EUROPEAN COMMISSION NEST PATHFINDER INITIATIVE
Specific Targeted Research Project MMCOMNET

THE MMCOMNET COLLABORATION NETWORK

University of Stockholm

University of Oxford

INSEAD

Technical University of Warsaw

Technical University of Dresden

ETH Zürich

Measuring and **M**odelling **Com**plex **Net**works Across Domains
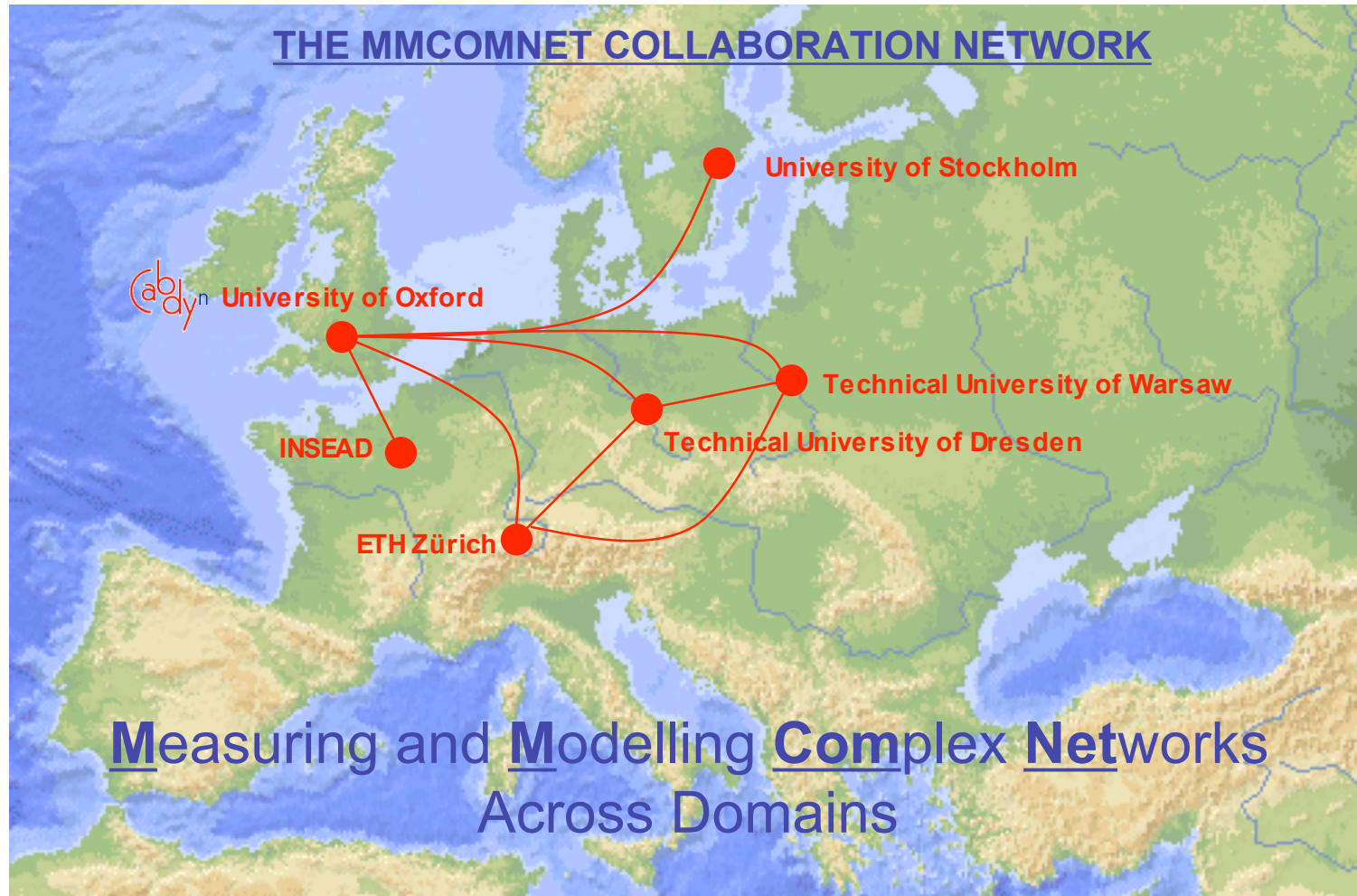
MMCOMNET Project Partners

Measuring and Modelling Complex Networks Across Domains

MMCOMNET Basic Facts:

- Start date: 1 February 2005

- Duration: 3 years

- European Commission contribution: €1,499,266

- No. of established senior researchers: 12

- No. of new research students
  and post-doctoral assistants: 10

- Website: http://sbs-xnet.sbs.ox.ac.uk/complexity/

Measuring and Modelling Complex Networks Across Domains

- Improve our understanding of the complex networks that surround us in everyday life, and play a key role in modern society.

- Bring together leading European researchers from the life sciences, physical sciences, social sciences, and mathematics in an adventurous and genuinely interdisciplinary programme of research.

