

# Inspiration for DMAS project topics

## Design of Multi-Agent Systems

Malvin Gatteringer

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The following collection of articles can serve as inspiration to choose a group project. You may choose other topics not mentioned here, but must refer to an existing publication as a reference.

Hint: use the “forward search” of Google Scholar, Microsoft Academic or the publisher websites!

## Papers, by main keyword

### Game Theory

- [6] Peter Danielson. “Competition among cooperators: Altruism and reciprocity”. In: *Proceedings of the National Academy of Sciences* 99.Supplement 3 (2002), pp. 7237–7242. DOI: 10.1073/pnas.082079899.
- [31] M. W. Macy and Y. Sato. “Trust, cooperation, and market formation in the U.S. and Japan”. In: *Proceedings of the National Academy of Sciences* 99.Supplement 3 (2002), pp. 7214–7220. DOI: 10.1073/pnas.082097399.
- [37] Brian Skyrms. “Evolution of Inference”. In: *The Stag Hunt and the Evolution of Social Structure*. 2003, pp. 49–64. DOI: 10.1017/CBO9781139165228.007.
- [48] Kenton K. Yee. “Ownership and Trade from Evolutionary Games”. In: *SSRN Electronic Journal* (2002). DOI: 10.2139/ssrn.319102.

### Economics

- [2] Thomas Berger and Christian Troost. “Agent-based Modelling of Climate Adaptation and Mitigation Options in Agriculture”. In: *Journal of Agricultural Economics* 65.2 (2014), pp. 323–348. DOI: 10.1111/1477-9552.12045.
- [19] M.D. Gerst et al. “Agent-based modeling of climate policy: An introduction to the ENGAGE multi-level model framework”. In: *Environmental Modelling & Software* 44 (2013), pp. 62–75. DOI: 10.1016/j.envsoft.2012.09.002.
- [28] Ayla Kangur et al. “An agent-based model for diffusion of electric vehicles”. In: *Journal of Environmental Psychology* 52 (2017), pp. 166–182. DOI: 10.1016/j.jenvp.2017.01.002. URL: [https://rinekeverbrugge.nl/wp-content/uploads/2017/02/Kangur\\_Jager\\_Verbrugge\\_Bockarjova\\_JEP2017.pdf](https://rinekeverbrugge.nl/wp-content/uploads/2017/02/Kangur_Jager_Verbrugge_Bockarjova_JEP2017.pdf).
- [31] M. W. Macy and Y. Sato. “Trust, cooperation, and market formation in the U.S. and Japan”. In: *Proceedings of the National Academy of Sciences* 99.Supplement 3 (2002), pp. 7214–7220. DOI: 10.1073/pnas.082097399.
- [48] Kenton K. Yee. “Ownership and Trade from Evolutionary Games”. In: *SSRN Electronic Journal* (2002). DOI: 10.2139/ssrn.319102.

## Voting and Judgement Aggregation

- [14] Ulle Endriss, ed. *Trends in Computational Social Choice*. 2017. URL: <http://research.illc.uva.nl/COST-IC1205/BookDocs/TrendsCOMSOC.pdf>.
- [21] Claudia V. Goldman and Shlomo Zilberstein. “Optimizing information exchange in cooperative multi-agent systems”. In: *Proceedings of the second international joint conference on Autonomous agents and multiagent systems - AAMAS 03*. 2003. DOI: 10.1145/860596.860598.
- [23] Davide Grossi and Gabriella Pigozzi. *Judgment Aggregation: A Primer*. 2014. DOI: 10.2200/s00559ed1v01y201312aim027.
- [42] E. Pacuit W. Holiday. *Strategic Voting Under Uncertainty About the Voting Method*. 2019. URL: <https://arxiv.org/abs/1907.09110v1>. Code is available at <https://github.com/epacuit/strategic-voting>, so it could be a good project topic.

