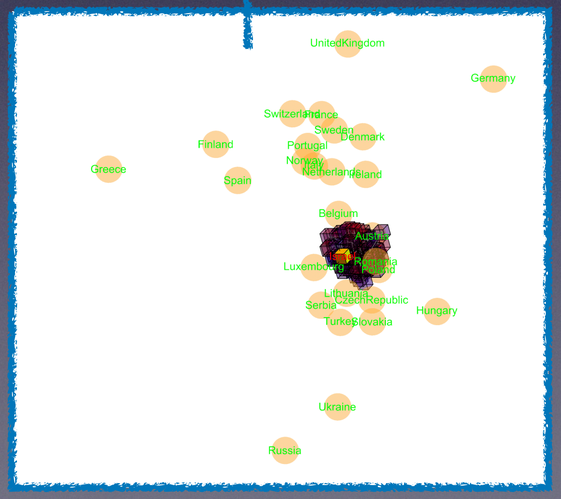
Synapses simultaneously act as connectors and storage elements.

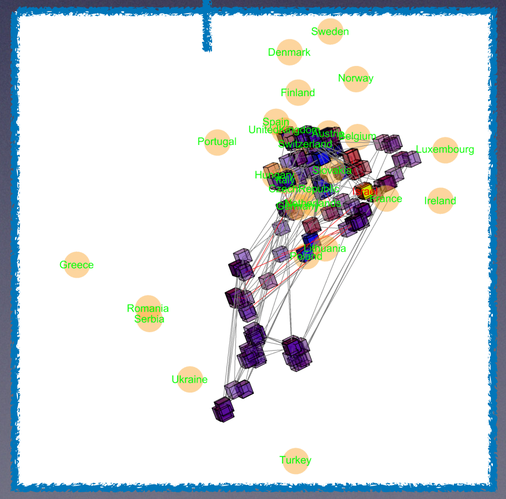
The tuning of the synapses occurs through USCL, that puts neurons into competition among themselves, while grasping the information secluded in the initial {countries, properties} dataset.

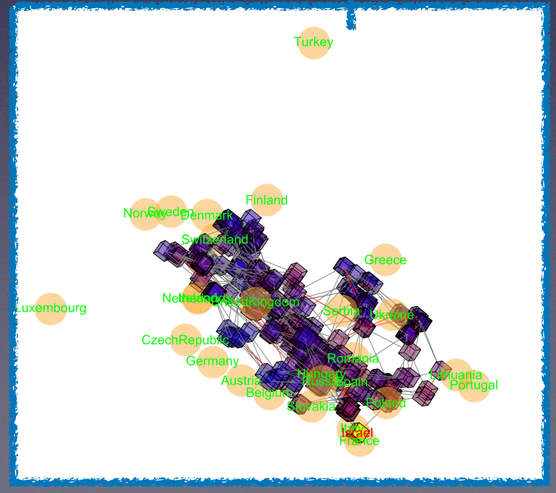
The learning process is completed after about 1200 steps. Learning scores, geometric and entropic, (yellow and blue) assess the quality of the learning process

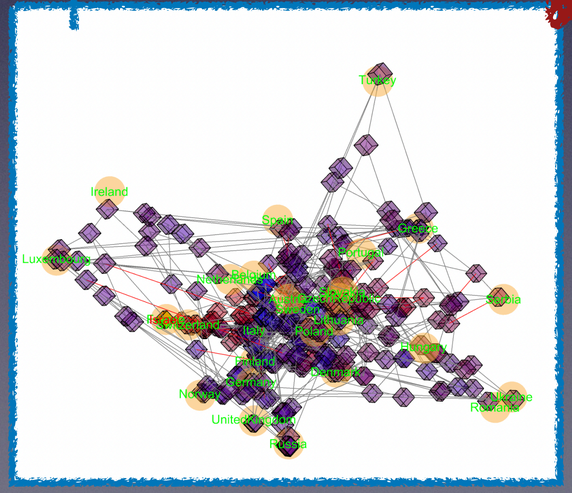
The collected knowledge is represented as an abstract network expanding during the learning process (below)

