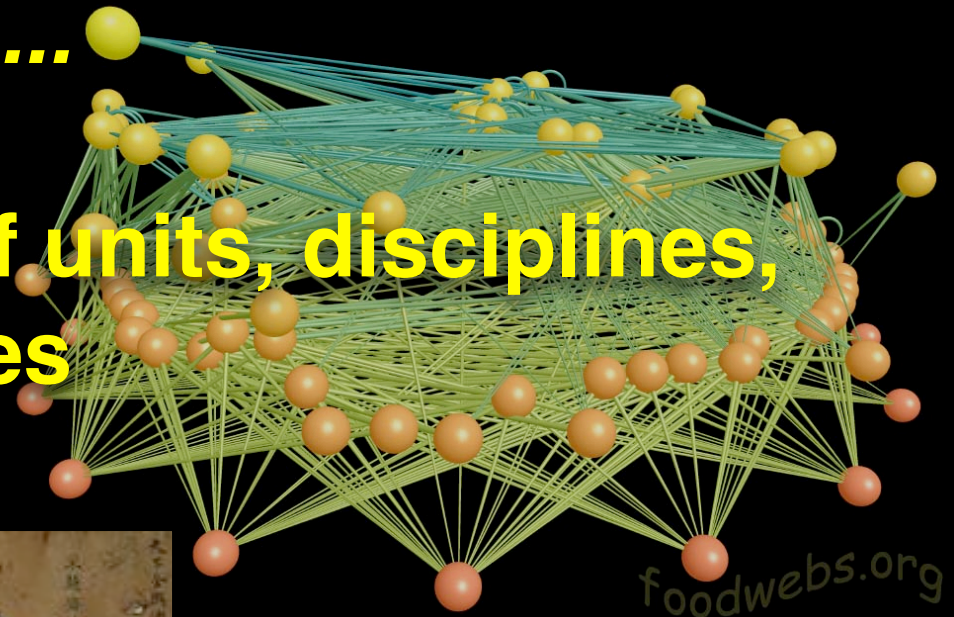


Everyone needs a map ...

**Educational mapping of units, disciplines,
faculties and universities**



Simon Angus & Andrew Newnham
Department of Economics
Monash University

Agenda

The idea ...

Some associated concepts

Networks: Quick concept review

Mapping:

... a unit

... a department

... two departments

... a faculty


... (ahem) ... a university

Have we got what we wanted?



The idea ...

This is how we present our unit ...



ECC3860
Integrated economic modelling

Unit Guide
Semester 2, 2011

The information contained in this unit guide is correct at time of publication. The University has the right to change any of the elements contained in this document at any time.

Last updated: 27 August 2011

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Learning Objectives

The learning goals associated with this unit are for students to:

1. understand some of the complexities of interdisciplinary policy problems, particularly in the areas of sustainable development;
2. comprehend and critically assess the complex systems perspective;
3. critically evaluate agent-based models and their outputs;
4. develop and analyse an agent-based model of an integrated modelling problem;
5. undertake verification, validation, evaluation and assessment of integrated modelling outputs;
6. apply integrated modelling approaches to real-world interdisciplinary economic problems.

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Monash prepares its graduates to be:

1. responsible and effective global citizens who:

- a. engage in an internationalised world
- b. exhibit cross-cultural competence
- c. demonstrate ethical values
- d. produce innovative solutions to problems
- e. apply research skills to a range of challenges
- f. communicate persuasively and effectively

Assessment Summary

Second marking

Where an assessment task is given a 1st grade by an examiner, the place of work will be marked again by a second examiner who will independently evaluate the work, and consult with the first marker. No student will be awarded a 1st grade for an assessment task in a unit without a second examiner confirming the result.

Return of final marks

Note: Exceptions to this are individual pieces of assessment contributing 10% or less of the final mark, unless the total of such pieces exceeds 30% of the final mark.

Faculty policy states that the final mark that a student receives for a unit will be determined by the Board of Examiners on the recommendation of the Chief Examiner taking into account all aspects of assessment.

The final mark for this unit will be released by the Board of Examiners on the date nominated in the Faculty Calendar. Student results will be accessible through the my.monash portal.

ECC3860 Integrated economic modelling - Semester 2, 2011

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Mode of Delivery

Clayton (Day)

Workload

6 points, SCA Band 3, 0.125 EFTBL

Unit Relationships

Prerequisites

Students must have passed ECC1002 before undertaking this unit.

Co-requisites

It is recommended that students study ECC2880 Prosperity, poverty and sustainability in a globalised world.

Chief Examiner

Simon Angu

Campus Lecturer

Clayton

Dr Simon Angu
Contact hours: Tuesday 10am-12pm, 11.6962

Dr Brett Parry
Contact hours: Thursday 1.30-3.30pm, 11.6960

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Examination 1	40%	To be advised.

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Our feedback to You

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- Check results

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Recommended Resources

Key online resources and websites:

Software

- Java: <http://www.java.com/>
- NetLogo: <http://cwi.nl/~jdb/edu/netlogo/netlogo.html>
- MASON: <http://cwi.nl/~jdb/edu/mason/mason.html>
- PyNet: <http://www.py.net/>
- JavaNet: <http://www.javatools.com/>
- R: <http://www.r-project.org/>
- StarLogo TNG: <http://cwi.nl/~jdb/edu/starlogo/starlogo.html>
- UCINET: <http://www.analytictech.com/>
- Visual Programming (VPL): <http://www.vpl.vassar.edu/products/vpl/>

People

- Simon Angu: simon.angu@monash.edu.au - angus@business.monash.edu.au
- Andrew Crookes: andrew.crookes@monash.edu.au
- Bernard Heesem: bernard.heesem@monash.edu.au

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Which says:

Concepts are linearly connected
Fragments will be connected by lecturer
(one fragment to another fragment at a
time)

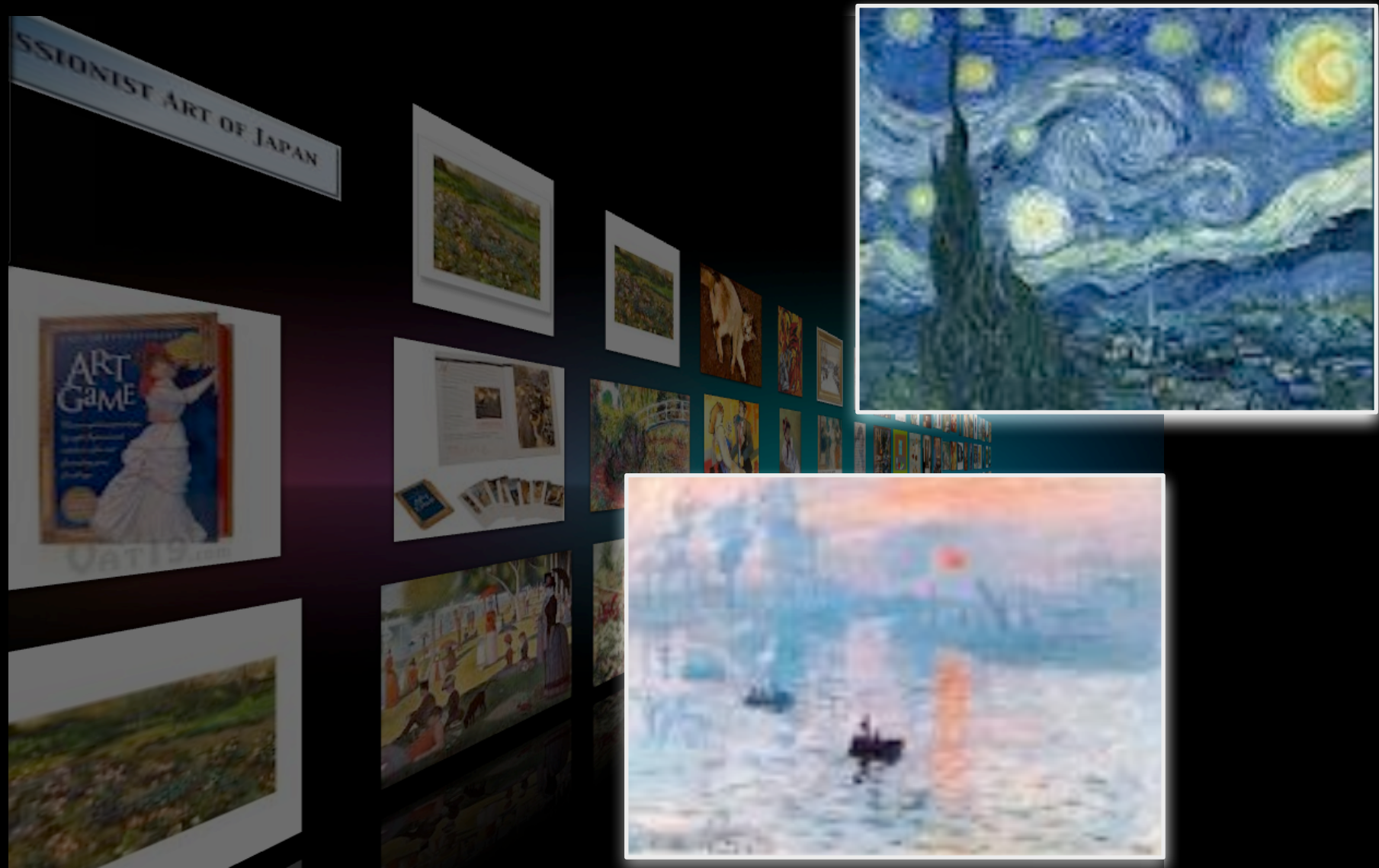
The unit is somehow 'complete'
These concepts are bundled together like
a self-contained island

Angus & Newnham: Everyone needs a map ...

A mental model of a lecturer ...



A mental model of a lecturer i ...



