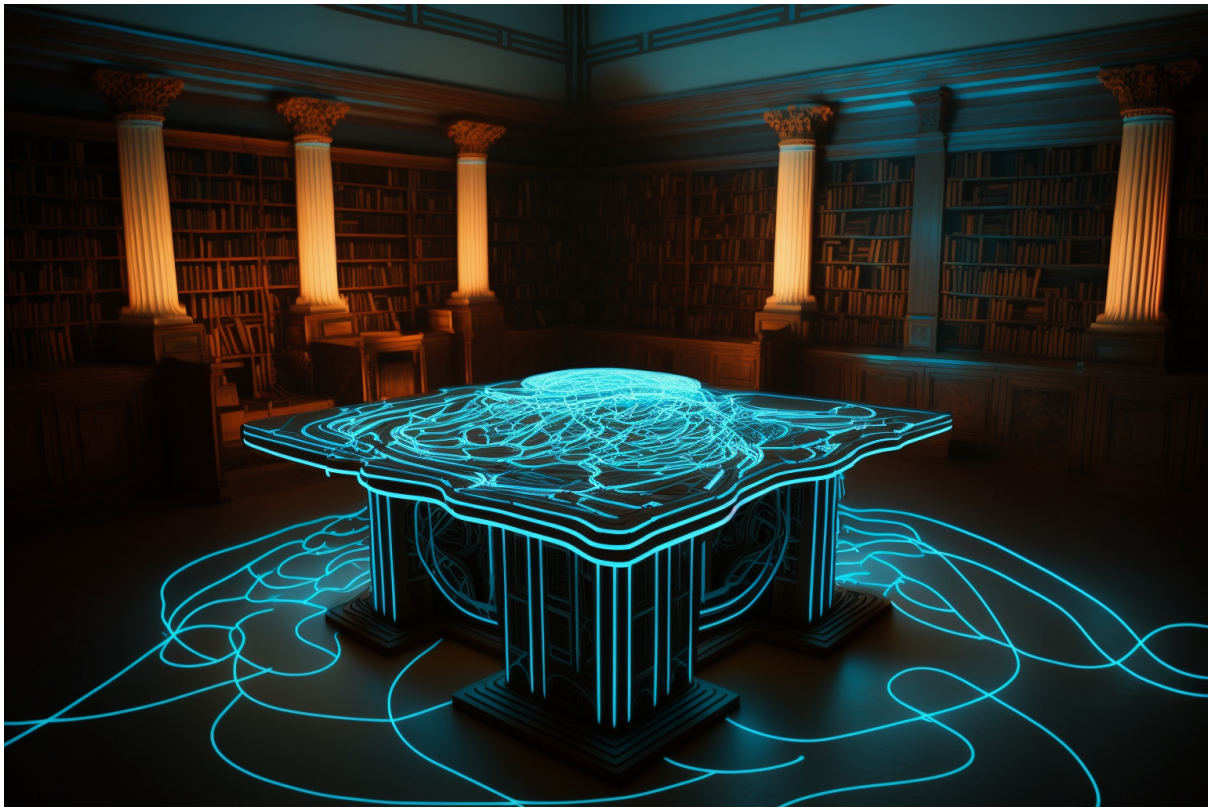

PWM-CS-HS2: Computational Social Science II
Theory for Computational Social Science (CSS)
Syllabus

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1 Course description:

The course focuses on the theoretical and practical dimensions of Computational Social Science (CSS). CSS integrates computational methods and research practices to investigate human behavior and social systems, encompassing the analysis of people, organizations, institutions, and complex socio-technical systems. The primary objectives of CSS are to comprehend emerging social phenomena driven by digitization and to offer fresh perspectives on traditional research interests in the social sciences, utilizing innovative data sets and analytical techniques.

In this course, we will explore a selection of core theories and topic areas where CSS has been successfully employed.

Please address your questions regarding entering the course to Ms. Katharina Kachelmann (katharina.kachelmann@uni-bamberg.de).

Learning objectives:

- Advanced understanding of concepts, theories, causal relationships and methods relevant to computational social science;
- Knowledge of the central paradigms in theory and research methods relevant to computational social science;
- Understanding of the applicability or transfer of theories and paradigms from different scientific areas in relation to computational social science.