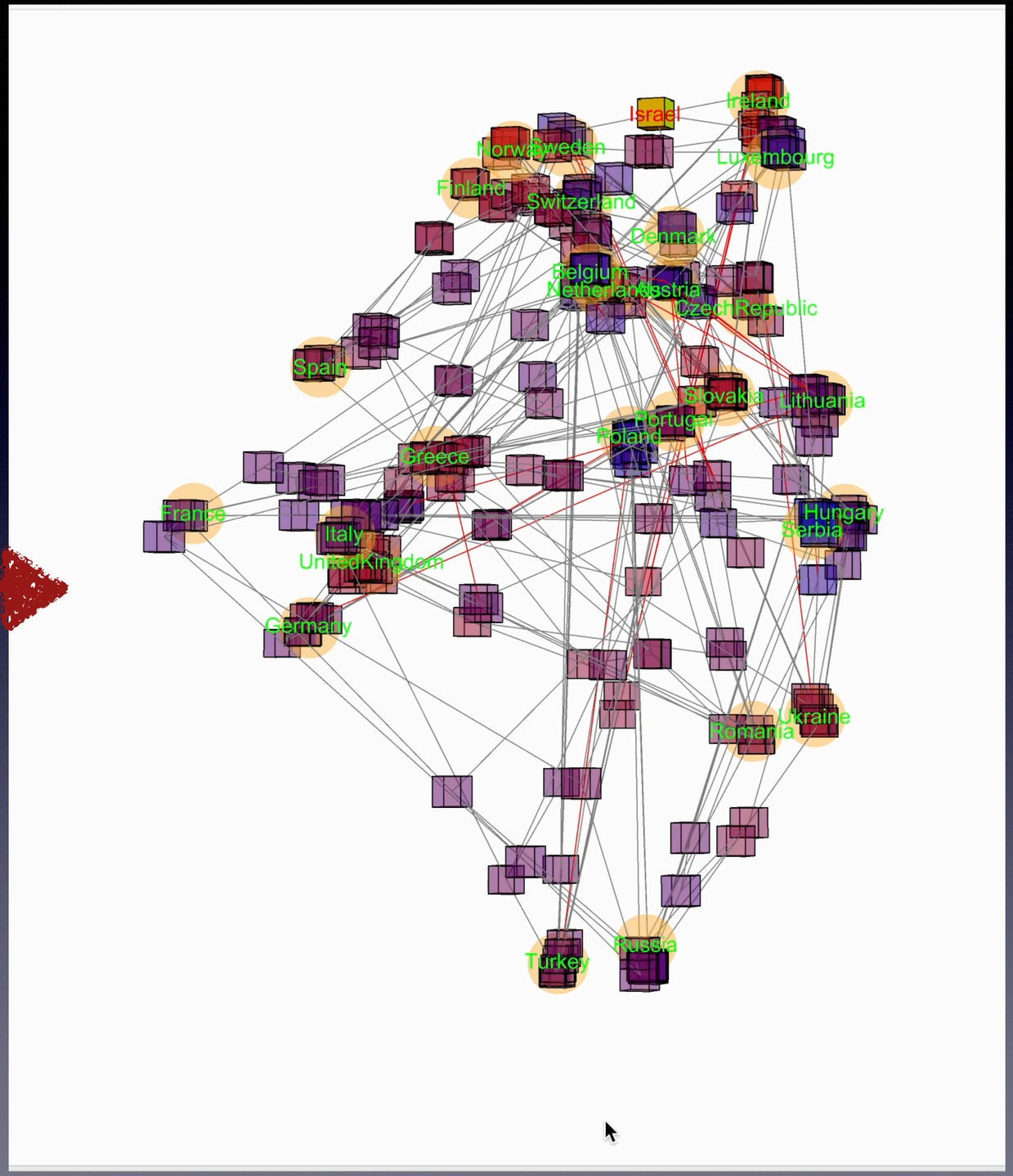










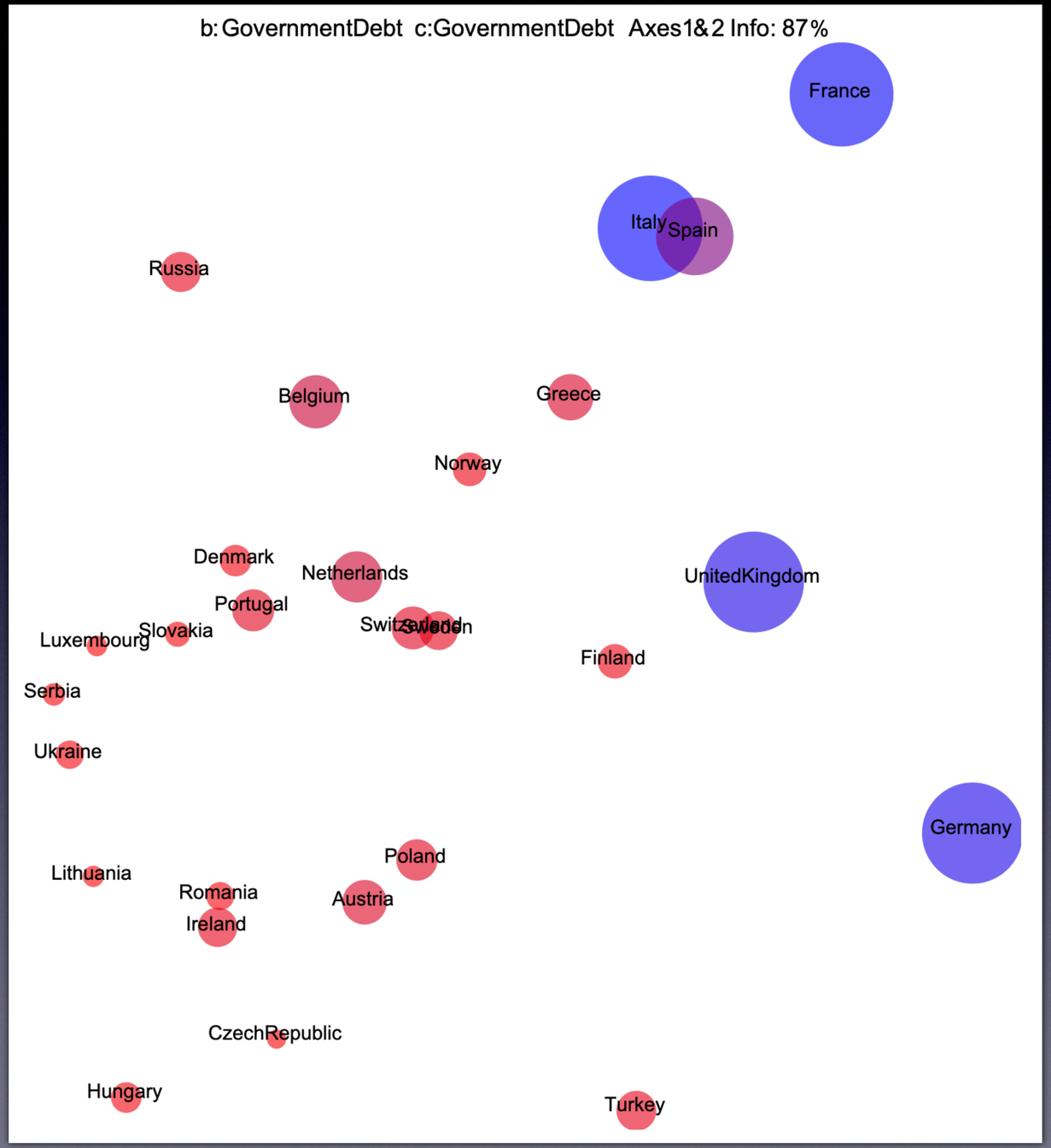


USCL enables the emergence of this coherent, holistic network of relations among the items (the countries)

USCL is auto-poetic in its essence. It detects correlations secluded in the initial data set

USCL is fundamentally stochastic (based on chance). It is definitely different from deep learning

The network is located in the *cognitive space* spanned by the synapses of the neurons, in this case $\mathbb{R}^{22}$. It is afterwards projected onto $\mathbb{R}^3$