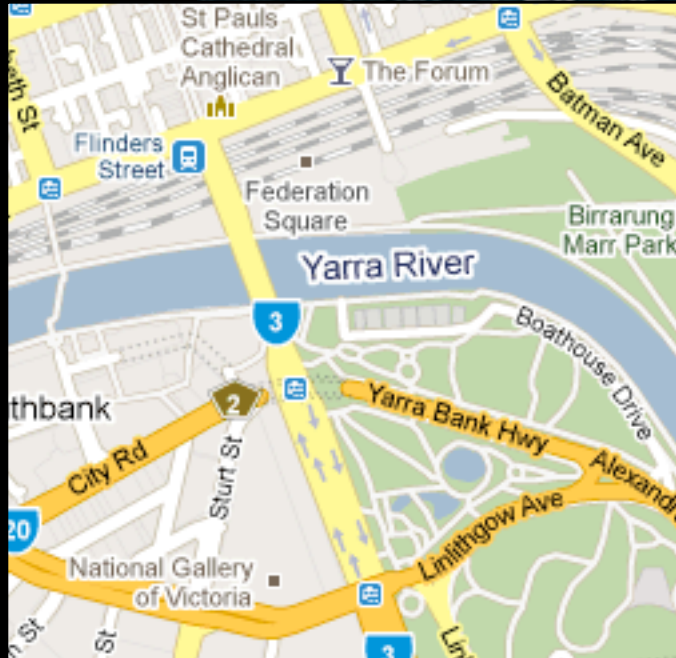
A mental model of a lecturer ii ...



Credit: <http://www.hojitsu.net/2009/02/tiltshift-test/>

Angus & Newnham: Everyone needs a map ...

A mental model of a lecturer ii ...



Credit: <http://www.hojitsu.net/2009/02/tiltshift-test/>

Angus & Newnham: Everyone needs a map ...

So if we are more like this:



Then we need one of these:



... to help people see where we're going and where we've been (and how everything fits together)

<http://www.wildernesstravel.com/leaders/hedges-adam>

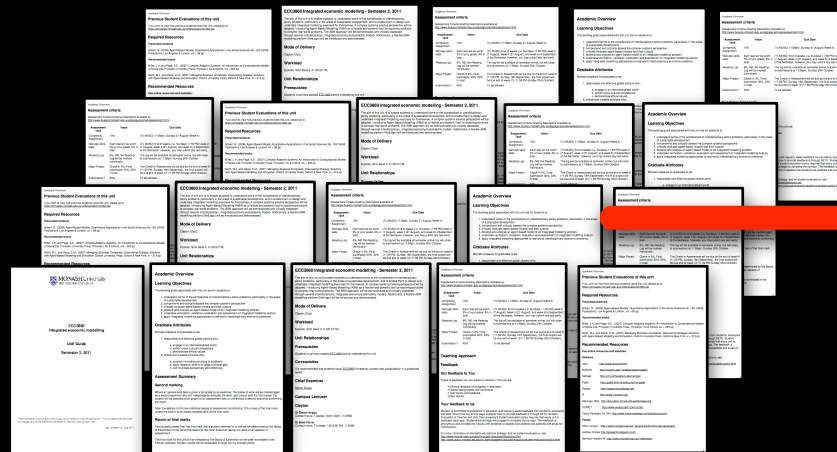
.. oh, actually, we already have that!



<http://www.wildernesstravel.com/leaders/hedges-adam>

Angus & Newnham: Everyone needs a map ...

So our problem is:



<http://www.wildernesstravel.com/leaders/hedges-adam>

Angus & Newnham: Everyone needs a map ...

Why would a map of our unit be helpful?

For students

See the key concepts in one place

See how they relate to each other (in 'concept-space')

Identify adjacent concepts to their interests, or difficulties

For staff

Make what is in our heads public

A key reference within our teaching to orientate the students our present 'location'

Enables us to keep the 'map' in mind and structure our teaching

Get away from purely linear/serial views of the knowledge landscape

<http://www.wildernesstravel.com/leaders/hedges-adam>

Some concepts ...



Maps as networks 1

Components of a network

nodes: concepts, locations,
airports, people

links:

'is similar to'

'is located near'

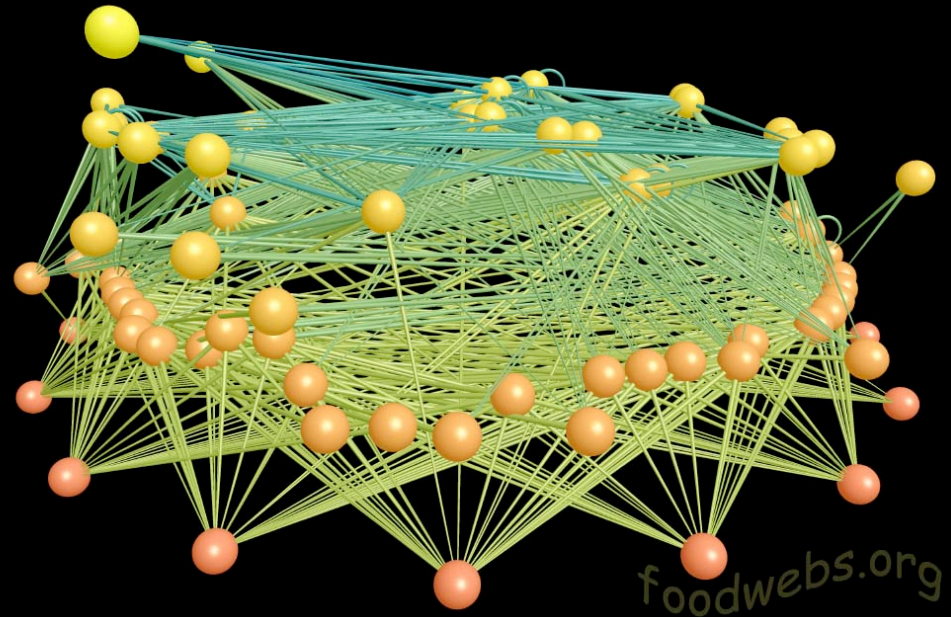
'has a transport link to'

'is in a sexual relationship with'

'is a parent of'

'is a trading partner of'

'is a predator of'



Dunne, J.A., R.J. Williams, N.D. Martinez.
2004. Network structure and robustness of
marine food webs. Marine Ecological Press
Series, vol. 273, pp. 291-30; Image produced
with FoodWeb3D, written by R.J. Williams and
provided by the Pacific Ecoinformatics and
Computational Ecology Lab
(www.foodwebs.org, Yoon et al. 2004).

Maps as networks 2

Clustering ...

Sub-sets of nodes which are
'similar' in some way may
be called a *cluster*

'cluster':

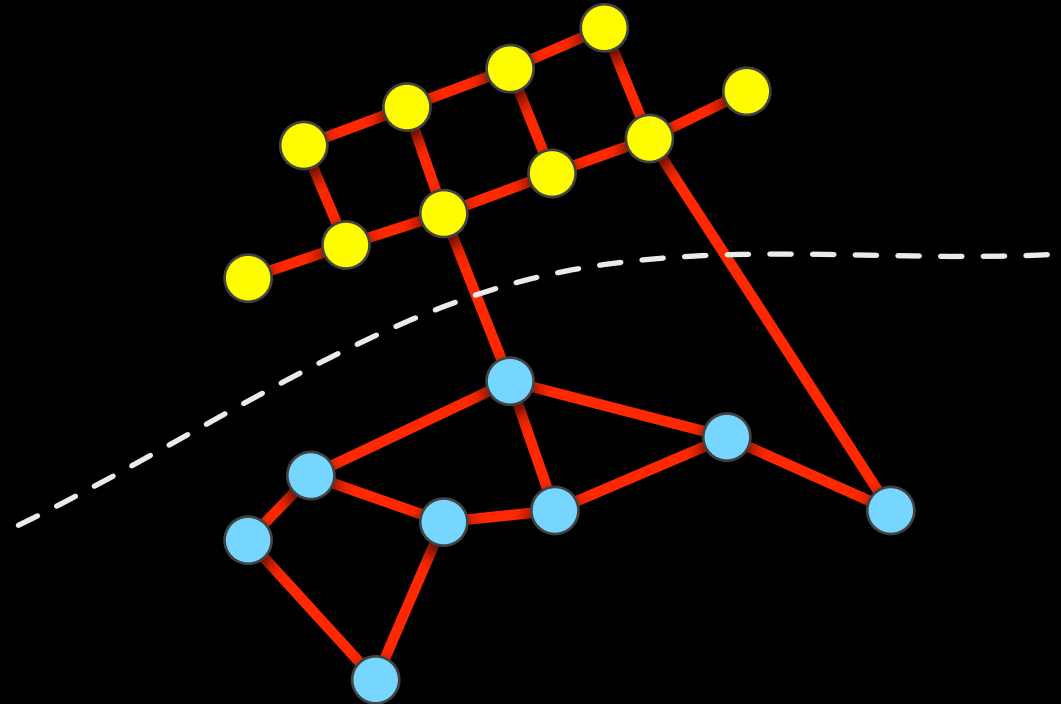
'are from the same family'

'share the same predator'

'are in the same country'

'are in the same ecology'

'share high connectivity with
each other'



Mapping a unit ...



