

# **Social Dynamics**

## Syllabus Fall Semester

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Chair for Marketing and Market Research  
URPP Social Networks  
Department of Business Administration  
University of Zurich, Switzerland  
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## PREAMBLE

Welcome to our “Social Dynamics” syllabus!

**“The internet connects us like the neurons in a giant brain. And with such a collective intelligence, what cannot we capable of?”**

*Adapted from Stephen Hawking*

Understanding and modelling social dynamics is key for policies aimed at large-scale behavioural change; for managerial decisions about targeting, influencer marketing, digital platform design; to anticipate unintended consequences of changes to the social systems we live in. In 2022, we created this seminar “Social Dynamics: Understanding how products and behaviours spread in society” to provide the students with an overview of four major themes in modern social dynamics research, an in-depth understanding of some of the most counter-intuitive properties of collective social behaviours, and the practical ability to implement and analyse the outcomes of computational models of social dynamics.

There will be two introductory lectures on social networks, models and simulations of social dynamics, and their coding in Python, with detailed coding tutorials. Subsequently, each student will study individually one pre-assigned research paper, attempt to replicate some of its findings, and deliver a presentation on the paper and results. To support the students’ work, there will be four Q&A sessions, which the students can use to code independently in class or ask questions to the instructors.

By attending the seminar, the students will become familiar with four main directions in modern social dynamics research:

- **Success inequalities and unpredictability.** Extensive research has shown that popularity and success typically follow heavy-tailed distributions, meaning that in many social systems, few products become hits whereas many others remain unknown. The students will learn basic mechanisms underlying the observed success inequalities, and their implications for the (un)predictability of new product success.
- **Simple vs. complex social contagion.** Many research papers and popular books assume that products and behaviours are “infectious” and spread throughout social networks like biological viruses. The students will learn when and why this epidemic metaphor can be applied to model certain types of information spreading (“simple contagion” processes), and why it fails to describe the spreading of political views, sustainable and healthy behaviours, and costly products. For these processes, the students will be introduced to the “complex contagion” theory, and to the role that different network structures and interventions play for the success of simple and complex contagion processes.
- **Seeding policies for social change.** Seeding policies guide decisions about which individuals to target first to initiate the penetration process for a new product or behaviour, with important applications for influencer marketing and interventions to promote sustainable behaviour. The students will become familiar with network-based seeding policies and their relative effectiveness for simple vs. complex contagion processes.
- **Algorithmic feedback and social dynamics.** Human behaviour is increasingly coupled with algorithmic behaviour, with potentially unpredictable and unintended long-

term consequences for digital platforms and global collective behaviour. The students will learn simple models to investigate the impact of ranking or recommendation algorithms on social dynamics.

Overall, the main objective is to offer the students an overview of the main theories and methods to understand the spreading of products and behaviours in society. During the seminar, the students will:

- Be introduced to various theories of social dynamics as well as their implications for policies aimed at social change.
- Be introduced to fundamental themes in modern social dynamics research.
- Obtain an overview of the impact of social network structures, social tie characteristics, and individual-level characteristics on the success or failure of new product or behaviour spreading.
- Analyse, present, and discuss diverse research papers where the spreading of products and behaviour has been investigated through agent-based simulations.
- Learn how to code in Python agent-based models of new product or behaviour spreading on social networks.
- Develop critical thinking about the main factors to consider when designing policies for social change.

This seminar will most likely take place in the **fall semesters**. All necessary information concerning the course can be found within this syllabus, in the UZH course book, and on our corresponding webpages.

We are pleased to welcome you to the seminar, and we hope that it will give you insights to make a large-scale difference in the world – whether through your future products, startups, or research papers.

# 1. QUICK OVERVIEW

## Instructors:

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<https://www.business.uzh.ch/de/research/professorships/market-research/teamoverview/tcurrent/Fei.html>

Office hours by appointment.