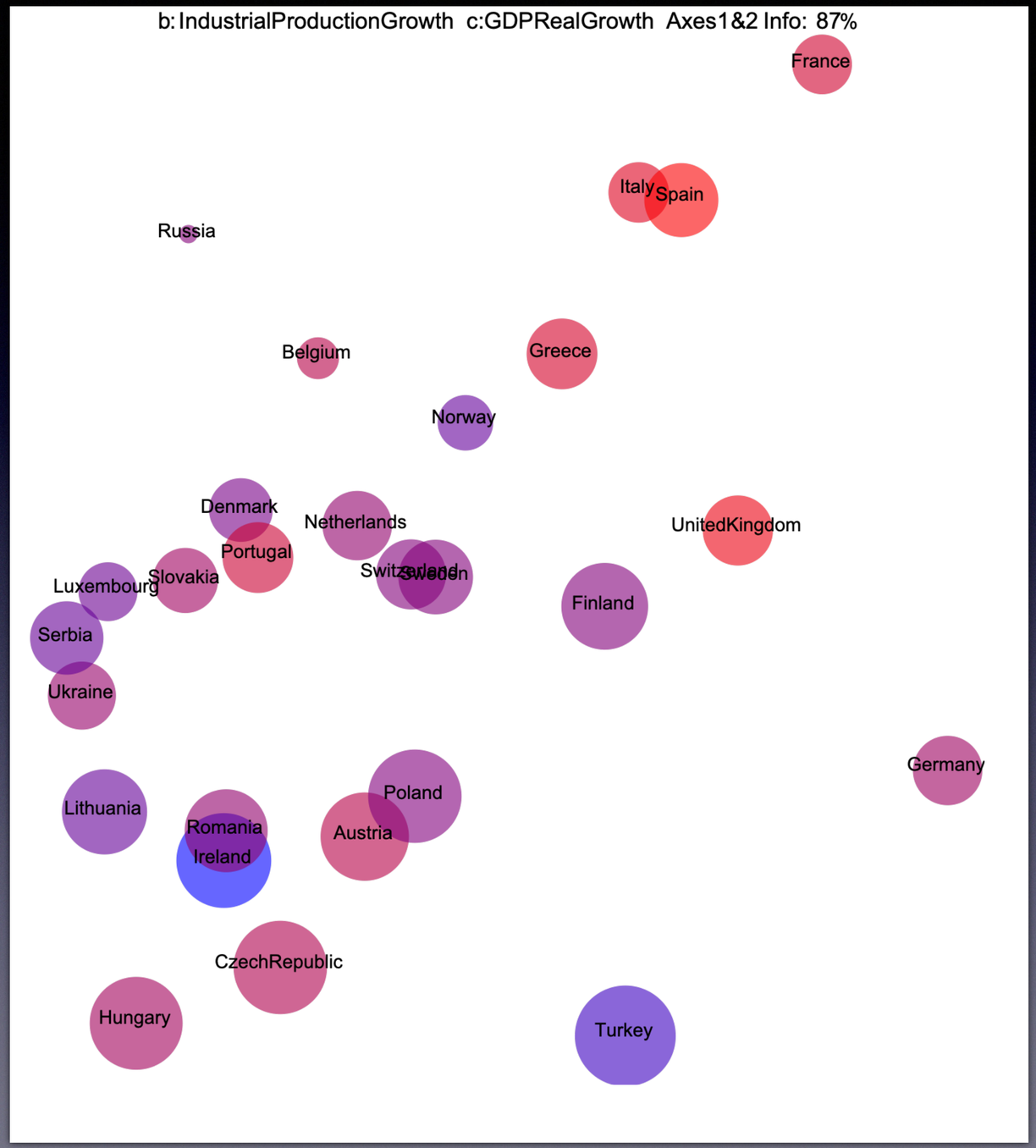


Projection of the previous network on its two first (1 & 2) principal components

Similar countries are located in coherent clusters, according to the information collected in the neural network

Size of bubbles and their colors code for government debts

Be aware: projection on the (1 & 3) principal components delivers complementary clues!!