2 Course requirements

2.1 Regular and active participation

The course features the discussion of the required readings. To benefit, students are expected to read the texts listed as required readings before each session and actively participate in the discussion for each session. In preparing the texts for each session, please use the following guiding questions where appropriate:

- What are the research questions?
- What hypotheses are advanced?
- What mechanism do the authors suppose contributes to the observed/explained outcome?
- What kind of evidence is presented?
- What are the findings?
- How convincing do you find the presented argument (e.g. How do the presented arguments/findings connect/contradict other findings? How does this connect with your own observations?)?

- Are the alternative approaches you would choose to pursue the presented question?

If you are unclear about the terms used above, check out the following background readings:

- Gerring, J. (2012). *Social science methodology: A unified framework* (2nd ed.). Cambridge University Press. https://doi.org/10.1017/CBO9781139022224
- Howard, C. (2017). *Thinking like a political scientist: A practical guide to research methods*. The University of Chicago Press.

You will find it useful to keep notes on the papers read by you.
Background Readings:

- On taking notes: Ahrens, S. (2022). *How to take smart notes: One simple technique to boost writing, learning and thinking* (2nd ed.).

2.2 Presentation

Participants will be asked for on a presentation on one of the topics discussed during the course. The task of the presenter will either to

a. research and present a set of five research papers, focusing on the topic of the week in question;

b. present a fresh case that illustrates the topic under discussion, critically discuss it along the theoretical lines advanced in the required reading or beyond, and advance a research design allowing for the identification of possible mechanisms leading to the observed outcomes.

During the first session, each student will be assigned a topic from the listed readings for presentations. Please keep the following considerations in mind in preparing your presentation:

- Please plan your presentation to take about 20-25 minutes;
- Please prepare a slide deck with a presentation program of your choice (except for Prezi);
- In preparing the presentation please follow the guidelines discussed in the first session;
- Discuss your plan for the presentation with the lecturer at lease one week before your presentation date;
- Please prepare a handout of one to two pages for your fellow students, summarizing the main points of your presentation;
- Upload the handout on the day your presentation is due to the assignment folder on the course's VC repository. Use the following template for the filename `"your_last_name-handout.pdf"`;

- The presentation will be graded and contribute 30% to your final grade.

If you do not follow these questions and guidelines this will be reflected in your grade.

Background Readings:

- Schwabish, J. (2017). *Better presentations: A guide for scholars, researchers, and wonks*. Columbia University Press.

2.3 Term paper

Participants will be asked to hand in a term paper. Please adhere to the following guidelines:

- Style requirements:
  - Font: Times New Roman, 12pt;
  - Line separation: 1.5;
  - Page borders: 2.5 cm left and right, 2cm above and below;
  - Page set: Block;
  - The first line of each paragraph is indented;
- Citation Style: Please follow the citation convention of the American Political Science Review (APSR) available at http://www.apsanet.org/APSR-Submission-Guidelines-August-2016, or you could simply use the reference style *APA* in the references manager of your choice;
- Cover page: University, department, course title, paper title, name, Matriknr., semester count, study program, and e-mail-address;
- Length: ca. 5000 words +/-10%
- Deadline: Please upload the paper up until September 30 electronically in the VC. The date is mandatory and can only be extended in case of officially certified illness;
- Use the following template for the filename `"your_last_name-paper.pdf"`.
- The term paper will be graded and contribute 70% to your final grade.

Background Readings:

- Basbøll, T. (2018a). The paper. *Inframethodology*. https://blog.cbs.dk/inframethodology/?page_id=614
- Becker, H. S. (1998). *Tricks of the trade: How to think about your research while you're doing it*. The University of Chicago Press.
- Becker, H. S. (2020). *Writing for social scientists: How to start and finish your thesis, book, or article* (3rd ed.). University of Chicago Press.
- Belcher, W. L. (2019). *Writing your journal article in 12 weeks: A guide to academic publishing success* (2nd ed.). The University of Chicago Press.