## Type:

Seminar

## Target Audience:

Master students assigned to the “Wahlpflichtbereich” BWL 4.

Master students assigned to the Minor in Marketing.

Master students in Informatics (including Major in Artificial Intelligence, Data Science, Information Systems).

*Please refer to the Course Catalogue for more details.*

## Frequency:

Fall semester.

## APS (ECTS):

3

## Workload Statement:

Part	Workload	ECTS
Course Preparation	4h	
Class attendance (meetings)	24h	
Individual work	46h	
Final Presentation	16h	
Total	90h	3

## Maximum Number of Students:

8

## Content:

Introduction into social dynamics research and agent-based modeling of social processes.

## Language:

English

## Basic Literature:

Social Dynamics – Syllabus

1. Medo, M., Cimini, G., & Gualdi, S. (2011). Temporal effects in the growth of networks. *Physical Review Letters*, 107(23), 238701.
2. Karimi, F., Genois, M., Wagner, C., Singer, P., & Strohmaier, M. (2018). Homophily influences ranking of minorities in social networks. *Scientific Reports*, 8(1), 1-12.
3. Watts, D. J., & Strogatz, S. H. (1998). Collective dynamics of 'small-world' networks. *Nature*, 393(6684), 440-442.
4. Centola, D., & Macy, M. (2007). Complex contagions and the weakness of long ties. *American Journal of Sociology*, 113(3), 702-734.
5. Watts, D. J., & Dodds, P. S. (2007). Influentials, networks, and public opinion formation. *Journal of Consumer Research*, 34(4), 441-458.
6. Guilbeault, D., & Centola, D. (2021). Topological measures for identifying and predicting the spread of complex contagions. *Nature Communications*, 12(1), 1-9.
7. Ciampaglia, G. L., Nematzadeh, A., Menczer, F., & Flammini, A. (2018). How algorithmic popularity bias hinders or promotes quality. *Scientific reports*, 8(1), 1-7.
8. Zhang, S., Medo, M., L , L., & Mariani, M. S. (2019). The long-term impact of ranking algorithms in growing networks. *Information Sciences*, 488, 257-271.

Additional literature, videos, tools, and some other recommendations will be given in class.

### **Prerequisites:**

Required: Basic R or Python programming; Knowledge of basic probability theory. No prior knowledge of social network methods or social dynamics modelling is required.

### **Course Number:**

03SM22MO0175

### **Registration:**

Please contact us through our website for enrolling and for current information. The number of participants is limited. Application for this seminar is via the new module booking tool: <https://studentservices.uzh.ch/uzh/launchpad/>. To apply for the seminar, students are required to upload a CV, academic transcript (grades) and brief motivation letter (max. 1 page).

### **Registration deadline:**

Please see the respective information posted on our website and in the VVZ.

### **Grading:**

70% final presentation [50% evaluation of the presentation; 20% evaluation of the submitted code].

30% in-class participation [20% multiple-choice tests during the final presentations; 10% active participation].

### **Location:**

Please see the respective information posted on our website and in the VVZ.

### **Note:**

This information in the syllabus supports the official information in the electronic university calendar (VVZ - Vorlesungsverzeichnis). In cases of doubt, the official information at the VVZ is valid.

## **2. COURSE MATERIAL**

Students have access to our web-based e-learning platform on OLAT to download the slides presented in class and find other relevant material such as datasets and literature. The following procedure is strongly recommended as preparation for the classes.

### **2.1 Overview of Classes**

On our webpage, an overview of all courses given by our team can be found. Students can develop an idea of the classes and how they best fit into their personal agenda. The sites can be accessed through:

*Chair for Marketing and Market Research Website*

*Marketing Group Zurich Website*

### **2.2 Hands-on Guides**

Several files have been prepared that provide background knowledge of the expectations in the classroom and some tips concerning “How to give presentations in class”, “How to write in an academic style”, etc. These guides should be read prior to class to obtain a good understanding of what is expected.

