WHAT COSTNET CAN DO FOR YOU *AND* WITH YOU

COST Action CA15109

Steffen Lauritzen

WHAT IS COST?

- European Union funding scheme
  - "Cooperation in Science and Technology"
  - Since 1971
  - Included in Horizon2020
- **Aim**: stimulate novel collaborations between scientists and stakeholders on important themes.

WHAT IS COSTNET?

- In 2015 group of 70 statisticians, probabilists and computer scientists submitted COST application:

- **IDEA**: get support for collaborations between scientists working on ***statistical networks.***
- Was funded and started on 1 June 2016.

EXAMPLES OF NETWORKS

- **Epidemics** and infectious diseases
  - Social networks, Gossip
- **Financial** networks and resulting crisis
  - Social networks of banks, "Lending" links
- **Genomic** and **Brain** networks
  - Signalling, drug targets, cell differentiation
- **Evolutionary** networks
  - Speciations and extinctions
- **Traffic** networks
  - Flow, optimization, delays.
- **Probabilistic** networks

HOW DOES STATISTICS ENTER?

- Networks are unknown
  - Genomic networks
- Networks are "random"
  - Social network in class setting
- Networks parameters are unknown
  - Epidemic spread coefficient
- Outcome of interest is unobserved quantity on network
  - Origin of food poisoning
- Outcome of interest are unknowns functions of inter-related sets of covariates.
  - Causal effect of certain drug targets

TIMELINESS

- **Statistical Network Science** with Applications (Lorentz Center, NL, April 2013)

- **NETWORKS** (Gravitational grant, NL, 2014-2023)

- **Statistical Analysis of Network Data** (ECAS, Munich, DE, Sept-Oct 2015)

- Theoretical foundations of **Statistical Network Analysis** (Newton Institute, UK, July-Dec 2016)

- Special Issue, **Applications of Stat. Network Science**, J. of Royal Statistical Society C, 2016

- **Statistical Network Science** (COST Seminaire Statistique, March 2017, Eurandom, NL)

MAIN AIMS OF ACTION

Scientific aim:

- to critically ***assess commonalities*** and opportunities for cross-fertilization of statistical network models in various applications, with attention to scalability in the face of Big Data.

Capacity building aim:

- To ***facilitate collaboration*** between diverse groups of statistical network modellers, which includes researchers from across the whole of Europe and at every stage in their scientific career and to facilitate contact with stakeholders.

Scientific objectives

- to initiate novel **transdisciplinary research links** within academia and with industrial stakeholders;

- **to communicate** existing approaches from one statistical network application field to another;

- to develop **novel theory and methodology** in important fields of network applications;

- **to seed future research projects** to channel efforts and maximize efficiency;

- **to identify pressing research needs** in statistical network analysis, modelling and inference.

Working Groups

- WG1: Exploring (massive) network data sets
  - WG Leaders: Clelia di Serio and Silvia Fierascu
- WG2 Network Modelling
  - WG Leaders: Steffen Lauritzen and Konstantin Avratchenkov
- WG3 Network Inference & Prediction
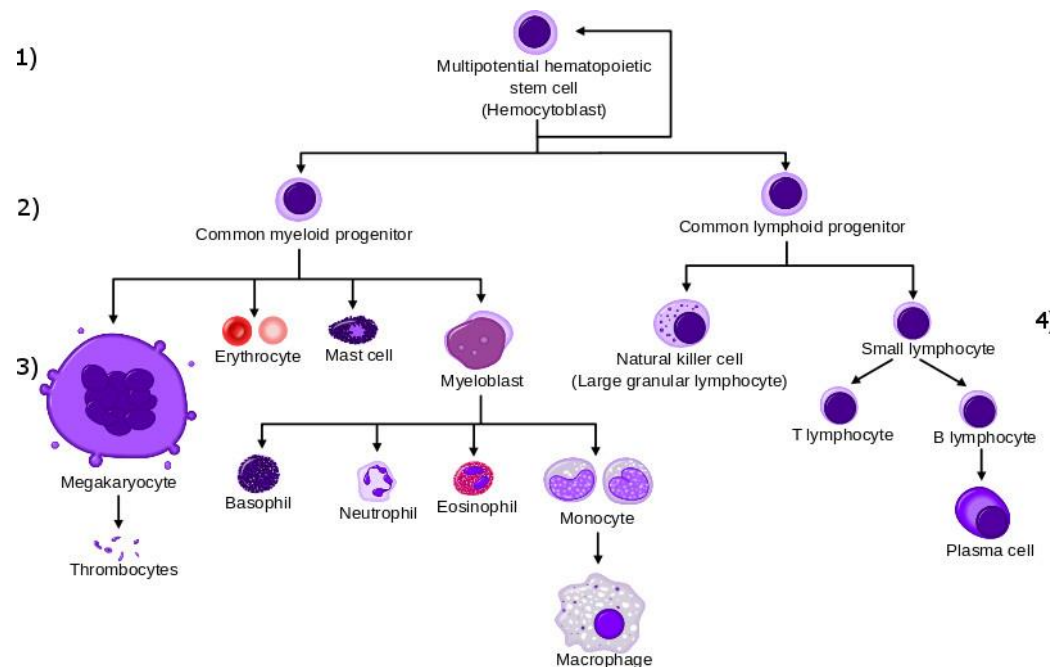 - WG Leader : Arnoldo Frigessi and Nial Friel