2.4 Policy on ChatGPT

By now, you have likely encountered accounts of ChatGPT's potential for assisting you in writing tasks. Perhaps you have even tried it out. This is excellent and highly recommended, as there is every reason to expect that your future life in work or research will involve working with AI-enabled assistants, whether for software development, data analysis, or managing mundane office tasks. Therefore, familiarizing yourself with these tools and learning about their strengths and weaknesses is crucial. However, as a student, certain uses may be more advisable than others.

Before you start using ChatGPT, consider what you might lose by relying on it. We assign research papers to help you practice specific tasks repeatedly throughout your studies, offering you the opportunity to learn and improve your skills. However, this will only happen if you actually *perform* the tasks and *do* the work. Relying on ChatGPT or other models too early in your education may prevent you from acquiring or refining these skills over time. At the same time, we can expect workflows in academia and industry to be shaped by collaboration between humans and AI-enabled systems, such as LLMs, sooner rather than later. Consequently, developing the necessary skills to use these models effectively is also essential.

One approach is to consider the skills or tasks you are expected to learn, perform, or improve with a given paper assignment. Challenge yourself to complete these tasks independently, write down your solutions, and then compare them with the output of your current AI-enabled model of choice or even competing models. By doing this, you can reflect on the accuracy of your work and the model's output, identify areas of improvement, and understand where the model's strengths and weaknesses lie. This process transforms LLMs into a supporting tool rather than a substitute, while also providing valuable insight into your own work.

For transparency reasons, we ask students at the Chair for the Governance of Complex and Innovative Technological Systems to include a short disclaimer in their papers, indicating if and which AI model they used and for what tasks. Possible tasks include:

1. Exploring a phenomenon, mechanism, or literature;
2. Formulating a research question;
3. Developing theory-driven hypotheses;
4. Analyzing data;
5. Structuring the paper;
6. Writing;
7. Editing.

Additionally, please describe how your work built upon the results provided by the model.

Remember, you are solely responsible for the text you submit. Undocumented use of AI-enabled models, plagiarism, flaws in reasoning or analysis, and fabricated sources may result in significant grade reductions or even failure of the class. It does not matter whether these issues originated from you or the model – as the author, you are accountable for the strengths and weaknesses of your submitted work.

Be aware that when grading papers, we may place greater emphasis on aspects where models perform poorly and discount tasks where models excel.

Background Readings:

- Jungherr, A. (2023d). Using ChatGPT and other large language model (LLM) applications for academic paper assignments. *SocArxiv*. https://doi.org/10.31235/osf.io/d84q6

3 Course plan

Class will meet in person (F21/03.02) at the following dates and times:

Thursday 14:00–16:00 c.t.

3.1 Week 1: Introduction: Why Theory? We got data! (April 20)

Background Readings:

- Godfrey-Smith, P. (2021). *Theory and reality: An introduction to the philosophy of science* (2nd ed.). The University of Chicago Press.

- Hand, D. J. (2004). *Measurement theory and practice: The world through quantification*. Wiley.

3.2 Week 2: Computational Social Science (CSS): Measures, Sensors, Simulations (April 27)

Required Reading:

- Brandt, M., Tucker, C. J., Kariryaa, A., Rasmussen, K., Abel, C., Small, J., Chave, J., Rasmussen, L. V., Hiernaux, P., Diouf, A. A., Kergoat, L., Mertz, O., Igel, C., Gieseke, F., Schöning, J., Li, S., Melocik, K., Meyer, J., Sino, S., … Fensholt, R. (2020). An unexpectedly large count of trees in the West African Sahara and Sahel. *Nature*, *587*(7832), 78–82. https://doi.org/10.1038/s41586-020-2824-5

- Jungherr, A. (2019). Normalizing digital trace data. In N. J. Stroud & S. C. McGregor (Eds.), *Digital discussions: How big data informs political communication* (pp. 9–35). Routledge. https://doi.org/10.4324/9781351209434-2

- Park, J. S., O'Brien, J. C., Cai, C. J., Morris, M. R., Liang, P., & Bernstein, M. S. (2023). Generative agents: Interactive simulacra of human behavior. *arXiv*. https://doi.org/10.48550/arXiv.2304.03442

Background Readings:

- Jungherr, A., & Posegga, O. (2023). Computational social science. In N. Kersting, J. Radtke, & S. Baringhorst (Eds.), *Handbuch digitalisierung und politische beteiligung* (pp. 1–17). Springer VS. https://doi.org/10.1007/978-3-658-31480-4_54-1

- Salganik, M. J. (2018). *Bit by bit: Social research in the digital age*. Princeton University Press.