ECC/ETC 3860 Integrated Economic Modelling

Methods

1. Write down key concepts in the unit;
2. Collate the list into *root-concepts* (e.g. 'complex-systems' ~ 'complex system');
3. For each root-concept, identify related root-concepts

Chaotic

Attractor

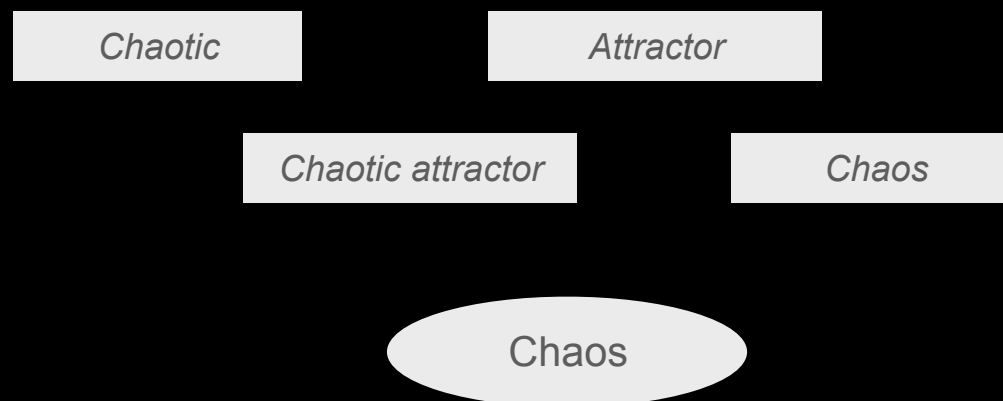
Chaotic attractor

Chaos

ECC/ETC 3860 Integrated Economic Modelling

Methods

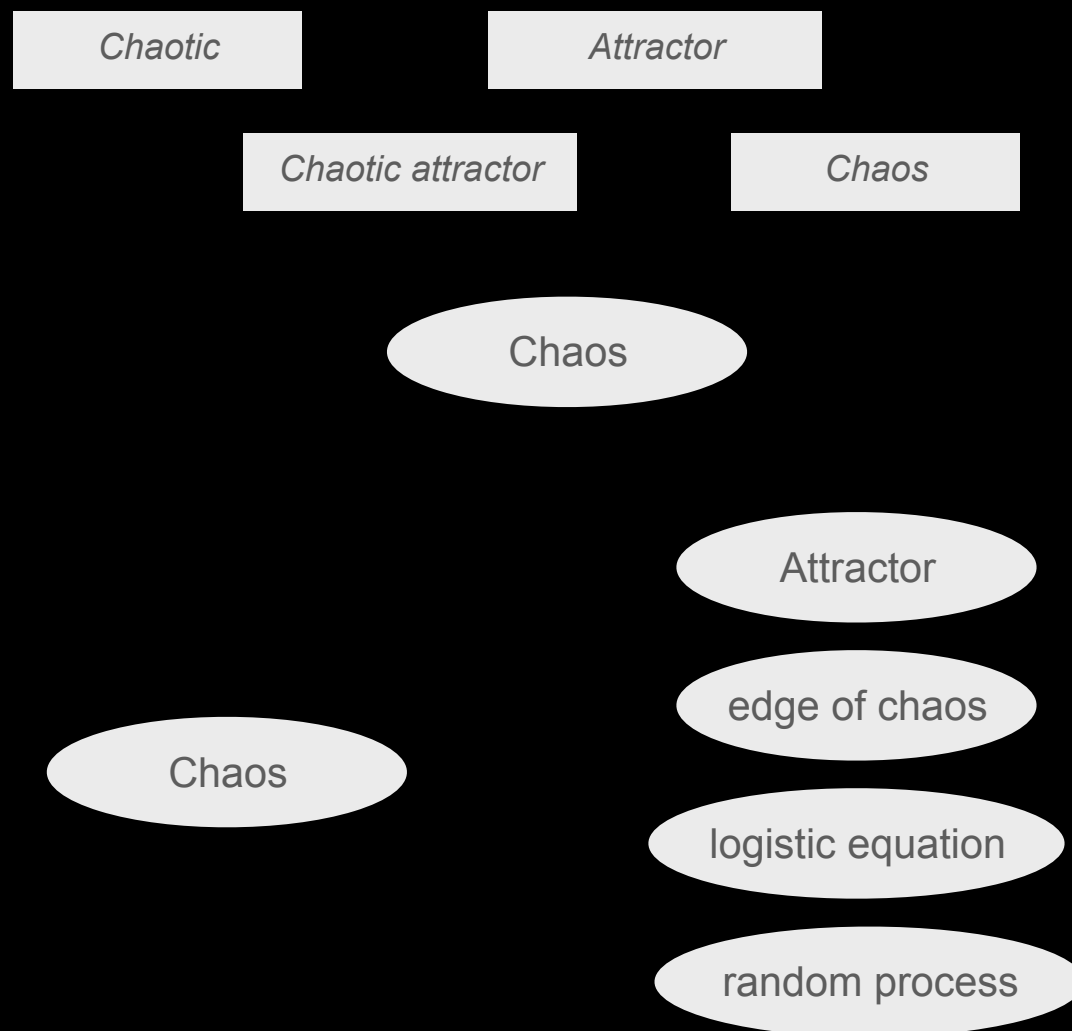
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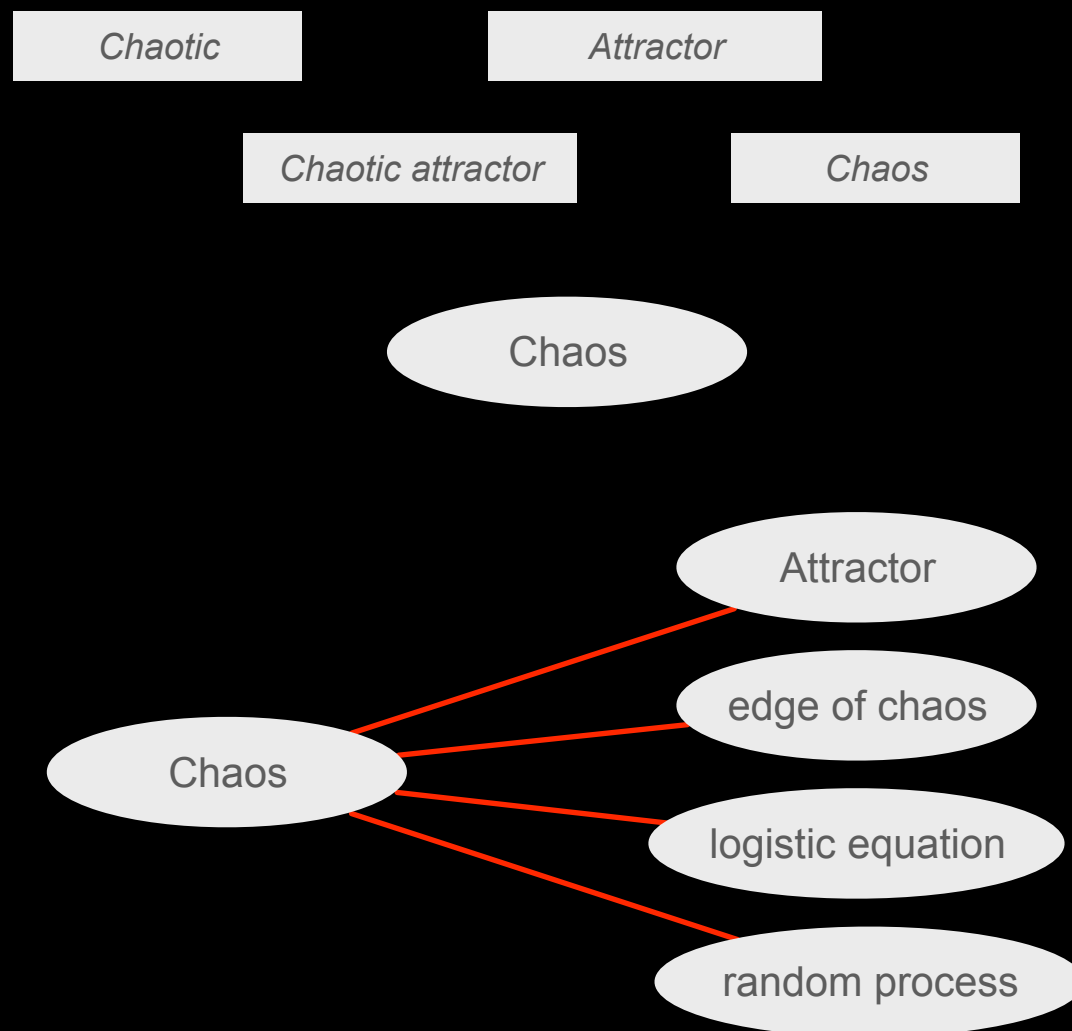
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ECC/ETC 3860 Integrated Economic Modelling

Results ...