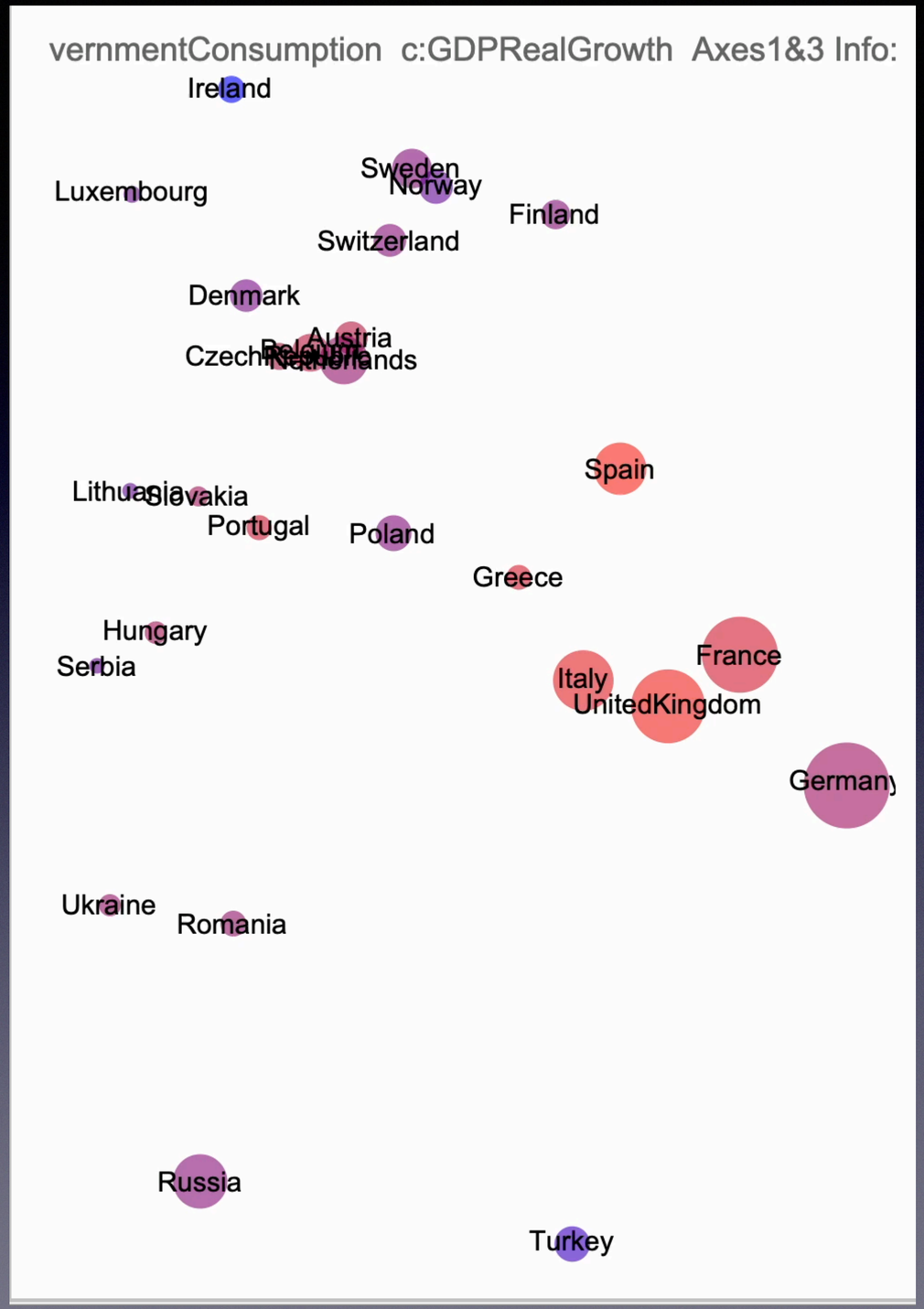


Projection of the network on its (1 & 2) principal components

The size of the bubbles codes in this case the Industrial Production Growth of the corresponding country.

The color of the bubbles code for the GDP Real Growth

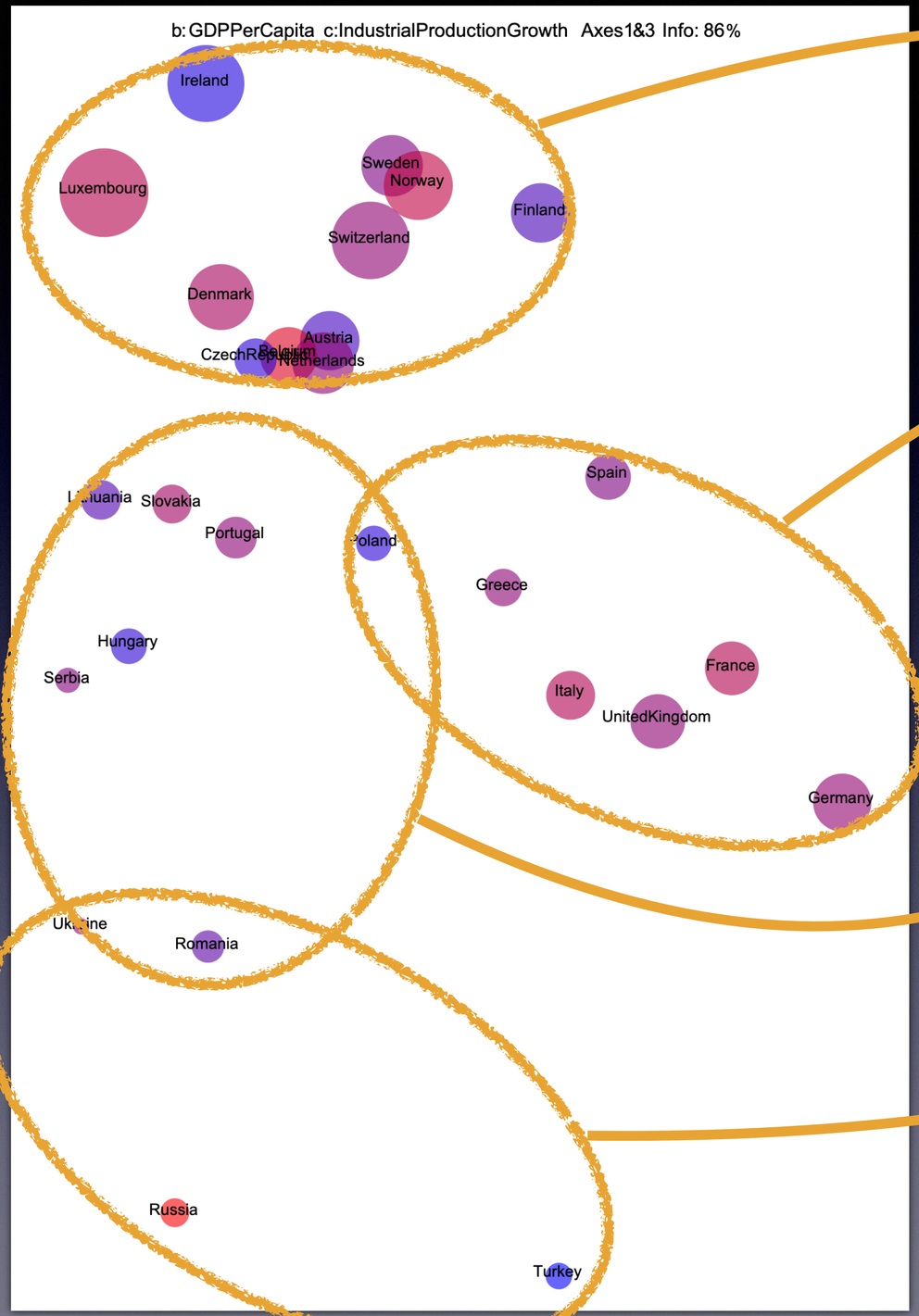
Be aware: the projection on the next (1 & 3) principal components delivers complementary clues!!