## Theory of Mind

- [40] Elske van der Vaart, Rineke Verbrugge, and Charlotte K. Hemelrijk. “Corvid Re-Caching without ‘Theory of Mind’: A Model”. In: *PLoS ONE* 7.3 (2012). Ed. by Gonzalo G. de Polavieja, e32904. DOI: 10.1371/journal.pone.0032904.
- [41] Kim Veltman, Harmen de Weerd, and Rineke Verbrugge. “Training the use of theory of mind using artificial agents”. In: *Journal on Multimodal User Interfaces* 13.1 (2018), pp. 3–18. DOI: 10.1007/s12193-018-0287-x. URL: <https://rinekeverbrugge.nl/wp-content/uploads/2019/02/VeltmanWeerdVerbrugge-2019.pdf>.
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- [45] Harmen de Weerd, Rineke Verbrugge, and Bart Verheij. “How much does it help to know what she knows you know? An agent-based simulation study”. In: *Artificial Intelligence* 199-200 (2013), pp. 67–92. DOI: 10.1016/j.artint.2013.05.004. URL: <https://rinekeverbrugge.nl/wp-content/uploads/2017/02/WeerdVerbruggeVerheij-AI.pdf>. Demo pages: <http://www.harmendeweerd.nl/rock-paper-scissors/> and <http://www.harmendeweerd.nl/limited-bidding/>.

## Social Simulation

- [1] Ana L. C. Bazzan. “A Distributed Approach for Coordination of Traffic Signal Agents”. In: *Autonomous Agents and Multi-Agent Systems* 10.1 (2005), pp. 131–164. DOI: 10.1007/s10458-004-6975-9.
- [12] Piter Dykstra et al. “Put Your Money Where Your Mouth Is: DIAL, A Dialogical Model for Opinion Dynamics”. In: *Journal of Artificial Societies and Social Simulation* 16.3 (2013). DOI: 10.18564/jasss.2178.
- [15] J. M. Epstein. “Modeling civil violence: An agent-based computational approach”. In: *Proceedings of the National Academy of Sciences* 99.Supplement 3 (2002), pp. 7243–7250. DOI: 10.1073/pnas.092080199.
- [22] N. M. Gotts, J. G. Polhill, and A. N. R. Law. “Agent-Based Simulation in the Study of Social Dilemmas”. In: *Artif. Intell. Rev.* 19.1 (2003), pp. 3–92. ISSN: 0269-2821. DOI: 10.1023/A:1022120928602.
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- [33] Daniel J. van der Post, Rineke Verbrugge, and Charlotte K. Hemelrijk. “The Evolution of Different Forms of Sociality: Behavioral Mechanisms and Eco-Evolutionary Feedback”. In: *PLoS ONE* 10.1 (2015). Ed. by Long Wang, e0117027. DOI: 10.1371/journal.pone.0117027. URL: <https://rinekeverbrugge.nl/wp-content/uploads/2017/02/journal-pone-PostVerbruggeHemelrijk.pdf>.
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- [38] Inge Slingerland et al. “A multi-agent systems approach to gossip and the evolution of language”. In: *Proceedings of the Annual Meeting of the Cognitive Science Society*. Vol. 31. 2009, pp. 1609–1614. URL: <https://escholarship.org/uc/item/96g32880>.

## Social Networks

- [7] Jordi Delgado. “Emergence of social conventions in complex networks”. In: *Artificial Intelligence* 141.1-2 (2002), pp. 171–185. DOI: 10.1016/s0004-3702(02)00262-x.
- [34] Jordi Sabater and Carles Sierra. “Reputation and Social Network Analysis in Multi-agent Systems”. In: *Proceedings of the First International Joint Conference on Autonomous Agents and Multiagent Systems: Part 1*. AAMAS ’02. 2002, pp. 475–482. DOI: 10.1145/544741.544854.

## Communication

- [8] F Dignum, B Dunin-Keplicz, and R Verbrugge. “Creating collective intention through dialogue”. In: *Logic Journal of the IGPL* 9.2 (2001), pp. 289–304. ISSN: 1367-0751. DOI: 10.1093/jigpal/9.2.289.
- [12] Piter Dykstra et al. “Put Your Money Where Your Mouth Is: DIAL, A Dialogical Model for Opinion Dynamics”. In: *Journal of Artificial Societies and Social Simulation* 16.3 (2013). DOI: 10.18564/jasss.2178.
- [18] Bruno Galantucci. “An Experimental Study of the Emergence of Human Communication Systems”. In: *Cognitive Science* 29.5 (2005), pp. 737–767. DOI: 10.1207/s15516709cog0000\_34.
- [20] Piotr J. Gmytrasiewicz and Edmund H. Durfee. “Rational Communication in Multi-Agent Environments”. In: *Autonomous Agents and Multi-Agent Systems* 4.3 (2001), pp. 233–272. ISSN: 1573-7454. DOI: 10.1023/A:1011495811107.
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## Gossip

