Final Project Assignment

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1 author:

Jan Treur
Vrije Universiteit Amsterdam
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Final Project Assignment

In the Behaviour Dynamics in Social Networks course, you encounter a number of domains and learn how to apply methods for Network-Oriented Modelling and Analysis. In the Final Project Assignment, each group is asked to pick a domain and use these methods to model some chosen human mental and social processes in this domain by Network-Oriented Modeling and analyze the network model's behavior. During the time you work on this Final Project Assignment, your group will have a personal supervisor and make appointments with him or her regularly, at least once or twice a week. Note that for all items indicated below your plans have to be discussed and agreed upon with your supervisor. Moreover, the choices made concerning modeling and analysis have to be motivated.

In the end, you will give a 10-minute presentation within one of the two lecture slots in the last week of this period, just before Christmas, and you will write a report about it (e.g., of about 10 to 25 pages, depending on font size and line distance). This report has to describe each of the following items:

- The chosen domain and processes
- Background domain knowledge used, for example, from Cognitive, Affective or Social Neuroscience or Social Science literature
- A fully specified graphical conceptual representation of the network model
- A fully specified conceptual representation of the network model by role matrices
- Simulations for some example scenarios, performed using one of the offered Matlab templates
- Verification or analysis of the model and its emerging behaviour (mathematical or network analysis)
- Parameter tuning in comparison to some data (empirical data, or data representing requirements for the outcomes of the model)

The idea is that for those who want this, the report can be the basis for submission of a paper to a conference (or maybe a journal); when this paper will be accepted, it can be presented there and you will get a publication out of it. Under the assumption that your supervisor also has contributed to the work, he or she will also be a (third) author of this submitted paper and also contribute to the writing of it.

1. Choose a Domain

You can choose your own domain or you can choose from the example domains that were addressed in the lectures and assignments (see also the list of options at the end of this document). Example domains may concern a more detailed model of one person, or multiple persons in a more complex network, where each person is modeled in a less detailed manner. The domains may be addressed by involving social media and data available in social media. Other domains may concern only a few persons, maybe just one or two, but address both more complex internal processes in these persons (for example, empathic interaction, or joint decision making) and their mutual interaction. Specific examples of domains can be found at the end of this document, and also examples from previous years and a list of options for conferences.

2. Design a Network Model for the Chosen Domain and Processes

All models are expected to have the form of a temporal-causal network model and are to be described in terms of the specific concepts addressed in the course in Books 1 and 2, such as states and their values, connections and their weights, speed factors, combination functions and perhaps learning or adaptation mechanisms and their parameters, such as speeds. You can explore different options or variations for your model. For example, you could:

- Use internal dynamics based on multiple states per person and different connections or connection weights to model different types of persons
- Make an adaptive network for internal characteristics which are dynamic over time, thus including a learning or adaptation process of a person
- Make an adaptive social network model with network characteristics which are dynamic over time
- Make a second- or higher-order adaptive network model

You can find more information on these elements in the different chapters of the two books. But also on the internet and in ResearchGate. Also, think about the structure of your network. Which properties do you want it to have? Do you want to focus on the dynamics of the states or on the adaptive dynamics of the connections, or both?

3. Design and Perform Simulation Experiments with your Model

Using one of the available templates you can obtain an executable version of the model. Conduct systematic simulation experiments based on some chosen scenarios and analyse the outcomes of these simulations. Design simulation scenarios with different settings for initial values and of parameter values. Describe the results of these simulation experiments both in graphs and textual explanations.

4. Verification of the Model by Analysis

Use one of the methods for analyzing the behaviour of your model, as addressed in the course. Analysis can have the form of social network analysis and/or mathematical analysis of emerging behaviour by identifying stationary points and equilibria.

5. Validation of the Model by Parameter Tuning

Validation of a model by parameter tuning can be done using simulated annealing as offered by the template in Matlab. For validation by parameter tuning, you need some data. There are two options, from which the first option would be preferred (but may be too hard to achieve):

- **Empirical data**

Try to acquire empirical data by yourself, for example from the internet (e.g., the Glasgow data or Knecht data), or from social media.

- **Data representing requirements for expected behaviour patterns**

Describe some requirements for different expected patterns of the modeled processes in terms of data for different states over time that you want to impose; such patterns can be known from the literature in a qualitative sense.

6. Options for Domains

This is just a list of options but certainly not complete. You can propose any chosen domain concerning human mental and social processes.

- **Modeling Variations of Metaplasticity in Mental Networks**
- **Modeling Higher-Order Adaptation in Social Networks**
- **Modeling Higher-Order Adaptation in Biological Causal Networks**
- **Modeling Strange Loops**
- **Modeling self-esteem and social media**
- **Modeling bullying behavior and victim behavior at social media.**
- **Plants are intelligent, here's how**
- **Reducing and regulation of negative influences of Social Media (Twitter/Youtube) on a person**
- **Modeling a person with bipolar disorder/ Schizophrenia (Inspired by 'a beautiful mind')**
- **Workplace aggression and bullying**
- **Gender and age for Cyberbullying**
- **Adaptive social networks using empirical data**
- **Fear and fear extinction learning**
- **Emotion regulation and disorders**
- **Desire regulation**
- **Habit learning, habit change, and/or habit contagion in a social context**
- **Emotions, rationality, and disturbances by extreme emotions**
- **Correct and incorrect ownership attribution**
- **Modeling monitoring and analysing opinion dynamics in social media**

- **Modeling monitoring and analysing news messages**
- **Contagion of lifestyle, exercise behaviour, or habits**
- **Mirroring emotions and other internal states**
- **Social responses and empathic interaction**
- **Joint decision making**
- **Monitoring, analysis, and support of social processes, for example, of healthy behavior**
- **Modeling a Highly Sensitive Person (Elaine Aron's book 1)**
- **Modeling a relationship between two persons one of which is a Highly Sensitive Person (Elaine Aron's book 2)**
- **Modeling the emergence and effects of segregation in society**
- **Adaptive Mental Networks using Modulation of connections in Mental Networks based on (other) states**
- **Adaptive Social Networks using Modulation of connections in Social Networks based on (other) states**
- **The Microbiome in Mental Health: Potential Contribution of Gut Microbiota in Disease and Pharmacotherapy Management (the Gut-Brain axis)**
- **Criticality theory applied to the wandering mind and meditation**
- **Cognitive modeling of mindfulness therapy by Eye movement desensitization and reprocessing**
- **Cognitive modeling of Brainspotting Therapy: About a Bataclan Victim**
- **Exam vs Non-exam anxiety: Effectiveness of Emotion Regulation Strategies.**
- **Food Desires: Unsuccessful regulation of temptation and the consequences of that on health and wellbeing. Goals; as a driver of emotion regulation strategies selection.**
- **Taking the intensity of emotions as a context for the choice of emotion regulation strategies. (empirical data available for interested candidates)**

7. Some Options for Conferences

- **18th International Conference on Practical Applications of Agents and Multi-Agent Systems, PAAMS'20**
- **Workshop on MAS for Complex Networks and Social Computation, CNSC'20**
- **17th International Conference on Distributed Computing and Artificial Intelligence, DCAI'20**
- **16th International Conference on Artificial Intelligence Applications and Innovations, AIAI'20**
- **NEUROIS'20**
- **International Conference on Computational Science, ICCS'20**

8. Example Publications for Final Projects in Previous Years

For the previous years a number of publications were realized as Final Projects of this course; check **here**.