3.3 Week 3: Collective attention: Coordination and Fragmentation (May 4)

Required Reading:

- Poon, P., Flack, J. C., & Krakauer, D. C. (2022). Institutional dynamics and learning networks. *PLoS One*, *17*(5), e0267688. https://doi.org/10.1371/journal.pone.0267688

Background Readings:

- Neuman, W. R. (1991). *The future of the mass audience*. Cambridge University Press.

- Prior, M. (2007). *Post-broadcast democracy: How media choice increases inequality in political involvement and polarizes elections*. Cambridge University Press. https://doi.org/10.1017/CBO9781139878425

- Webster, J. G. (2014). *The marketplace of attention: How audiences take shape in a digital age*. The MIT Press.

3.4 Week 4: No meeting (May 11)

3.5 Week 5: No meeting (May 18)

3.6 Week 6: Ideas: Spread and change(May 25)

Required Reading:

- Barron, A. T. J., Huang, J., Spang, R. L., & DeDeo, S. (2018). Individuals, institutions, and innovation in the debates of the French Revolution. *PNAS: Proceedings of the National Academy of Sciences*, *115*(18), 4607–4612. https://doi.org/10.1073/pnas.1717729115

- Cookson, J. A., Fox, C., Gil-Bazo, J., Imbet, J. F., & Schiller, C. (2023). Social media as a bank run catalyst. *Social Science Research Network*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4422754

Background Readings:

- Underwood, T. (2019). *Distant horizons: Digital evidence and literary change*. The University of Chicago Press.

- Piper, A. (2018). *Enumerations: Data and literary study*. The University of Chicago Press.

3.7 Week 7: Controlling people (June 1)

Required Reading:

- King, G., Pan, J., & Roberts, M. E. (2013). How censorship in China allows government criticism but silences collective expression. *American Political Science Review*, *107*(2), 326–343. https://doi.org/10.1017/S0003055413000014

- Gueorguiev, D. D., & Malesky, E. J. (2019). Consultation and selective censorship in China. *The Journal of Politics*, *81*(4), 1539–1545. https://doi.org/10.1086/704785

- Tai, Y., & Fu, K.-w. (2020). Specificity, conflict, and focal point: A systematic investigation into social media censorship in China. *Journal of Communication*, *70*(6), 842–867. https://doi.org/10.1093/joc/jqaa032

Background Readings:

- Feldstein, S. (2021). *The rise of digital repression: How technology is reshaping power, politics, and resistance*. Oxford University Press. https://doi.org/10.1093/oso/9780190057497.001.0001

3.8 Week 8: No meeting (June 8)

3.9 Week 9: Challenging authority (June 15)

Required Reading:

- Fu, K.-w. (2023). Digital mobilization via attention building: The logic of cross-boundary actions in the 2019 Hong Kong social movement. *The Information Society*. https://doi.org/10.1080/01972243.2023.2185717

- Jungherr, A., & Jürgens, P. (2014). Through a glass, darkly: Tactical support and symbolic association in Twitter messages commenting on Stuttgart 21. *Social Science Computer Review*, *32*(1), 74–89. https : / / doi . org / 10 . 1177 / 0894439313500022

Background Readings:

- Gurri, M. (2018). *The revolt of the public and the crisis of authority in the new millennium* (2nd ed.). Stripe Press.

- Tufekci, Z. (2017). *Twitter and tear gas: The power and fragility of networked protest*. Yale University Press.