49 Root-concepts (nodes)

280 links

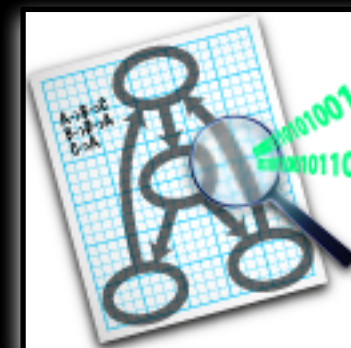
Avg. Degree: 5.714

Layout the network

Graphviz <http://www.graphviz.org/>

sfdp

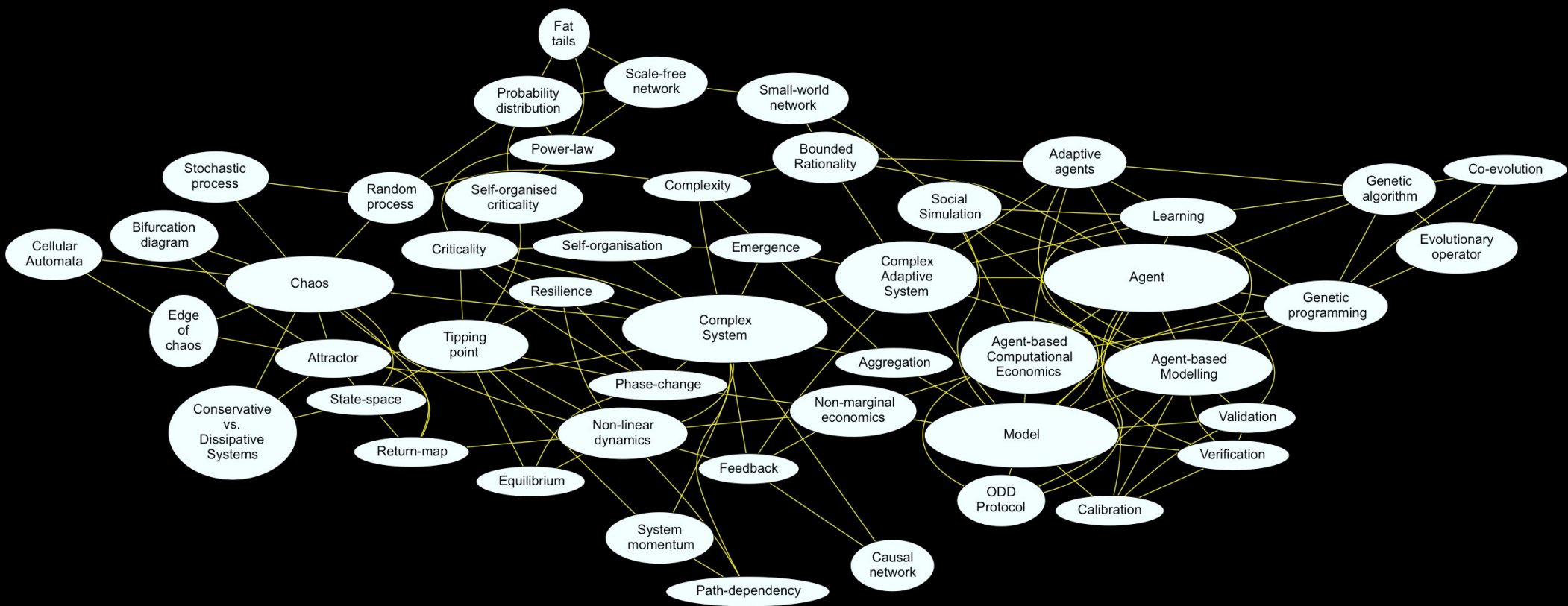
gvmap

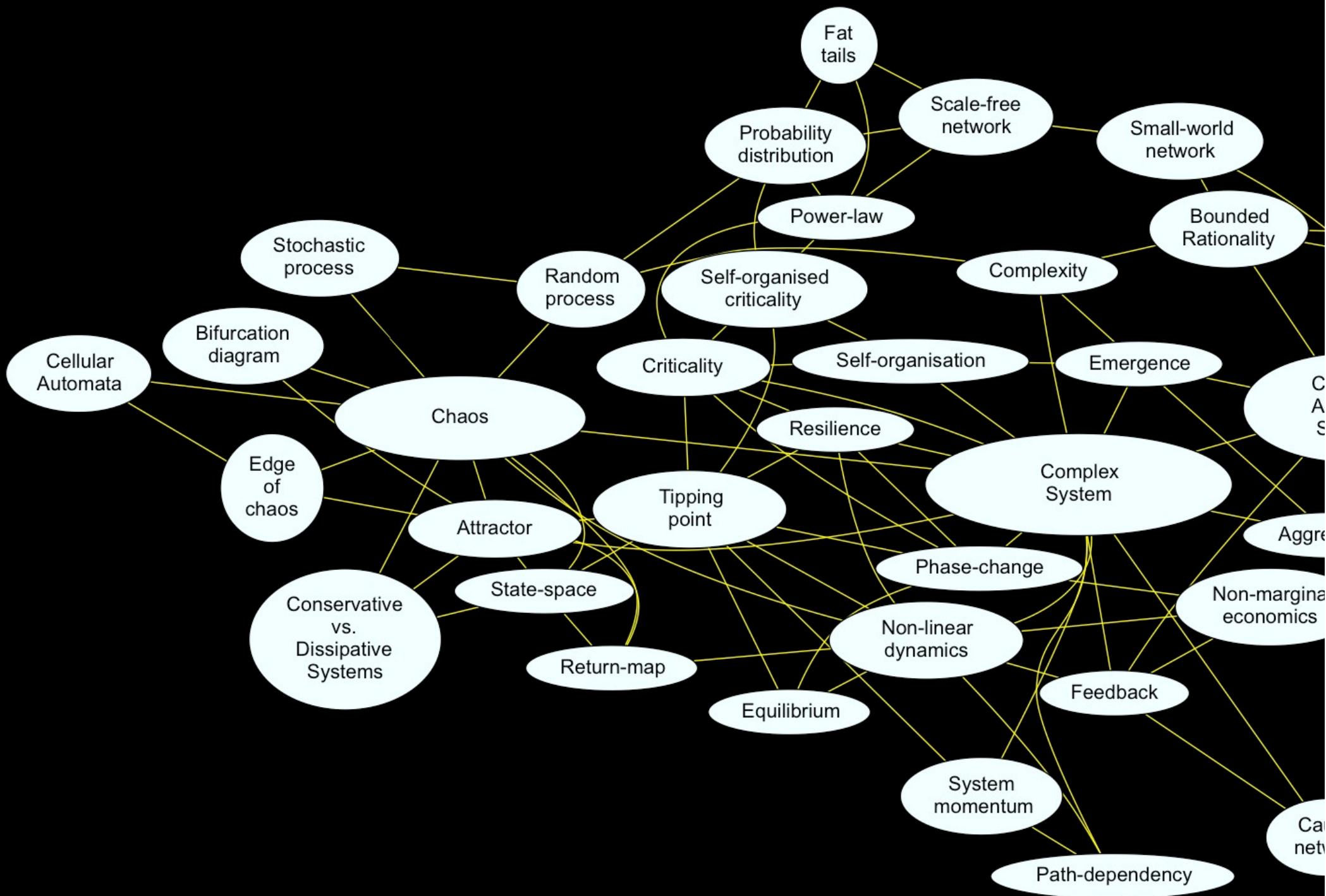


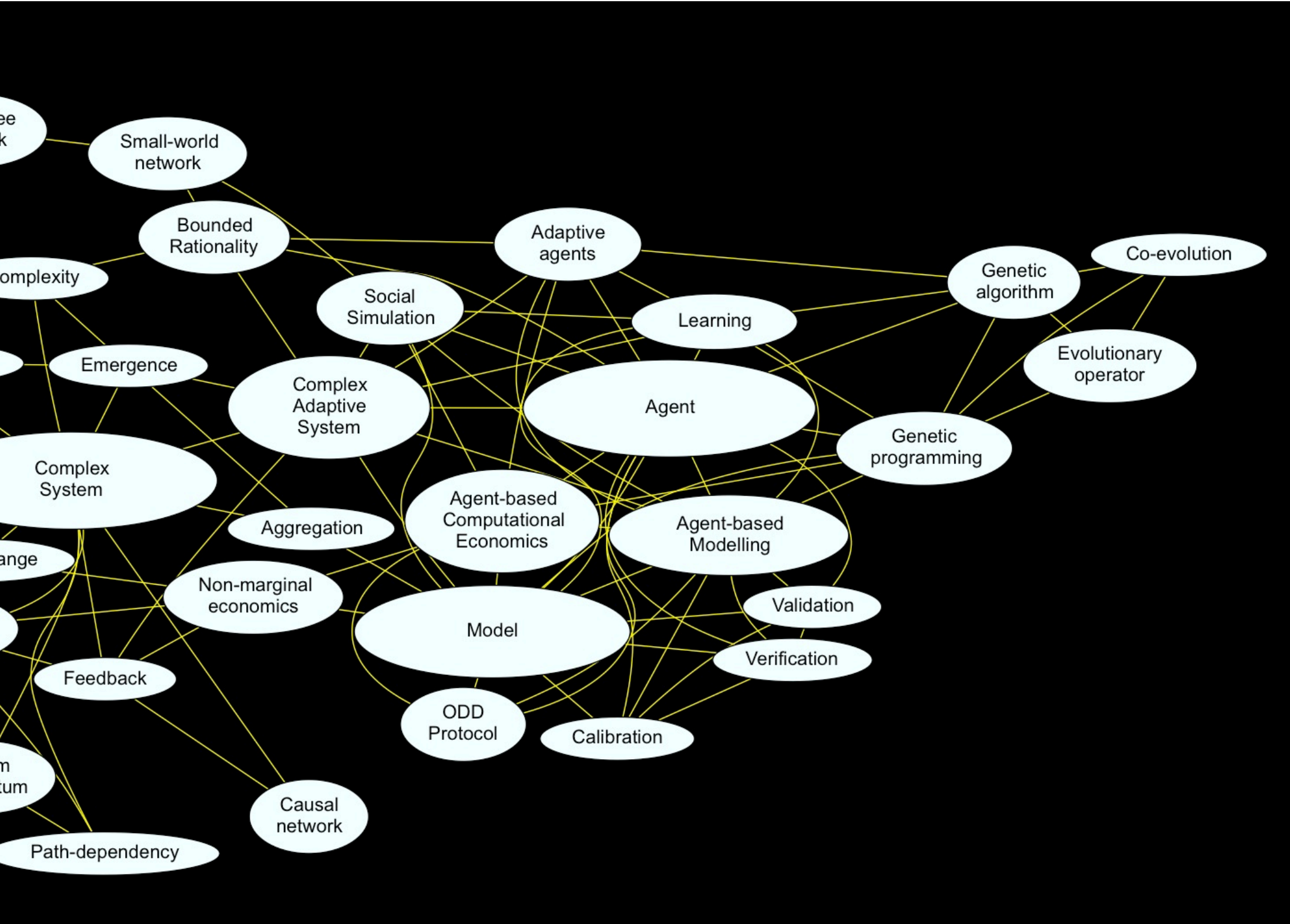
See also



<http://gephi.org/>

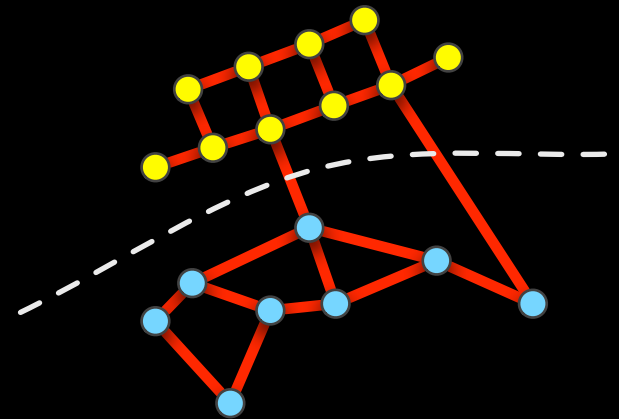




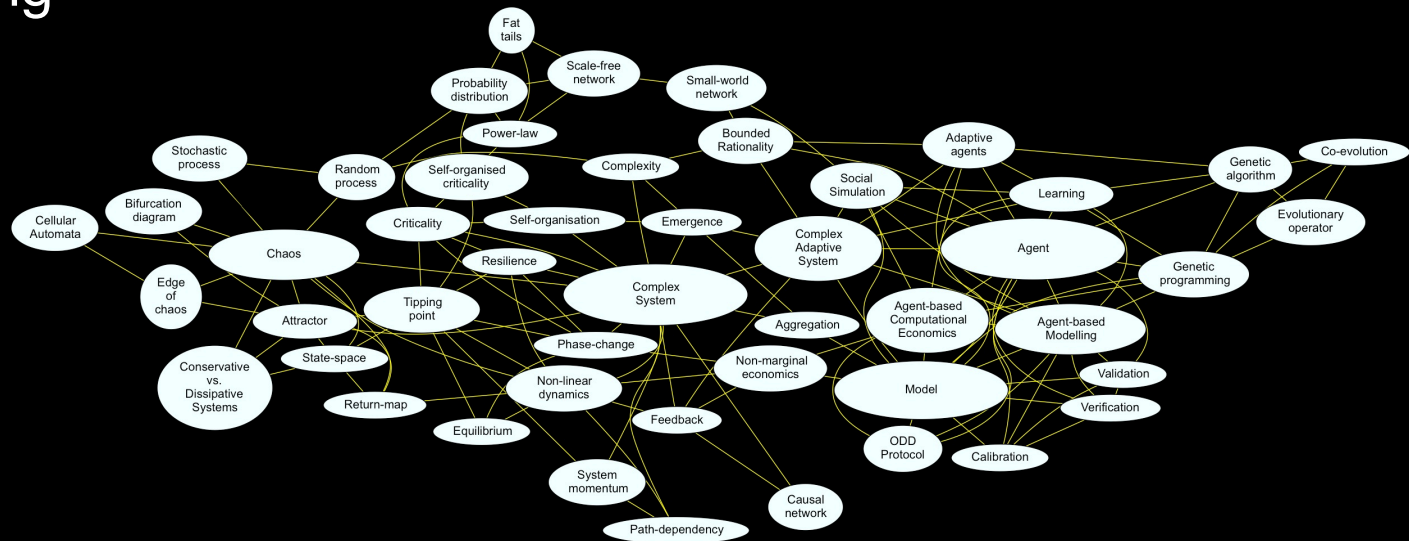


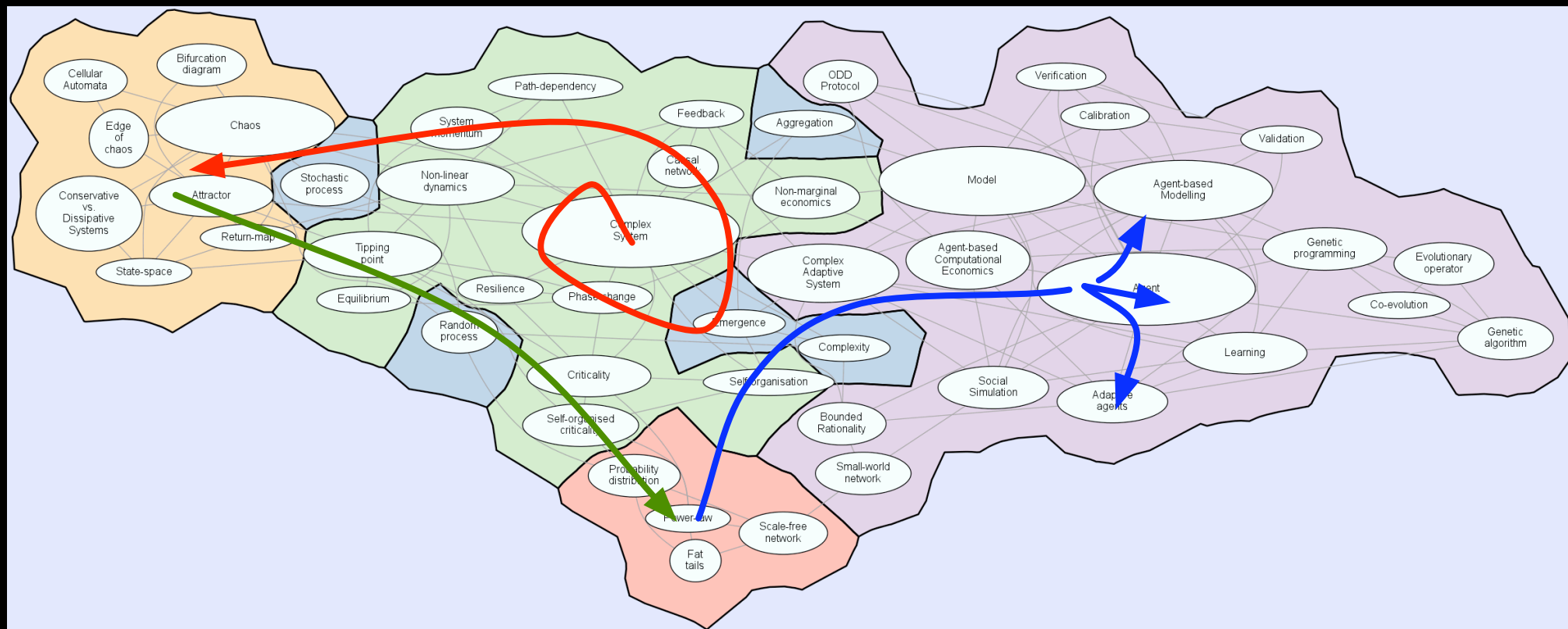
Network .. now map?

We need to identify
associated nodes ... call
these 'countries'.



To do this, layout in 2D, and
apply clustering
algorithm





What did we learn?

... 4 main countries:

'Chaos-land'

'Complex Systems-land'

'Agent-land'