Projection of the network on its (1 & 3) principal components

Any couple of properties may be chosen by the user of the software and displayed accordingly

Be aware: the projection on the previous (1 & 2) principal components delivers complementary clues!!



Enablers: Netherlands, Finland, Switzerland, Denmark, Luxemburg, Ireland, Norway, Sweden, Belgium, Czech Rep. Austria

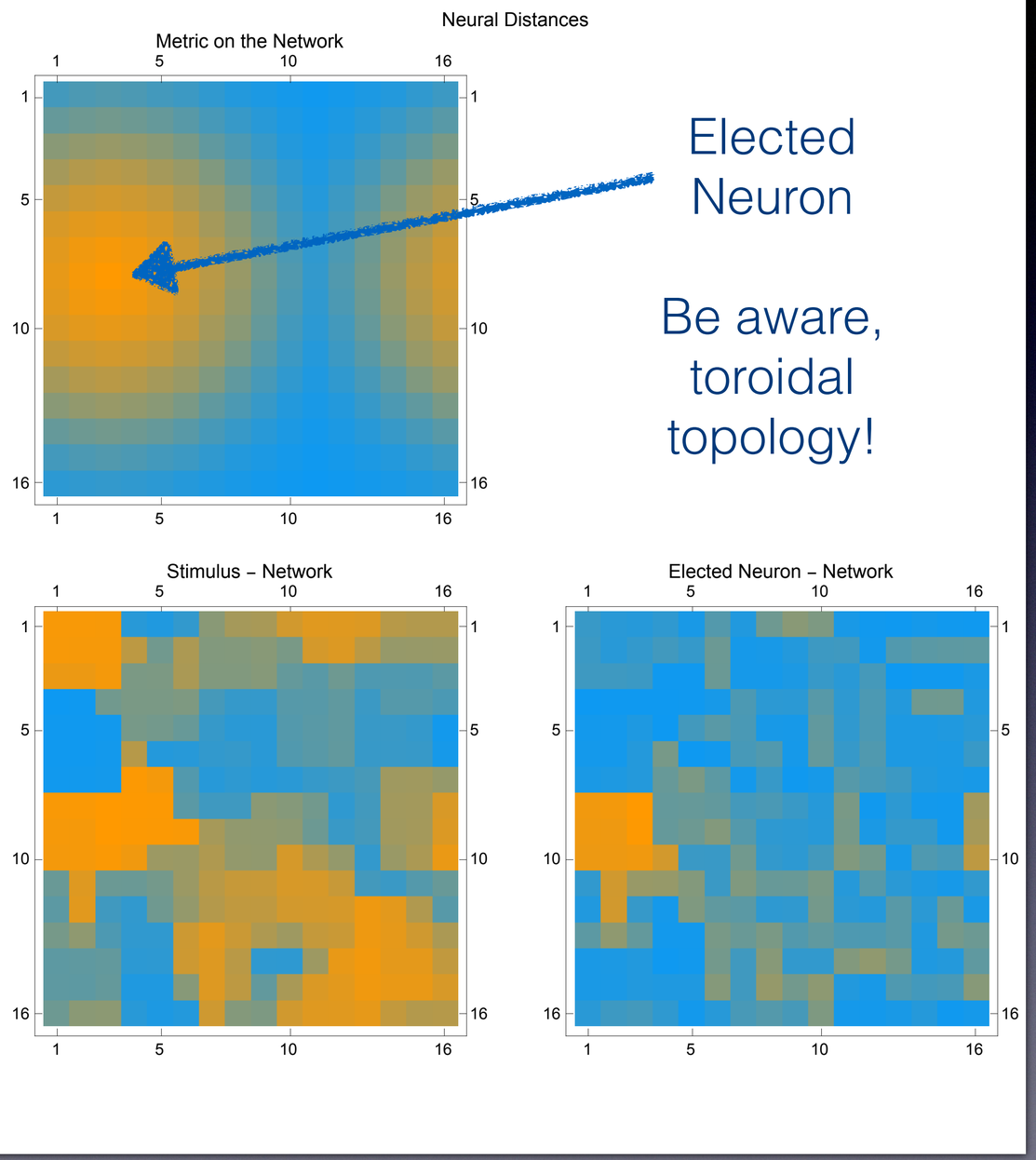
Old Westen Europe: Germany, France, United Kingdom, Italy, Spain, Greece, Poland

Challengers: Lithuania, Slovakia, Portugal, Poland, Hungary, Serbia, Romania, Ukraine

Outliers: Russia, Turkey, Ukraine, Romania

The global view

Rich countries display large bubbles, industrially growing countries bluish colors



Alien items that were not taken into consideration during the initial learning process - *as here Israel* - may be presented afterwards to the network