- Focus on specific systems in well-defined application domains

  - **biological networks**
  - **supply chains and networks**
  - **innovation networks**
  - **transport networks**
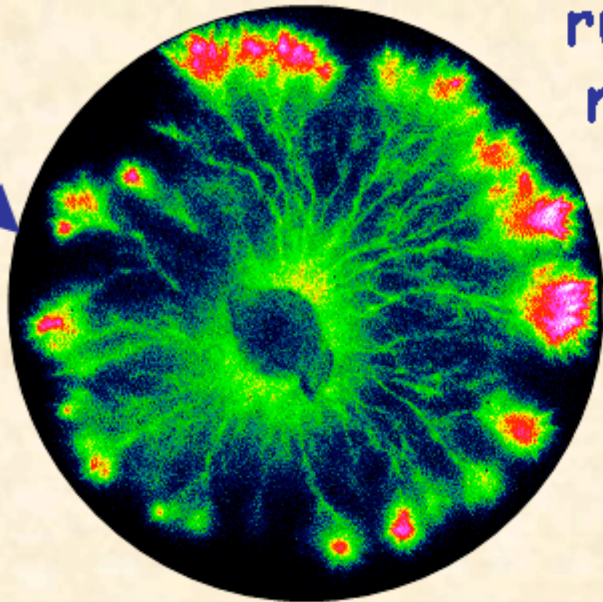
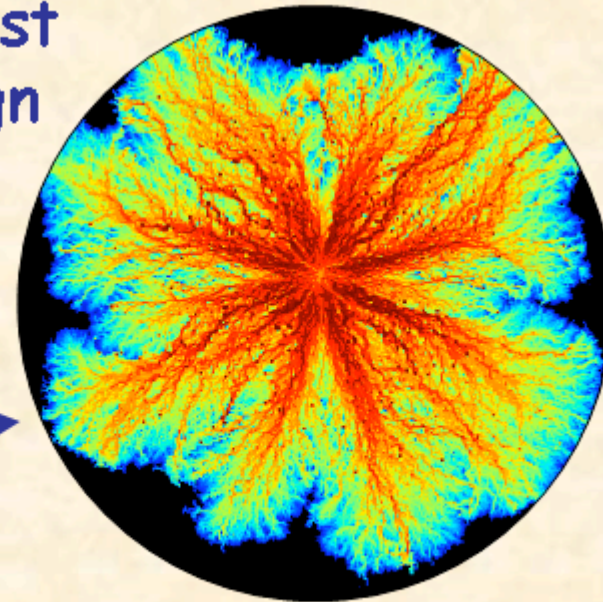MMCOMNET

Foraging mycelial system

weighted spatial network
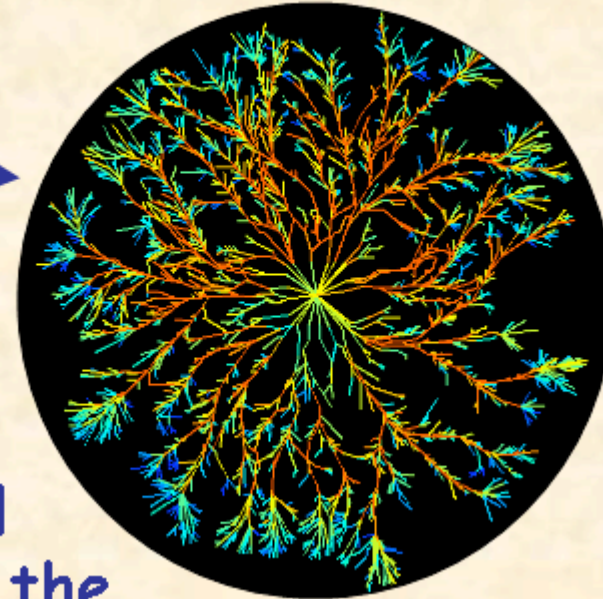
Experimental investigation of the rules for robust network design

Cabdyn

OXFORD

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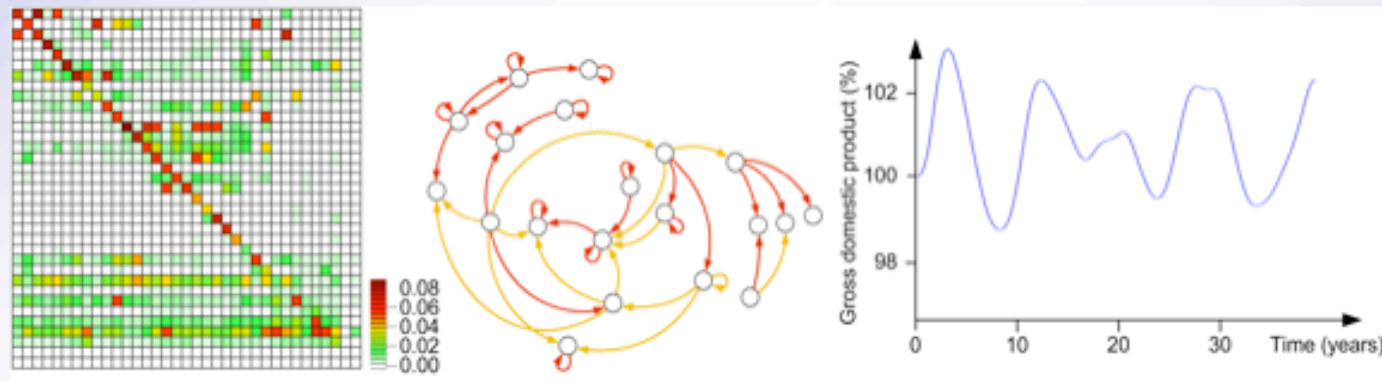
Functional imaging of network flux