'Networks-land'

Some 'Strasburgs'

Random/Stochastic Processes

Aggregation

Emergence

Complexity

... interfaces between countries:

Chaos --- Complexity

Complexity --- Networks

Complexity --- Agent

Agent --- Networks

... Possible framework for teaching the unit:

Start in Complex Systems-land

- introduce other countries, key linking concepts

Then take on 'theory' in Chaos-land and

'Network-land'

Then move to practice .. Agent-land

... taking it further

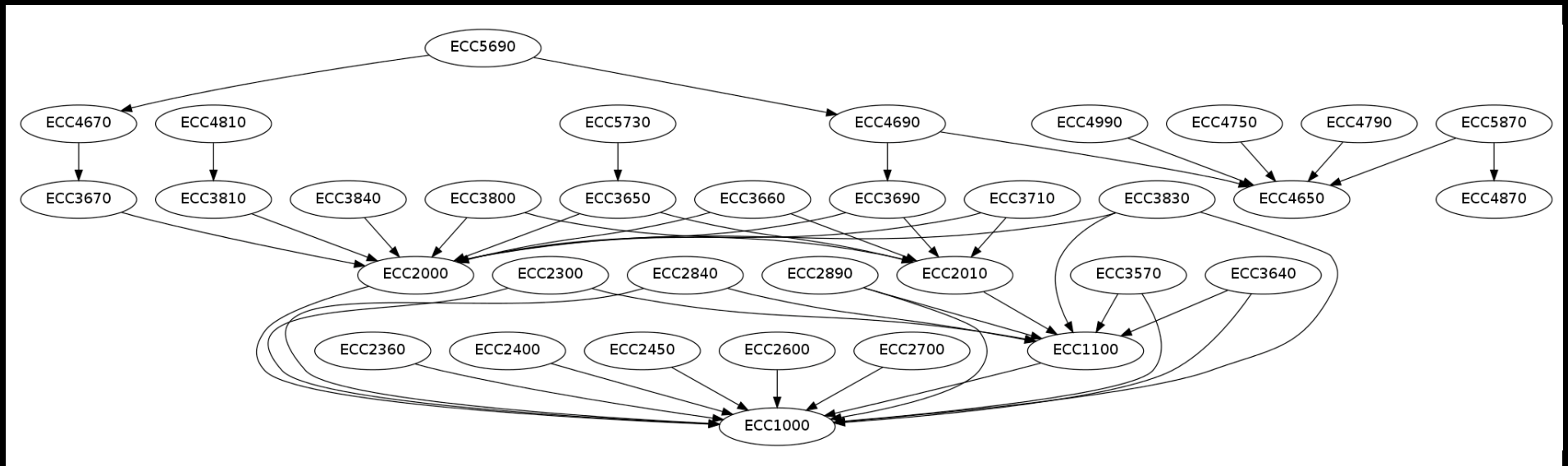
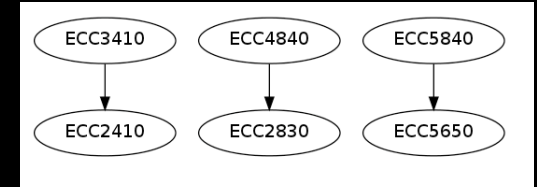
... mapping a unit in
its context

... mapping one or
more departments ...



Department of Economics ...

... we could do this:



Department of Economics ...