Lower left panel: all neurons of the network respond to an unknown stimulus

Upper left panel: one sigle neuron - {3,8} - is elected as the optimal representative of the unknown stimulus

Lower right panel: the unknown stimulus receives the attributes of the crowd the elected neuron is a member of - *in this case Ireland* -

A_Configuration

Eurasian_Config

Wolfram Cloud

B_Socio-Economics

Contingence_Relations.dat

D_Neural_Learning

M_Input.dat

C_Normalization

Reseau.dat

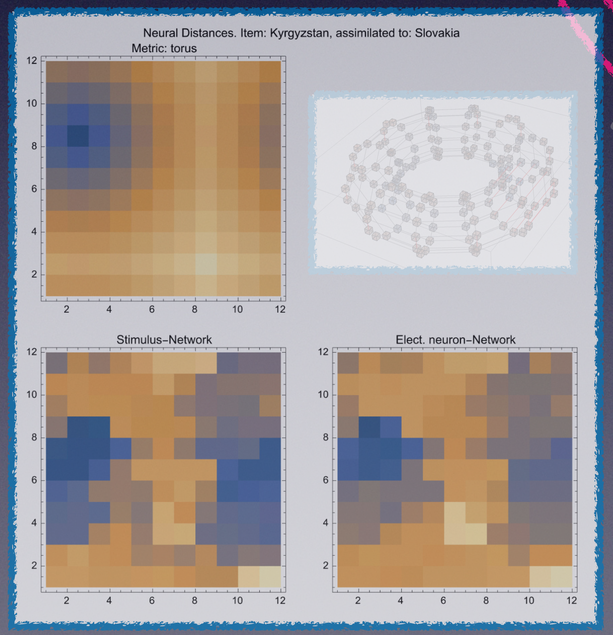
M_InputPlus.dat

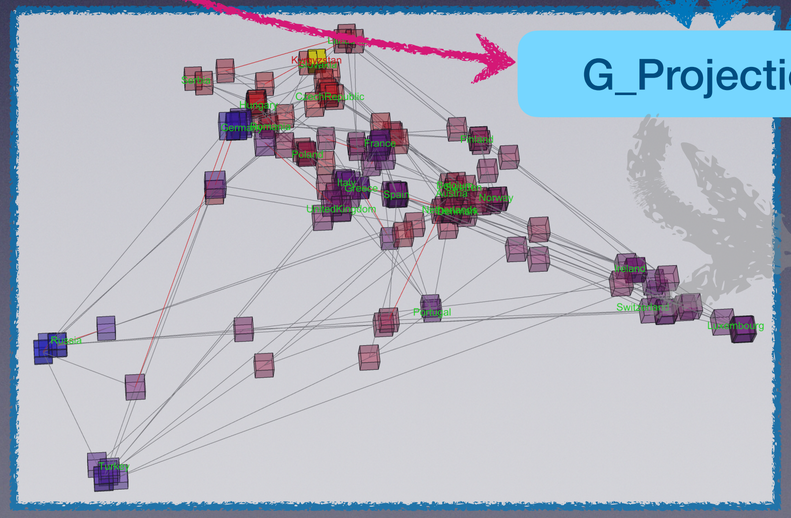
E_Graphics

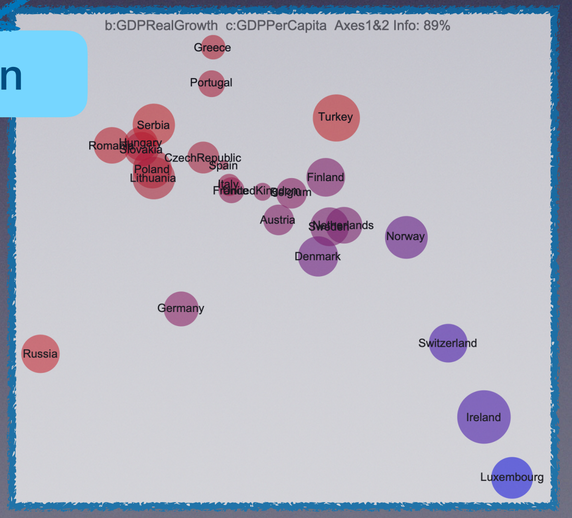
F_Decision

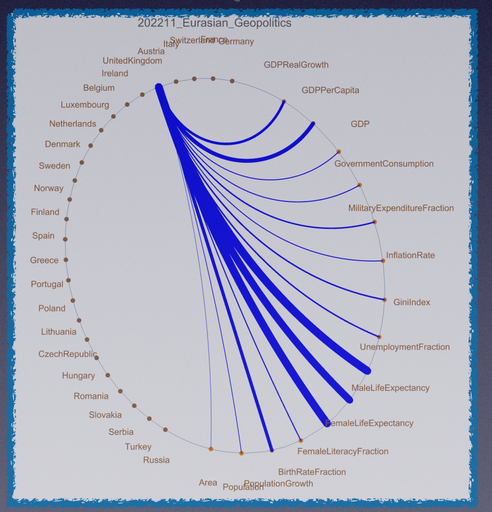
Normalized.dat

G_Projection

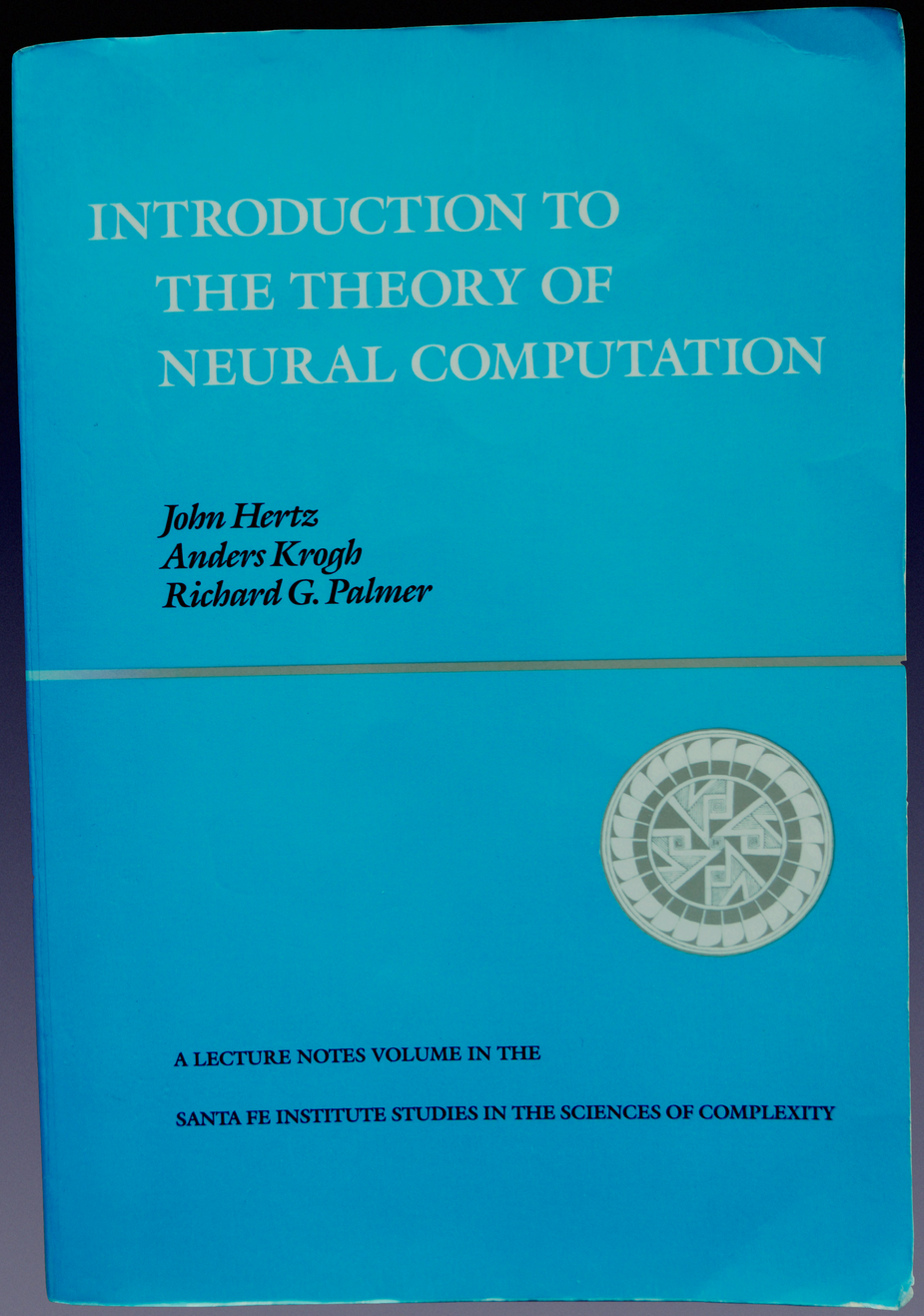








Overall outline of the system



Most of the scientific knowledge implemented in this work was available 30 years ago, as for example in this groundbreaking incunabulum edited by the Santa Fe Institute in the Sciences of Complexity.

The statistics are provided by the guide/SocioeconomicAndDemographicData from the Wolfram Knowledge Base:

Socioeconomic & Demographic Data

The Wolfram Language provides seamless access to the curated and continuously updated Wolfram Knowledgebase, which includes a wide range of types of socioeconomic and demographic data. Free-form linguistics provides a convenient mechanism for accessing all available data; more common categories also have specific associated Wolfram Language functions.

Last but not the least, the dataset implemented is absolutely agnostic.

Music: John Abercrombie,Timeless, 1974