### **2.3 Syllabus**

For each course, a syllabus exists with all details concerning that specific course. This is the guideline for the class and a must-read. Everything concerning the grading of the course, the agenda, the planned topics, the workload, readings, and much more can be found in the syllabus.

### **2.4 The Slides**

The slides presented and discussed in class are available on the e-learning platform. Slides can be downloaded for each class. The slides do not completely cover the entire syllabus. Therefore, it is necessary to participate in class.

### **2.5 Recommended Readings**

Recommended readings are articles that go into more details on the specific topics. They are provided in the course material folder.

### **2.6 Recommended Other Material**

Throughout the class, we recommend different videos to watch, websites to verify, tools to test, and so on. They are presented at the end of each lecture.

### **2.7 Templates**

Slide presentations have to meet our formal requirements. Templates will be provided at the beginning of this course.

### **2.8 Additional Readings**

The literature on social dynamics is cross-disciplinary, with relevant papers found in leading journals in marketing, management science, computer science, physics, and sociology, among others. The instructor can guide the students by pointing to the most relevant papers to further study a topic of interest.

## 3. COURSE CONTENTS

### 3.1 Overview of Meetings

- 1<sup>st</sup> lecture and Kick-Off meeting, 04.10.2023, 14-18h.
- 2<sup>nd</sup> lecture: 11.10.2023, 14-18h.
- 1<sup>st</sup> Q&A session: 18.10.2023, 14-18h.
- 2<sup>nd</sup> Q&A session: 25.10.2023, 14-18h.
- 3<sup>rd</sup> Q&A session: 01.11.2023, 14-18h.
- 4<sup>th</sup> Q&A session: 08.11.2023, 14-18h.
- Submission of presentation slides and code: 13.11.2023, 23:59h.
- 1<sup>st</sup> final presentation block: 15.11.2023, 08-12h.
- 2<sup>nd</sup> final presentation block: 15.11.2023, 14-18h.
- 3<sup>rd</sup> final presentation block: 16.11.2023, 08-12h.
- 4<sup>th</sup> final presentation block: 17.11.2023, 14-18h.

### 3.2 Details of Classes

This is the preliminary outline for HS 2023. This is subject to change and additional literature might be given in class.

#### Lecture 1. Overview of Social Dynamics research

##### 1.1. Kick-off

Objectives of the seminar.

Schedule and evaluation criteria.

##### 1.2. Overview of social dynamics research

Success and failure stories across art, marketing, and health-related behaviour.

Preview of the 4 themes examined in the seminar and the related research questions.

##### 1.3. Python tutorial.

Simulating a preferential attachment model. Template code will be provided.

#### Lecture 2. Tools in Social Dynamics research

##### 2.1. Agent-based modelling.

Applications: Controlling a pandemic, planning traffic, predicting global warming.

Why agent-based models to understand emergent social phenomena.

Key elements of agent-based models in a paradigmatic example.

How agent-based models complement econometrics, machine learning, and experiments.

##### 2.2. Network science.

Global network properties: Small worlds and degree distributions.

Local network properties: Strong and weak ties, clustering.

Individual-level network properties: Centrality.

Simulating a network formation process.

Summary of typical properties of real social networks.

### 2.3. Python tutorial.

Simulating the threshold model. Template code will be provided.

### 2.4. Coding task assignment.

Each student will be assigned to a paper. She/he will receive a specific coding task with instructions on which results to replicate from the assigned paper, as well as instruction for the structure of the final presentation.

### Q&A sessions 1-4.

During these sessions, the students can ask specific questions regarding the coding task and the presentation. When needed, the instructors will help solve obstacles faced in the implementation of the assigned tasks.

### Final presentation blocks 1-4.

Block 1: 2 presentations on Success inequalities and unpredictability.

Block 2: 2 presentations on Simple vs. complex social contagion.

Block 3: 2 presentations on Seeding policies for social change.