... or we could repeat the Unit method

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*(need to ask every lecturer to give us (say) 10 concepts ...
... then collate ... then ask them to give us relational links to
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Answer: We need SCALABILITY

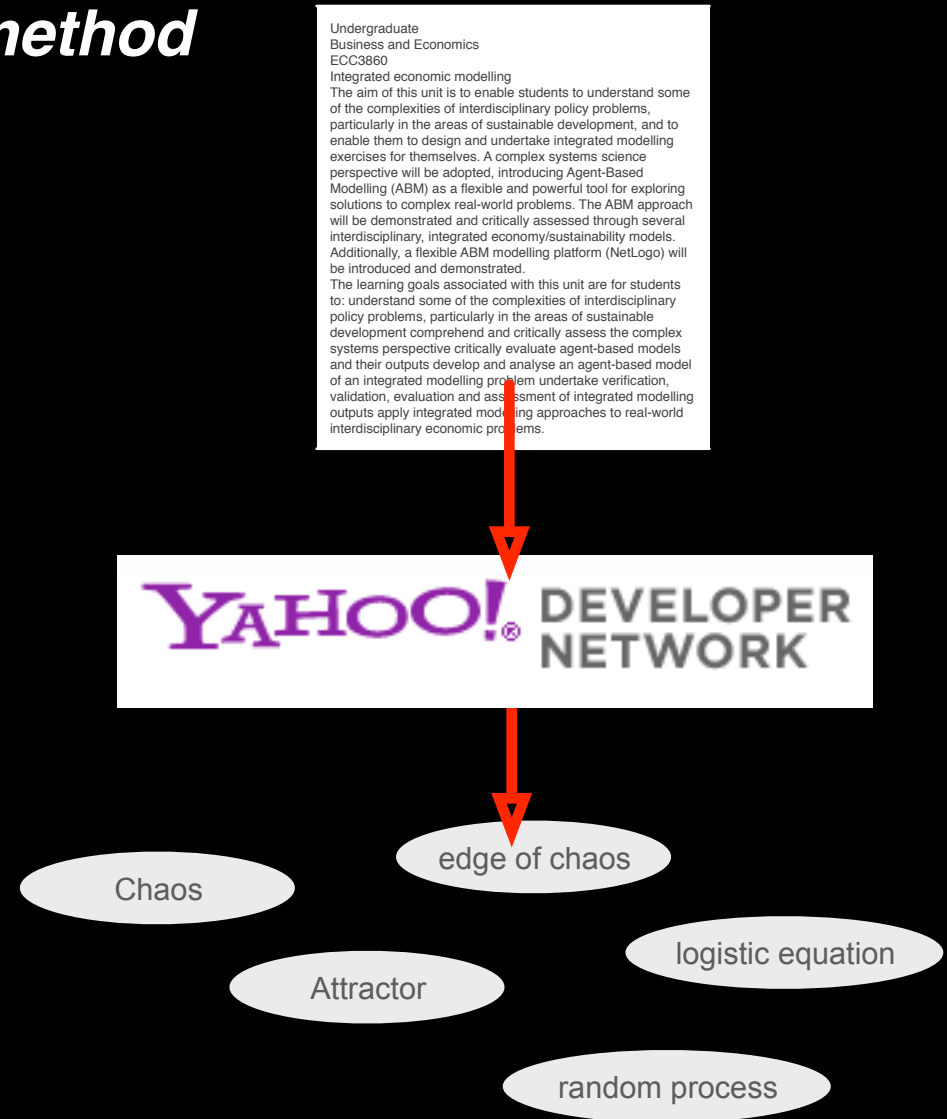
(that means, 'automation')

... enter the bots

... or we could repeat the Unit method

NEW method

1. Get a database (from the faculty, or ...) of unit *synopsis* and *objectives*;
2. Send this text to Yahoo's key-word finder API;
3. Receive back key-words for *every unit* in Economics;
4. Now link two units if ...



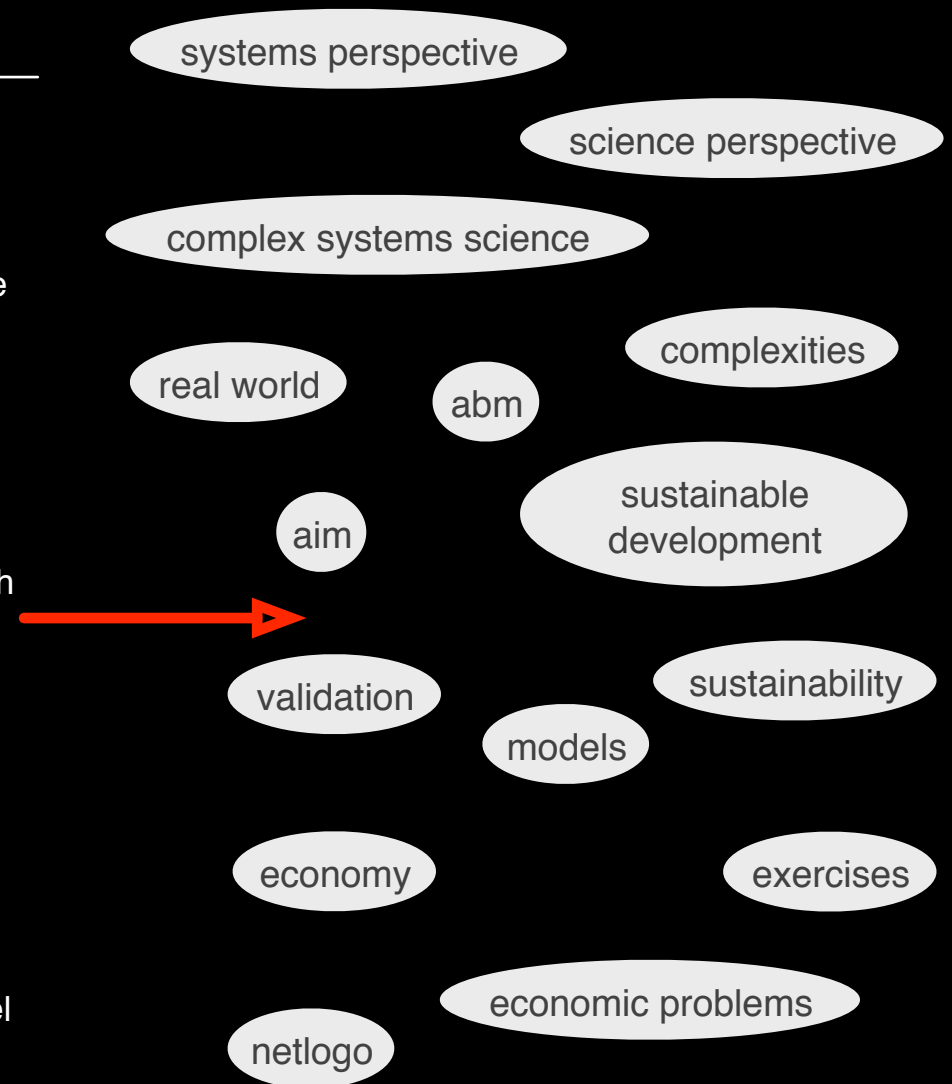
... output

Undergraduate
Business and Economics
ECC3860

Integrated economic modelling

The aim of this unit is to enable students to understand some of the complexities of interdisciplinary policy problems, particularly in the areas of sustainable development, and to enable them to design and undertake integrated modelling exercises for themselves. A complex systems science perspective will be adopted, introducing Agent-Based Modelling (ABM) as a flexible and powerful tool for exploring solutions to complex real-world problems. The ABM approach will be demonstrated and critically assessed through several interdisciplinary, integrated economy/sustainability models. Additionally, a flexible ABM modelling platform (NetLogo) will be introduced and demonstrated.

The learning goals associated with this unit are for students to: understand some of the complexities of interdisciplinary policy problems, particularly in the areas of sustainable development comprehend and critically assess the complex systems perspective critically evaluate agent-based models and their outputs develop and analyse an agent-based model of an integrated modelling problem undertake verification, validation, evaluation and assessment of integrated modelling outputs apply integrated modelling approaches to real-world interdisciplinary economic problems.



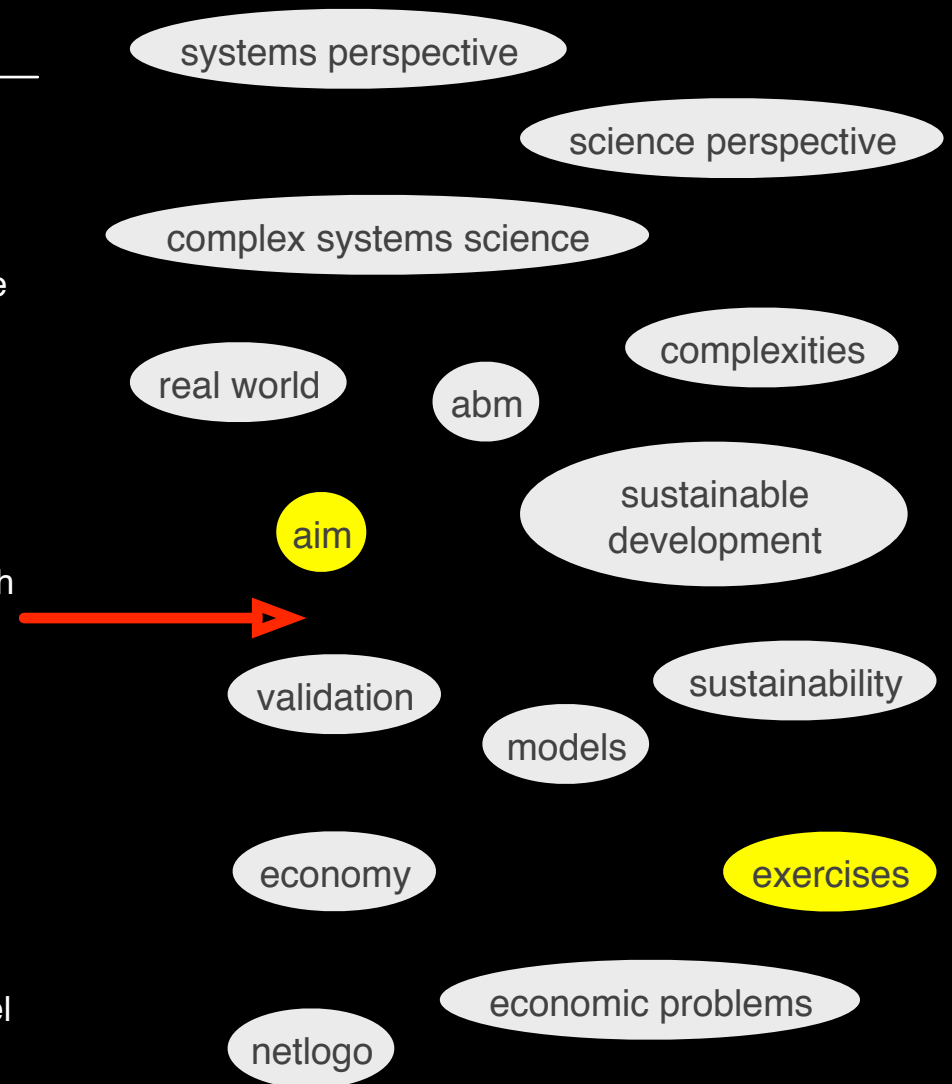
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Refining the method ...

3. Keyword cleaning:

- a) Take out a 'black-list' set of keywords;
- b) Take out any keyword mentioned **just once** across all units;
- c) Take out the **5% most common** remaining keywords

The Black-List

clayton
clayton-day
gippsland
assessment-task
caulfield
australia
assessment-tasks
summative-assessment
berwick
peninsula
analytical-skill
analytical-skills
safrica
sem
fourth-year
insight
key-role
critical-assessment
malaysia
exercises
assessment

Links ...