3.10 Week 10: Language: Discourse (June 22)

Required Reading:

- Jungherr, A., Posegga, O., & An, J. (2019). Discursive power in contemporary media systems: A comparative framework. *The International Journal of Press/Politics*, *24*(4), 404–425. https://doi.org/10.1177/1940161219841543

- Rauchfleisch, A., Siegen, D., & Vogler, D. (2021). How COVID-19 displaced climate change: Mediated climate change activism and issue attention in the Swiss media and online sphere. *Environmental Communication*. https://doi.org/10.1080/17524032.2021.1990978

Background Readings:

- Lafont, C. (2020). *Democracy without shortcuts: A participatory conception of deliberative democracy*. Oxford University Press. https://doi.org/10.1093/oso/9780198848189.001.0001

3.11 Week 11: Language: Interactions (June 29)

Required Reading:

- An, J., Kwak, H., Posegga, O., & Jungherr, A. (2019). Political discussions in homogeneous and cross-cutting communication spaces. In J. Pfeffer, C. Budak, Y.-R. Lin, & F. Morstatter (Eds.), *ICWSM 2019: Proceedings of the thirteenth international AAAI conference on web and social media* (pp. 68–79). Association for the Advancement of Artificial Intelligence (AAAI).

- Perry, C., & DeDeo, S. (2021). The cognitive science of extremist ideologies online. *arXiv*. https://doi.org/10.48550/arXiv.2110.00626

Background Readings:

- Clark, H. C. (1996). *Using language*. Cambridge University Press. https://doi.org/10.1017/CBO9780511620539

- Cramer Walsh, K. (2004). *Talking about politics: Informal groups and social identity in american life*. The University of Chicago Press.

- Gamson, W. A. (1992). *Talking politics*. Cambridge University Press.

3.12 Week 12: What does the algorithm do? (July 6)

Required Reading:

- Narayanan, A. (2023). Understanding social media recommendation algorithms. *Knight First Amendment Institute at Columbia University*. https://knightcolumbia.org/content/understanding-social-media-recommendation-algorithms

- Kaiser, J., & Rauchfleisch, A. (2020). Birds of a feather get recommended together: Algorithmic homophily in YouTube's channel recommendations in the United States and Germany. *Social Media + Society*, *6*(4), 1–15. https://doi.org/10.1177/2056305120969914

- Mitchell, S., Potash, E., Barocas, S., D'Amour, A., & Lum, K. (2021). Algorithmic fairness: Choices, assumptions, and definitions. *Annual Review of Statistics and Its Application*, *8*, 141–163. https://doi.org/10.1146/annurev-statistics-042720-125902

Background Readings:

- Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2022). *Introduction to algorithms* (4th ed.). The MIT Press.

3.13 Week 13: Using AI in research: Large language models (LLMs) (July 13)

Required Reading:

- Burnell, R., Schellaert, W., Burden, J., Ullman, T. D., Martinez-Plumed, F., Tenenbaum, J. B., Rutar, D., Cheke, L. G., Sohl-Dickstein, J., Mitchell, M., Kiela, D., Shanahan, M., Voorhees, E. M., Cohn, A. G., Leibo, J. Z., & Hernandez-Orallo, J. (2023). Rethink reporting of evaluation results in AI. *Science*, *380*(6641), 136–138. https://doi.org/10.1126/science.adf6369

- Horton, J. J. (2023). Large language models as simulated economic agents: What can we learn from Homo Silicus? *arXiv*. https://doi.org/10.48550/arXiv.2301.07543

- Wolfram, S. (2023). What is ChatGPT doing … and why does it work? *Stephen Wolfram: Writings*. https://writings.stephenwolfram.com/2023/02/what-is-chatgpt-doing-and-why-does-it-work/

- Ziems, C., Held, W., Shaikh, O., Chen, J., Zhang, Z., & Yang, D. (2023). Can large language models transform computational social science? https://calebziems.com/assets/pdf/preprints/css_chatgpt.pdf

Background Readings:

- Agrawal, A., Gans, J., & Goldfarb, A. (2022b). *Prediction machines: The simple economics of artificial intelligence* (Updated and Expanded). Harvard Business Review Press. (Original work published 2018).

- Mitchell, M. (2019). *Artificial intelligence: A guide for thinking humans*. Farrat, Straus; Giroux.

- Smith, B. C. (2019). *The promise of artificial intelligence: Reckoning and judgment*. The MIT Press.

3.14 Week 14: Conclusion & discussion (July 20)