WG1: Exploring (massive) network data sets

- Sampling networks
- Sampling data on networks
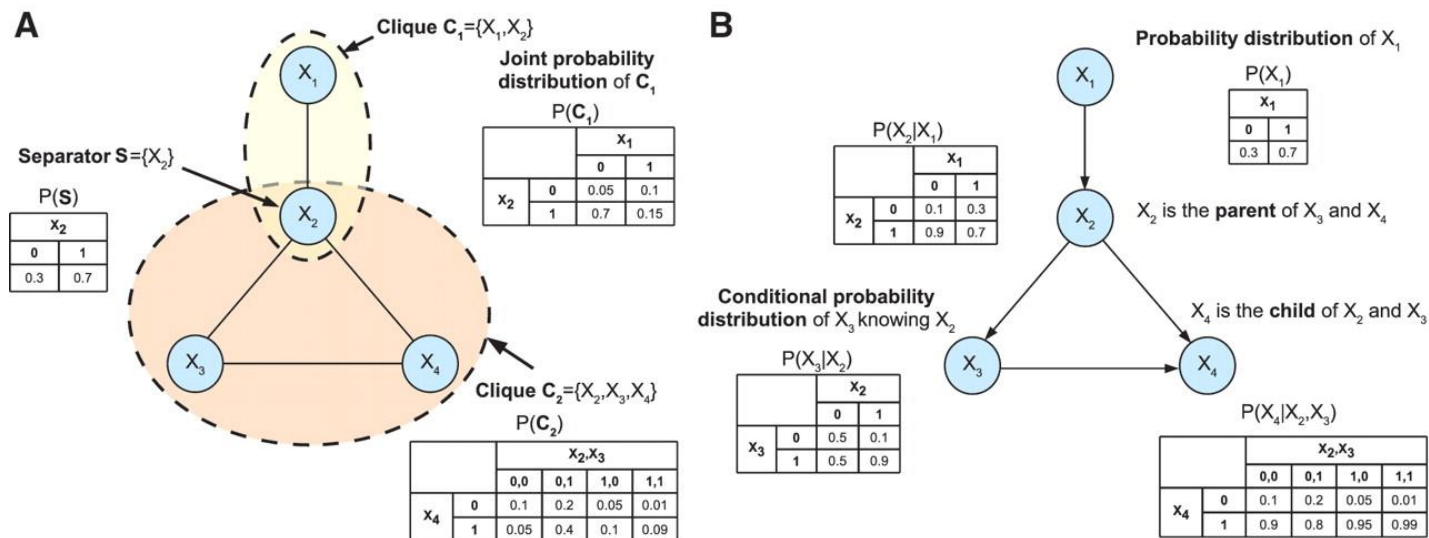- Applied statistical network projects

(Image modified from Wikimedia Commons, Fred Hutch)

WG2 NETWORK MODELLING

- Graphical models
- ERGMs and other social network models
- Network flow models (ODEs)
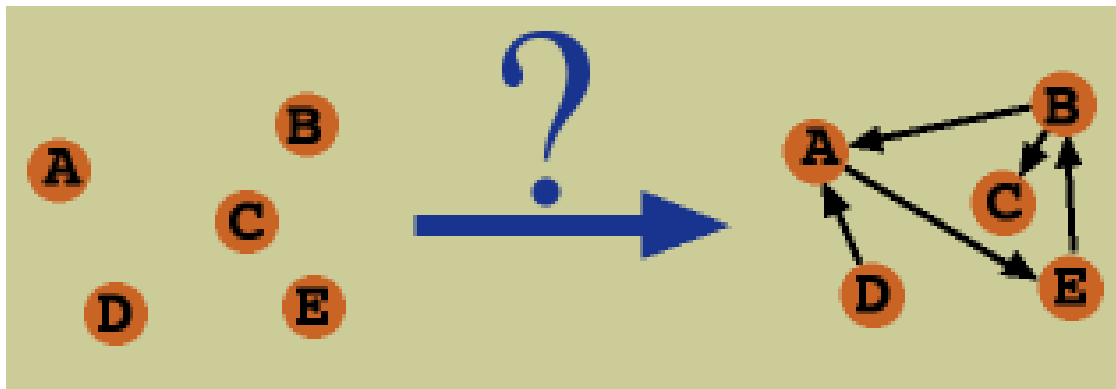- SEIR outbreaks on configuration models

Probabilistic graphical models for genetic association studies, *Briefings in Bioinformatics*, March 30, 2011, doi: 10.1093/bib/bbr015

WG3 Network Inference & Prediction

- Sparse inference of (dynamic) networks
- Inferring network parameters
- Likelihood-free methods in large networks

Capacity building objectives

- To stimulate **Early Career Investigators** in field of Statistical Network Science

- To achieve geographical and demographical diversity with special attention to **gender balance** and COST **Inclusiveness Target Countries**.

