An introduction to graph analysis and modeling

Introduction

MSc in Statistics for Smart Data – ENSAI

Automn semester, 2018

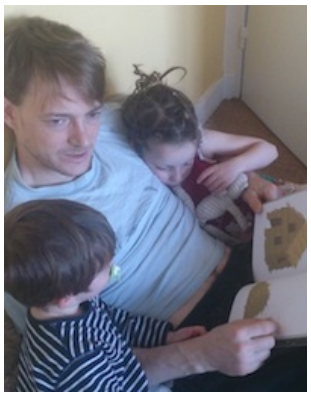
`https://github.com/jchiquet/CourseStatNetwork`

Teacher

UMR 518 AgroParisTech/Inra

https://www6.inra.fr/mia-paris

Julien Chiquet



Researcher at Inra

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Motivation

Unravel the latent organization of an observed network

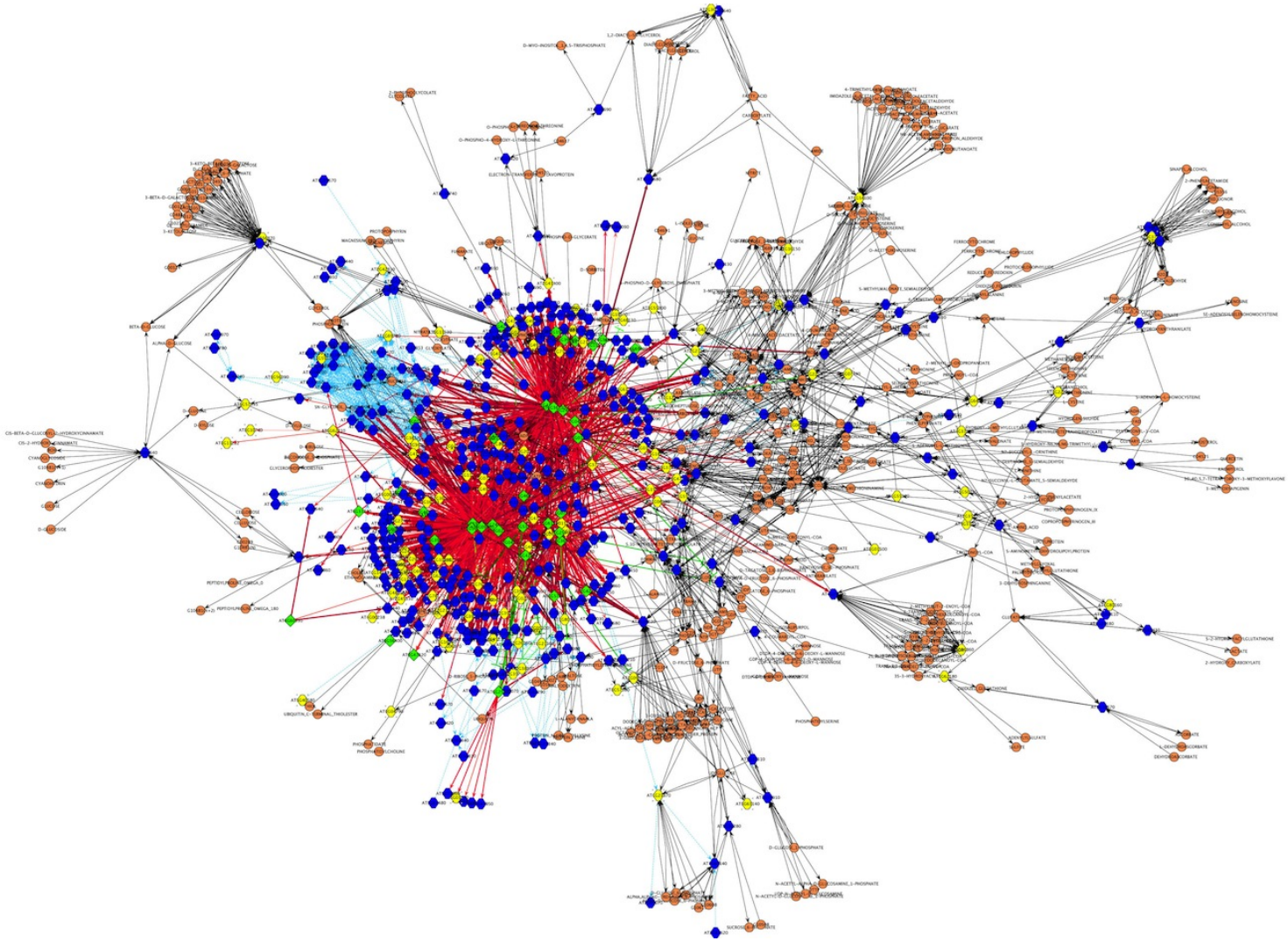

Figure: Regulatory network identified in mammalian cells: highly organized

Motivation

Unravel the latent organization of an observed network