- [10] Hans van Ditmarsch and Ioannis Kokkinis. “The Expected Duration of Sequential Gossiping”. In: *Lecture Notes in Computer Science* (2018), pp. 131–146. DOI: 10.1007/978-3-030-01713-2\_10. Code available at [https://github.com/Jannis17/gossip\\_protocol\\_expectation](https://github.com/Jannis17/gossip_protocol_expectation).
- [11] Hans van Ditmarsch, Ioannis Kokkinis, and Anders Stockmarr. “Reachability and Expectation in Gossiping”. In: *PRIMA 2017: Principles and Practice of Multi-Agent Systems*. Ed. by Bo An et al. 2017, pp. 93–109. ISBN: 978-3-319-69131-2. DOI: 10.1007/978-3-319-69131-2\_6.
- [24] S. Hedetniemi, S. Hedetniemi, and A. Liestman. “A survey of gossiping and broadcasting in communication networks”. In: *Networks* 18 (1988), pp. 319–349. DOI: 10.1002/net.3230180406.

## Virus Models

- [3] Isobel Braithwaite et al. “Automated and partly automated contact tracing: a systematic review to inform the control of COVID-19”. In: *The Lancet Digital Health* (2020). DOI: 10.1016/s2589-7500(20)30184-9.
- [4] Liviu-Adrian Cotfas et al. “Evaluating Classical Airplane Boarding Methods Considering COVID-19 Flying Restrictions”. In: *Symmetry* 12.7 (2020), p. 1087. DOI: 10.3390/sym12071087.
- [5] Marco D’Orazio, Gabriele Bernardini, and Enrico Quagliarini. *How to restart? An agent-based simulation model towards the definition of strategies for COVID-19 "second phase" in public buildings*. 2020. arXiv: 2004.12927 [physics.soc-ph].
- [9] Frank Dignum et al. “Analysing the Combined Health, Social and Economic Impacts of the Coronavirus Pandemic Using Agent-Based Social Simulation”. In: *Minds and Machines* 30.2 (2020), pp. 177–194. DOI: 10.1007/s11023-020-09527-6.
- [17] N Ferguson et al. *Report 9: Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demand*. Tech. rep. Mar. 16, 2020. DOI: 10.25561/77482. Code available at <https://github.com/mrc-ide/covid-sim>.
- [36] Petrônio C.L. Silva et al. “COVID-ABS: An agent-based model of COVID-19 epidemic to simulate health and economic effects of social distancing interventions”. In: *Chaos, Solitons and Fractals* 139 (2020), p. 110088. DOI: 10.1016/j.chaos.2020.110088.
- [39] Harry Stevens. *Why outbreaks like coronavirus spread exponentially, and how to “flatten the curve”*. Washington Post. Mar. 14, 2020. URL: <https://www.washingtonpost.com/graphics/2020/world/corona-simulator/>.

## Biology

- [26] Joseph Henrich and Robert Boyd. “Why People Punish Defectors”. In: *Journal of Theoretical Biology* 208.1 (2001), pp. 79–89. DOI: 10.1006/jtbi.2000.2202.
- [27] C.M. Jonker et al. “BDI-modelling of complex intracellular dynamics”. In: *Journal of Theoretical Biology* 251.1 (2008), pp. 1–23. DOI: 10.1016/j.jtbi.2007.10.017.
- [43] Harmen de Weerd and Rineke Verbrugge. “Evolution of altruistic punishment in heterogeneous populations”. In: *Journal of Theoretical Biology* 290 (2011), pp. 88–103. DOI: 10.1016/j.jtbi.2011.08.034.
- [46] J. Fransje van Weerden, Rineke Verbrugge, and Charlotte K. Hemelrijk. “Modelling non-attentional visual information transmission in groups under predation”. In: *Ecological Modelling* 431 (2020), p. 109073. DOI: 10.1016/j.ecolmodel.2020.109073.