- To **complement the Action's physical meetings** with innovative online initiatives to stimulate more inclusive and continuous collaborative ties between Action participants.

ACTION ACTIVITIES

- **Action conferences & WG meetings**
- **Short term scientific missions (STSMs)**
- Live online seminar series
- Blogs and Wikis on Action website
- Summer Schools & online courses
- **Young researchers meetings**
- Mentoring scheme: joint PhD supervision
- Peer Penpal scheme
- Platform for academic and industrial collaboration

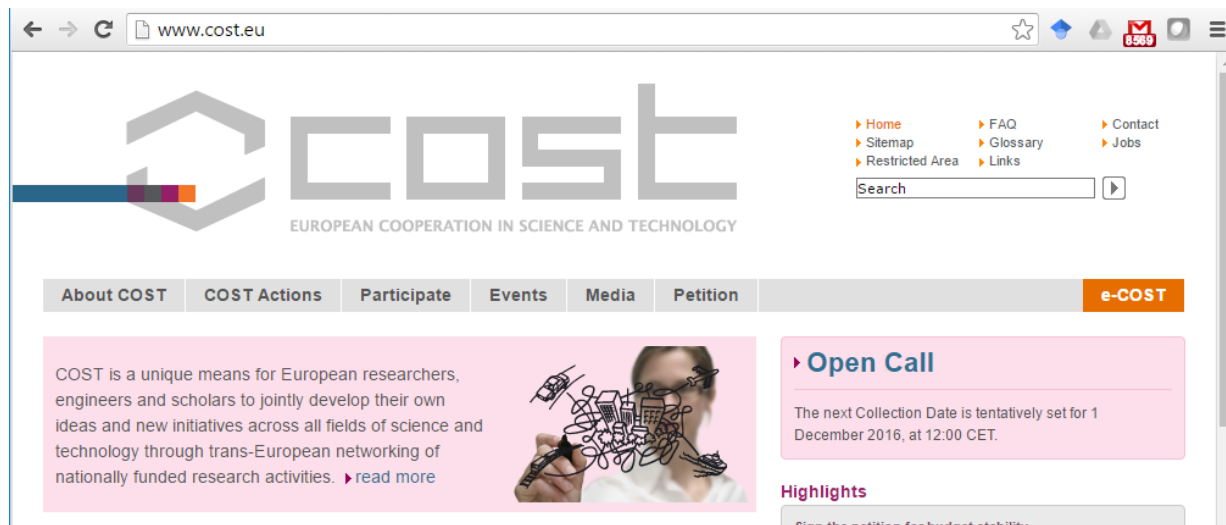# GRANT PERIOD 1 (1/5/16 – 30/4/17): PROPOSED ACTIVITIES

- 1 June 2016 – 1 December 2016
  - Put together online infrastructure
- 1 June 2016 – 30 April 2017
  - STSMs
- 23 September, 2016 (afternoon)
  - MC meeting
- **21-23 September, 2016**
  - **Action Conference, Ribno, Slovenia**
  - **1st Action conference with WG meetings**
- **6-10 March 2017**
  - **Winter School on Statistical Network Science.**
  - **Eurandom, Eindhoven, NL**

GET INVOLVED!

- You can still join the Action:
  - Sign up on www.cost.eu :

  - Join COSTNET meetings and apply for STSM funds
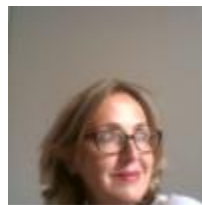 - Get funding to organize COSTNET funding

Conclusions

- Statistical network science is already active in large variety of applied fields.

- More central coordination and exchange would benefit both methodological and applied field.

- YOU CAN JOIN THE ACTION!

MANAGEMENT STRUCTURE

- **Action Chair**: Ernst Wit (Groningen, MC NL)
- **Vice Chair**: Gesine Reinert (Oxford, MC UK)
- **Grant Holder Manager**: Goeran Kauermann (Ludwig-Maximilians-University Munich, MC DE)
- **WG1 Leader**: Clelia di Serio (Milan, MC IT)
- **WG2 Leader**: Steffen Lauritzen (Copenhagen, MC DK)
- **WG3 Leader**: Arnoldo Frigessi (Oslo, MC NO)
- **STSM coordinator**: Veronica Vinciotti (Brunel, MC UK)
- **Outreach coordinator**: Anuska Ferligoj (Ljubljana, MC SI)
- **Dissemination Coordinator:** Claire Gormley (UCD, MC IE)