What defines a link?

1. Share ≥ 1 keyword in common;
2. Share ≥ 2 keywords in common;
3. Weight for abundance ...

Latent meaning considerations

Written text are signs, signifying underlying meanings which are not textual

Example: "efficiency"

Economics ...

Physics ...

Chemistry ...

What did we learn?

... 3 main regions

'Economics-land'

'EBS-land'

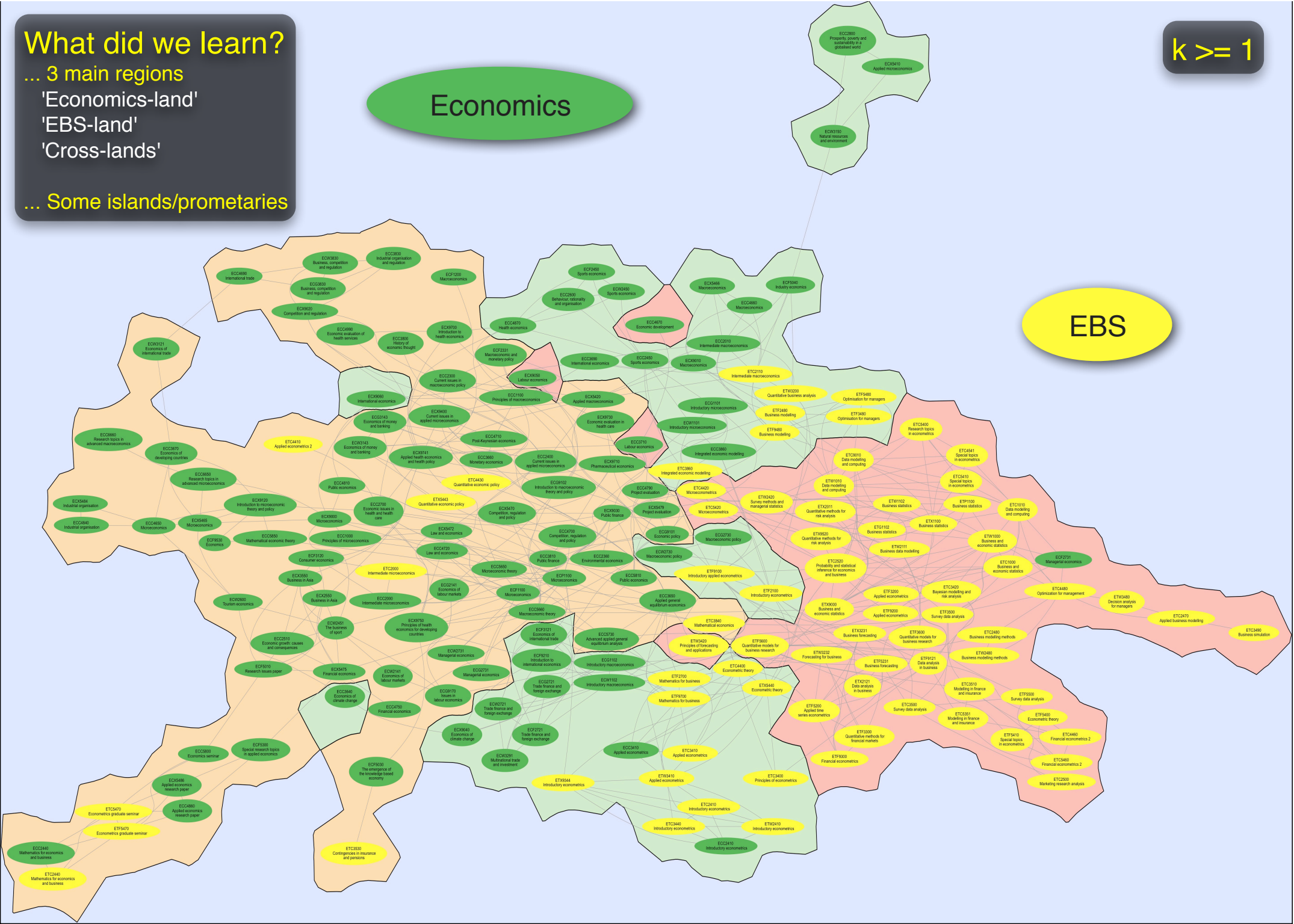
'Cross-lands'

... Some islands/prometaries

$k \geq 1$

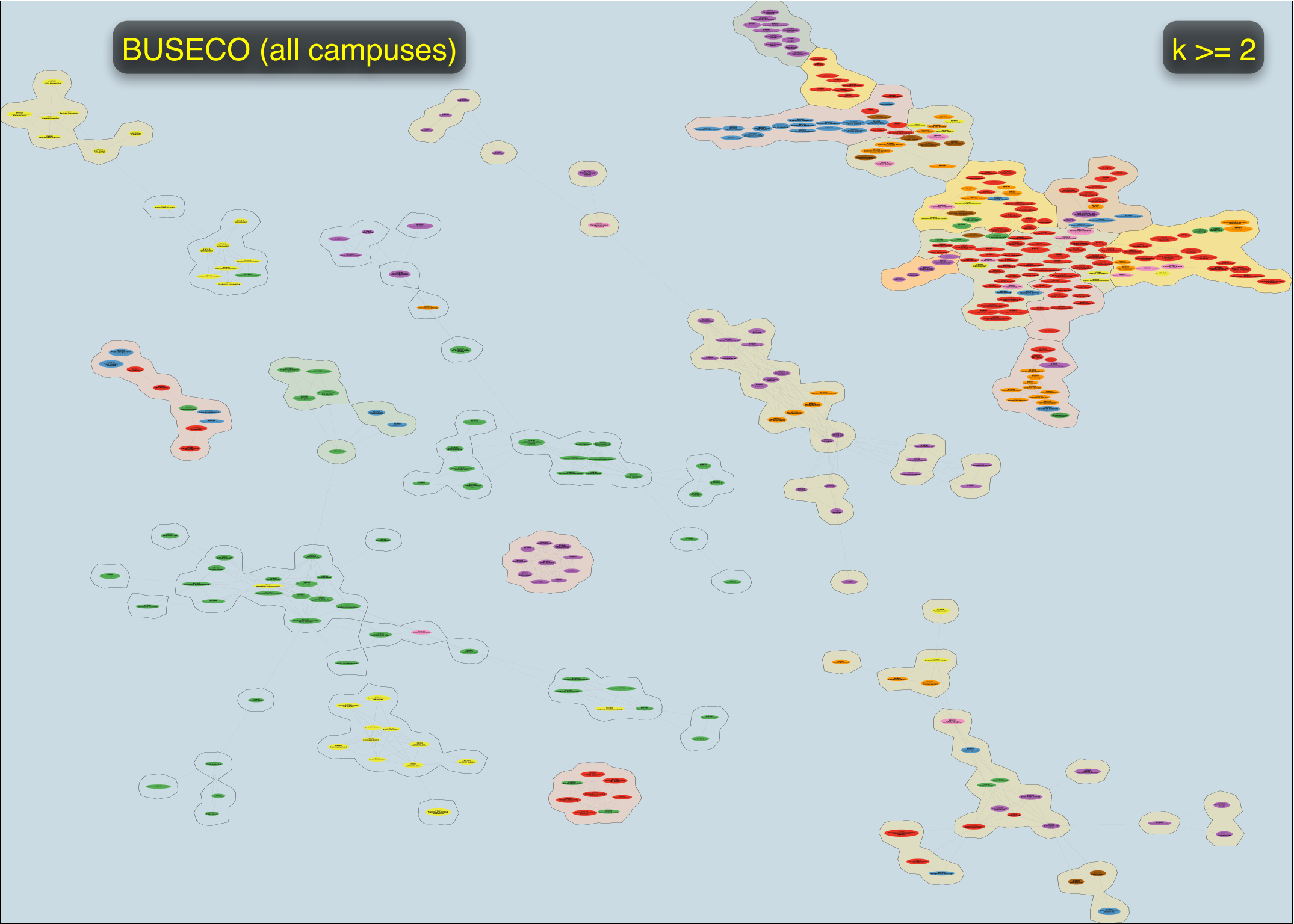
Economics

EBS



BUSECO (all campuses)