## Books

- [13] D. Easley and J. Kleinberg. *Networks, Crowds, and Markets: Reasoning about a Highly Connected World*. 2010. URL: <https://www.cs.cornell.edu/home/kleinber/networks-book/>.
- [14] Ulle Endriss, ed. *Trends in Computational Social Choice*. 2017. URL: <http://research.illc.uva.nl/COST-IC1205/BookDocs/TrendsCOMSOC.pdf>.
- [16] Joshua M. Epstein. *Generative Social Science: Studies in Agent-Based Computational Modeling*. 2007. ISBN: 9780691125473. URL: <https://www.jstor.org/stable/j.ctt7rxj1>.
- [23] Davide Grossi and Gabriella Pigozzi. *Judgment Aggregation: A Primer*. 2014. DOI: 10.2200/s00559ed1v01y201312aim027.
- [47] Michael Wooldridge. *An Introduction to MultiAgent Systems*. Second Edition. 2009. ISBN: 9780470519462. URL: <http://www.cs.ox.ac.uk/people/michael.wooldridge/pubs/imas/IMAS2e.html>.

## Journals and conferences

- Journal of Autonomous Agents and Multi-Agent Systems
- International Conferences on Autonomous Agents and Multiagent Systems
- International Conference on Agents and Artificial Intelligence
- Journal of Artificial Societies and Social Simulation

## Libraries and Frameworks

- NetLogo: <https://ccl.northwestern.edu/netlogo/>  
See also the NetLogo Modeling Commons [http://modelingcommons.org/browse/list\\_\\_models](http://modelingcommons.org/browse/list__models)
- Mesa: Agent-based modeling in Python 3+: <https://github.com/projectmesa/mesa/>
- MASON (Java): <https://cs.gmu.edu/~eclab/projects/mason/>

Please avoid using heavy machine learning frameworks (TensorFlow, ) in your projects. The focus of your project should be on the multi-agent system, not on individual agents or learning.

## Other

## References

- [1] Ana L. C. Bazzan. “A Distributed Approach for Coordination of Traffic Signal Agents”. In: *Autonomous Agents and Multi-Agent Systems* 10.1 (2005), pp. 131–164. DOI: 10.1007/s10458-004-6975-9.
- [2] Thomas Berger and Christian Troost. “Agent-based Modelling of Climate Adaptation and Mitigation Options in Agriculture”. In: *Journal of Agricultural Economics* 65.2 (2014), pp. 323–348. DOI: 10.1111/1477-9552.12045.
- [3] Isobel Braithwaite et al. “Automated and partly automated contact tracing: a systematic review to inform the control of COVID-19”. In: *The Lancet Digital Health* (2020). DOI: 10.1016/s2589-7500(20)30184-9.
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- [5] Marco D’Orazio, Gabriele Bernardini, and Enrico Quagliarini. *How to restart? An agent-based simulation model towards the definition of strategies for COVID-19 "second phase" in public buildings*. 2020. arXiv: 2004.12927 [physics.soc-ph].
- [6] Peter Danielson. “Competition among cooperators: Altruism and reciprocity”. In: *Proceedings of the National Academy of Sciences* 99.Supplement 3 (2002), pp. 7237–7242. DOI: 10.1073/pnas.082079899.
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- [9] Frank Dignum et al. “Analysing the Combined Health, Social and Economic Impacts of the Coronavirus Pandemic Using Agent-Based Social Simulation”. In: *Minds and Machines* 30.2 (2020), pp. 177–194. DOI: 10.1007/s11023-020-09527-6.
- [10] Hans van Ditmarsch and Ioannis Kokkinis. “The Expected Duration of Sequential Gossiping”. In: *Lecture Notes in Computer Science* (2018), pp. 131–146. DOI: 10.1007/978-3-030-01713-2\_10. Code available at [https://github.com/Jannis17/gossip\\_protocol\\_expectation](https://github.com/Jannis17/gossip_protocol_expectation).
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- [13] D. Easley and J. Kleinberg. *Networks, Crowds, and Markets: Reasoning about a Highly Connected World*. 2010. URL: <https://www.cs.cornell.edu/home/kleinber/networks-book/>.
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