Block 4: 2 presentations on Algorithmic feedback and social dynamics.

## 4. EVALUATION

### 70%: Final presentation (50% final presentation + 20% code evaluation)

50% final presentation.

Each presentation will last 20 minutes, followed by 20 minutes of questions and discussions.  
Evaluation criteria:

- Correctly positioning the paper in the literature.
- Clearly articulating the research question(s) answered by the paper.
- Clearly specifying the agent-based modelling elements of the paper (agents, decision rule, network structure, control and order parameters, validation).
- Clearly articulating the papers' implications for social dynamics research.
- Critically presenting the obtained results in the coding task, including faced challenges and reasons behind possible discrepancies compared to the original paper's results.
- Critically presenting the limitations of the paper (e.g., data, model, implementation, interpretation of results) and ideas for further research on the topic.

20% evaluation of the submitted code.

Evaluation criteria.

- Correctness of the implementation.

### Deadline.



The presentation slides and code must be submitted **no later than 13.11.2023, 23:59** to [manuel.mariani@business.uzh.ch](mailto:manuel.mariani@business.uzh.ch) [email subject: Social Dynamics Seminar: Final Documents (SURNAME)].

### **30%: In-class participation (20% in-class multiple-choice tests + 10% active participation)**

20% multiple-choice tests.

Evaluation of 4 multiple-choice tests (4 questions each) that will be held during the presentation days, after each block of presentations. The questions can be answered by simply following the presentations and related discussions, and they will not require prior study of all the papers.

10% active participation.

We would like to create a very interactive environment in which we all participate and openly share our ideas in a kind way. Even very basic questions or doubts are welcome. Therefore, we simply evaluate the quantity of your interventions during the 2 lectures and questions during the discussions following the presentations.

## **5. ACADEMIC FRAUD**

Academic fraud is an act by a student, which may result in a false academic evaluation of that student or of another student. The Honor Code of the University of Zurich applies to all work in this course and will be strictly enforced. The intent of the Honor Code in this course is to ensure that each student claims and receives credits for his/her own efforts. Violations to this are considered academic fraud.

## **6. ADMINISTRATIVE COMMENTS**

### **6.1 Students with Disabilities**

Any student with a documented disability needing academic adjustment or accommodations is requested to speak with the instructor of this course during the first day of the course. All discussion will remain confidential. Students with disabilities will need to also contact the directors of the school.

### **6.2 Registration Cards**

Registration cards will be handed out at the beginning of the course. Students will be asked to add a recent profile picture and some personal information. The information is kept confidential and is only accessible to our team. We will need this information to learn the students' names by pictures and for administrative reasons. Delivering these files is of course voluntary.

### **6.3 Name Plates**

Name plates should be used regularly in class so that we can learn the students' names. Name plates will be handed out during the first day of the course.

### **6.4 Getting in Contact**

Emails should be short and to the point. Before sending an email, it should be clarified that email is the right medium for the question or concern at hand. Questions can also be asked at the beginning of or during lectures and exercises. Emails should be first sent to the TAs.

### **6.5 Class Dismissal**

Students are asked to remain seated and attentive until class is dismissed by the lecturer or teaching assistant.

### **6.6 Sound-emitting Devices**

It is expected that everyone turns off/mutes all devices that emit sounds and noises that may interrupt the class (e.g., mobile phones, pagers, watch alarms). If an occasion arises, in which a student may need to receive a phone call, he or she has to inform the lecturer or teaching assistant before class.

### **6.7 Laptops and Calculators**

Laptops, tablets, mobile phones, and programmable calculators are allowed in class if indicated by the lecturer or teaching assistant and as far as their usage supports the individual learning process. Otherwise, they are not permitted.

### **6.8 Important Deadlines and Class Schedule**

Important deadlines and the class schedule are communicated in the first lecture. If a student cannot participate in this lecture, it is his/her duty to obtain any relevant information.

***We are very much looking forward to meeting you in class!***