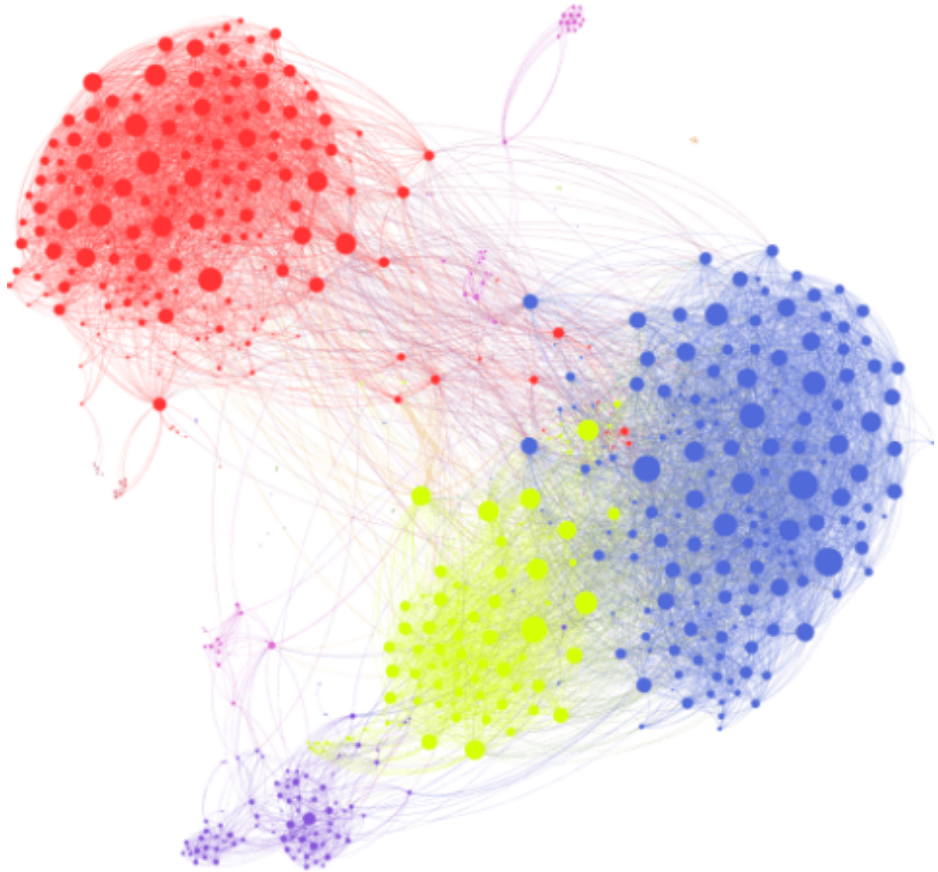

Figure: Friendship network in Facebook communities

Motivation

Unravel the latent organization of an observed network

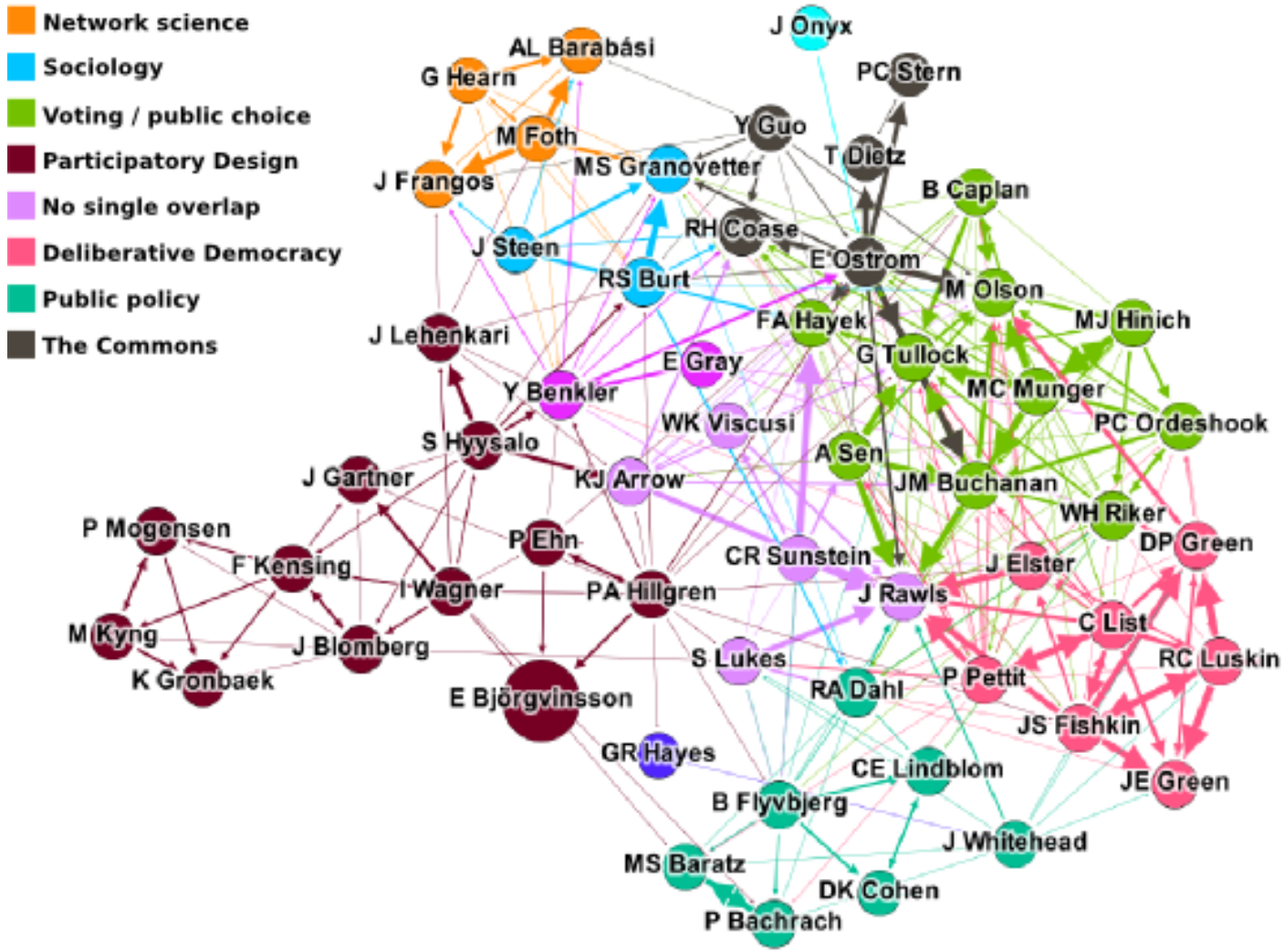

Figure: Coauthorship network in google scholar stars + communities

Agenda (expected...)

first day Descriptive Analysis of Network Data (06/11)

1. Basic on Graphs
2. Descriptive Statistics
3. Graph Partionning

second day Statistical Models for Networks Data (15/11)

1. Stochastic Block Model

third day Extensions of the SBM and project preparation (22/11)

1. Accouting for covariates
2. Weighted network
3. Dynamic network
4. ... and more

Module Assessment

1. Practicals
   - each session comes with practicals on R
   - send me a R-markdown report at the end of the session/day
2. Projects
   - article review (an SBM extension)
   - application project (find some network data to play with)
   - implementation of an algorithm / analysis

General books in Statistical Learning and networks

`https://github.com/jchiquet/CourseStatNetwork`

- Statistical Analysis of Network Data: Methods and Models, by Eric Kolazcyk
- Statistical Analysis of Network Data with R, Eric Kolazcyk and Gábor Csárdi
- Pattern recognition and Machine Learning, C. Bishop