Agent-based flux simulation

Investigation of the network structure:

- **Positive** and **negative feedbacks** in production processes
- **Time lags** in the information flow and adaptation process

Business cycles because of the structure of production networks?

Input output matrix

Related delivery network

Resulting oscillations in the gross domestic product

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Optimal Traffic Flow Control and Production Scheduling

- Traffic is a prime example of a complex system consisting of inter-acting queues

- Optimization algorithms can be transferred to production systems, sometimes organizations

- Vehicles correspond to products, traffic lights to service stations or machines

- Formulas for travel times relate to formulas for cycle times (pro-duction times)

- Conflicts in usage (e.g. of intersection areas) require priority rules and scheduling strategies which are adaptive to a varying demand.
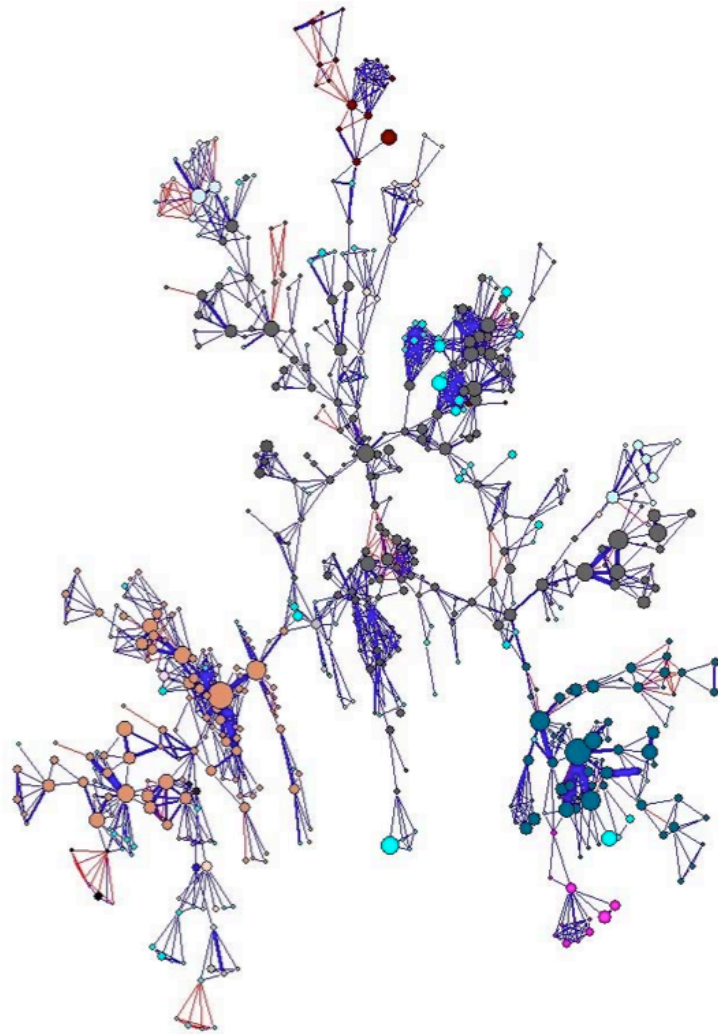
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VERKEHRSWISSENSCHAFTEN FAKULTÄT VV

DRESDEN UNIVERSITY OF TECHNOLOGY
"FRIEDRICH LIST" FACULTY OF TRAFFIC AND TRANSPORT SCIENCES
INSTITUTE OF TRANSPORT & ECONOMICS
CHAIR OF TRAFFIC MODELLING AND ECONOMETRICS

Innovation Networks
Venture Capital Firm Syndication Activity over 1 year

137 agents
919 edges

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INSEAD

Regional Innovation Clusters and Networks

High-Tech Clusters Modelled as Complex, Dynamic Networks

Flows of:

- Information (patents, publications etc.)
- People
- Knowledge
- Capital (venture capital, joint ventures etc.)

Key Questions:

- Are there robust properties associated with superior innovation rates & value generation?
- How do innovation clusters evolve?
- Are there generative rules for innovation networks - how can high-tech clusters be replicated successfully?

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Measuring and Modelling Complex Networks Across Domains

ANTICIPATED OUTPUTS FROM MMCOMNET

- New metrics for measuring complex networks provided as software tools.

- New models for the functional and dynamic properties of complex networks and associated software.

- New insights into the management of complex networks.

- Novel design principles which can guide the construction of technical, socio-technical, and socio-economic networks.

European Commission

Framework 6   NEST Pathfinder Initiative