$k \geq 2$



$k \geq 2$

BLT

EBS

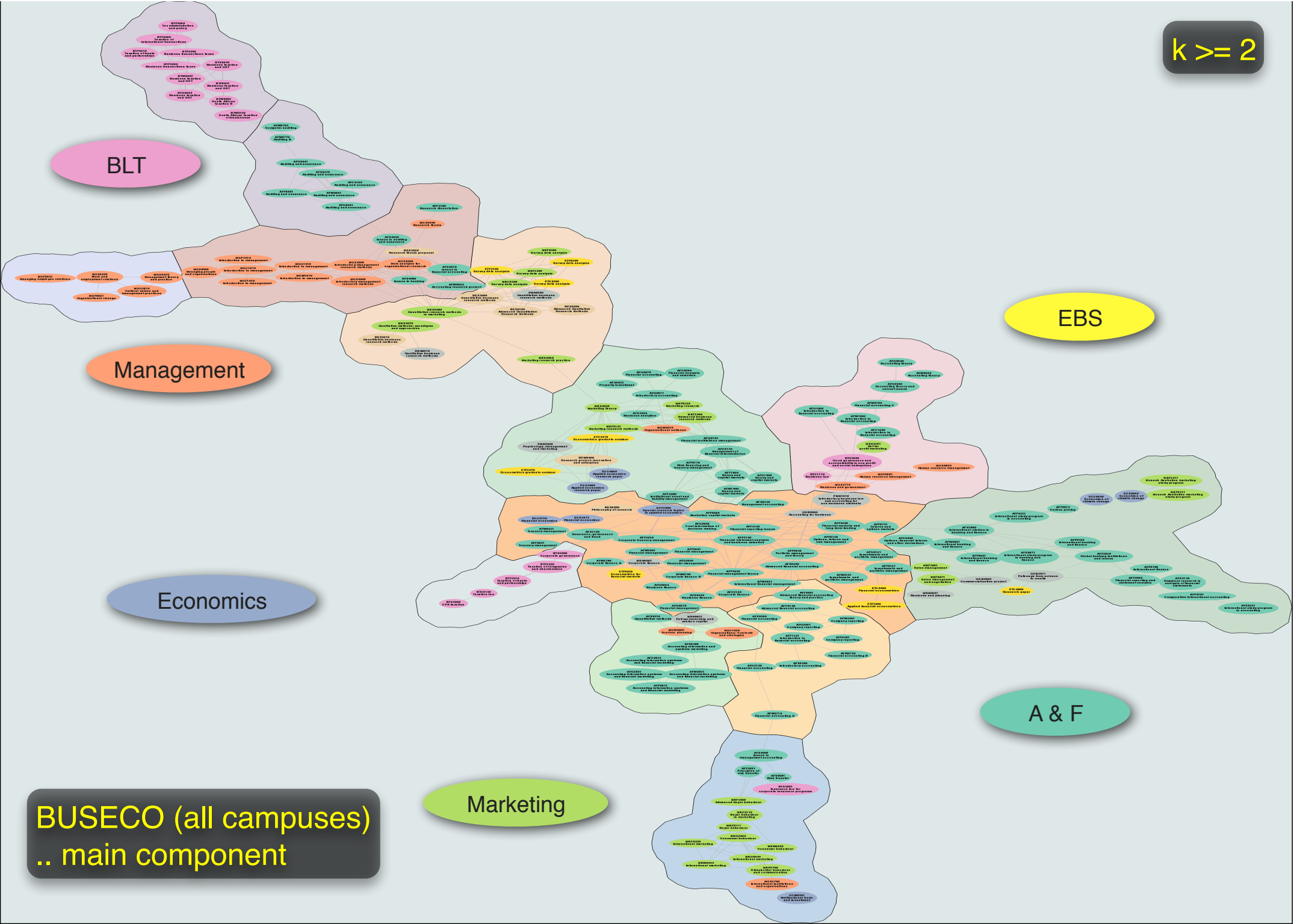
Management

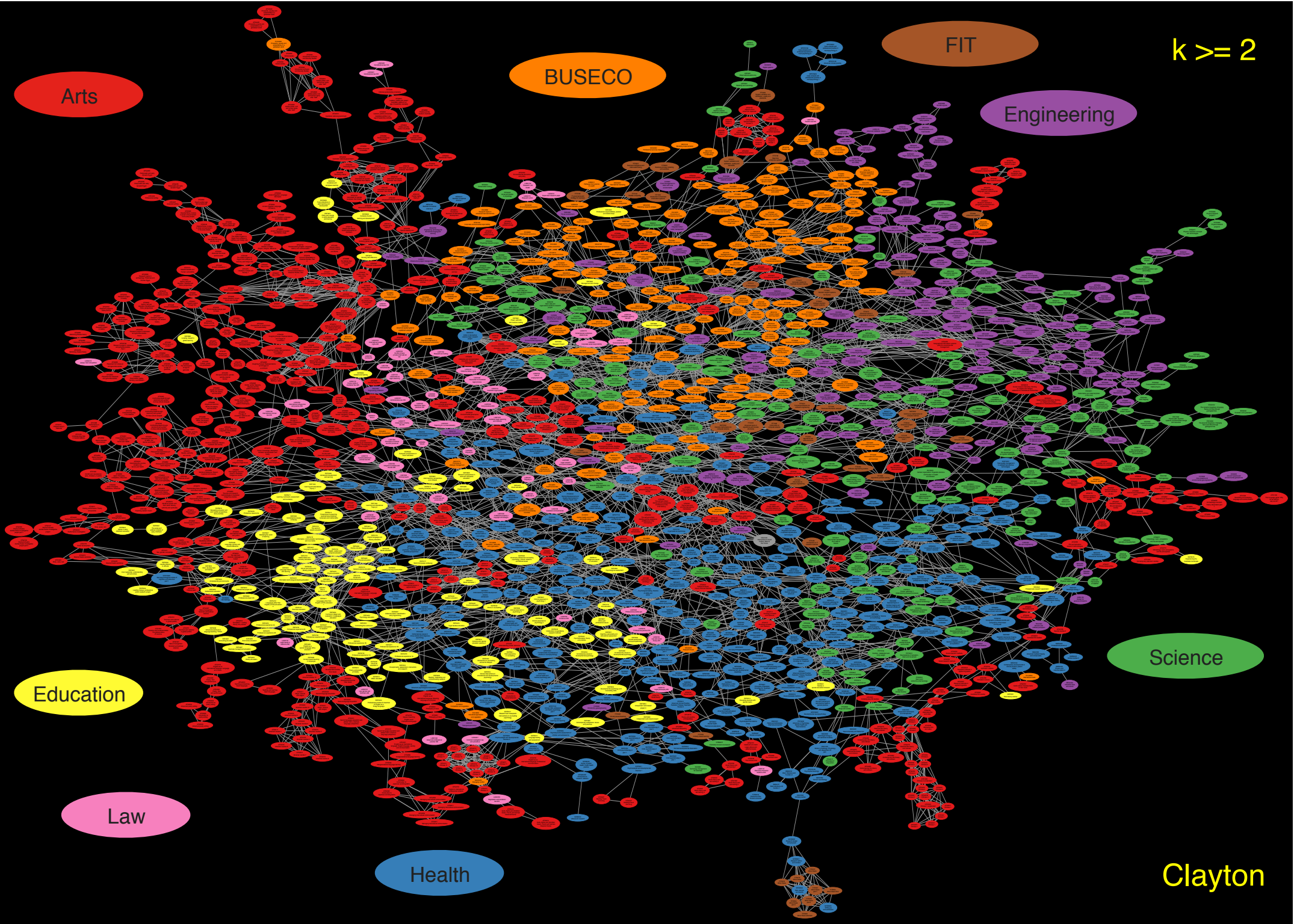
Economics

A & F

Marketing

BUSECO (all campuses)
.. main component





BUSECO

FIT

$k \geq 2$

Arts

Engineering

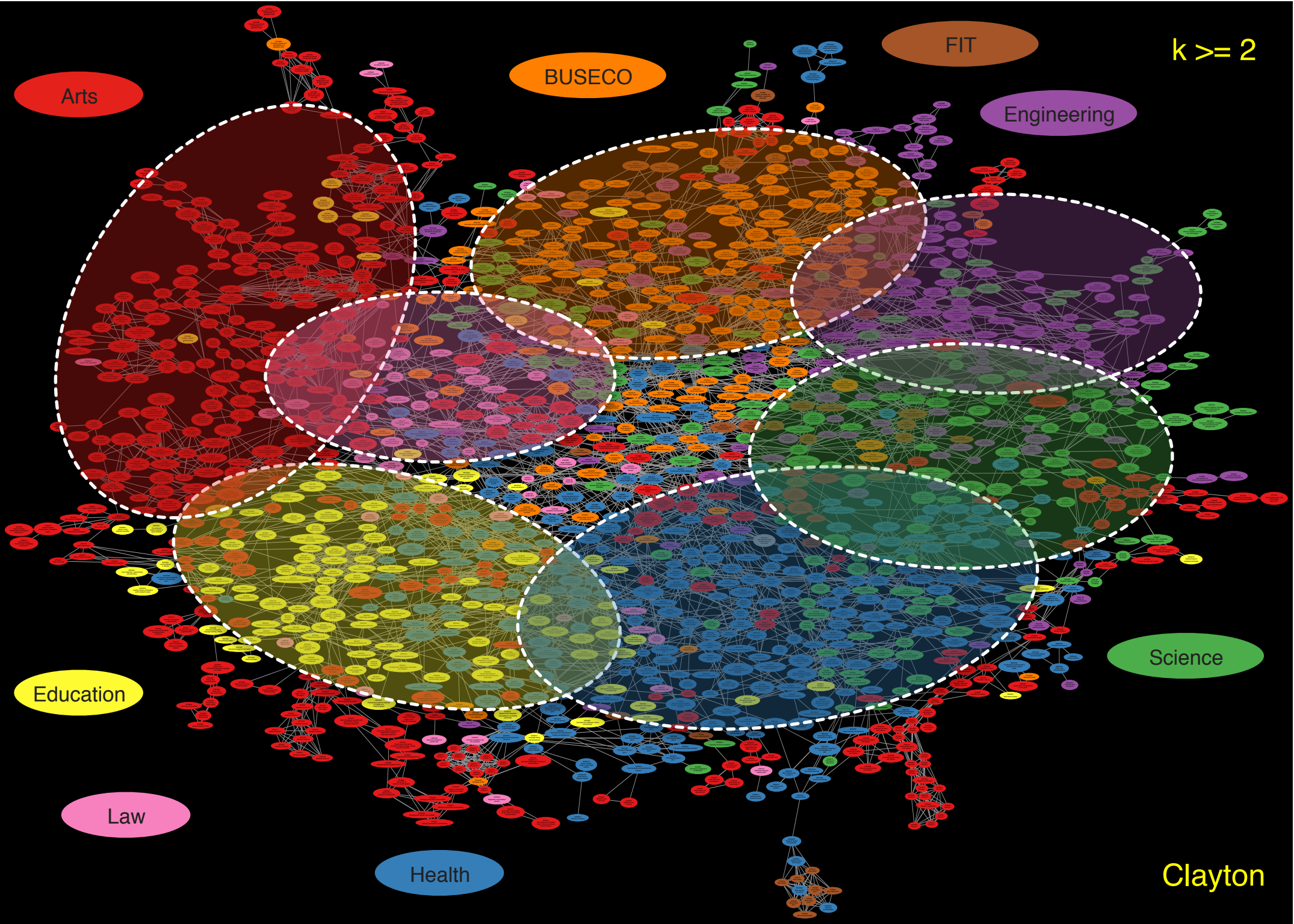
Science

Clayton

Education

Law

Health



Further work ...

1. Validation:

- > Keywords
- > Links

2. Clustering algorithms

- > plenty of choices

3. Quantitative output

- > clusters, nodes gained/lost, density
- > network properties ...