Paper suggestions: modeling

Here you can find a list of suggested papers that involve modeling. You can also find suitable papers on your own (ask Thilo Figge).

> If you are unhappy with a paper you can always ask Thilo Figge to look for a replacement topic.

> You will have to write a one-page summary of the paper and send it to Thilo Figge a few days before your presentation.

Citation	Link	Keywords
Zitzmann C and Kaderali L (2018) Mathematical Analysis of Viral Replication Dynamics and Antiviral Treatment Strategies: From Basic Models to Age-Based Multi-Scale Modeling. Front. Microbiol. 9:1546. doi: 10.3389/fmicb.2018.01546	https://www.frontiersin.org/journals/microbiology/articles/10.3389/fmicb.2018.01546/full	mathematical modeling, viral kinetics, viral replication, human immunodeficiency virus, Hepatitis C virus, Influenza A virus, antiviral therapy, immune response
Almansour S, Dunster JL, Crofts JJ, Nelson MR (2024) Modelling the continuum of macrophage phenotypes and their role in inflammation, *Mathematical Biosciences*, Volume 377, 109289, ISSN 0025-5564, https://doi.org/10.1016/j.mbs.2024.109289.	https://www.sciencedirect.com/science/article/pii/S0025556424001494	mathematical modeling, macrophages and inflammation, Bifurcation analysis, PDE
Chathoth K, Fostier L, Martin B, Baysse C, Mahé F (2022) A Multi-Skilled Mathematical Model of Bacterial Attachment in Initiation of Biofilms. *Microorganisms,*10(4):686. https://doi.org/10.3390/microorganisms10040686	https://www.mdpi.com/2076-2607/10/4/686	biofilm, bacterial attachment, mathematical model, stochastic, 2D and 3D
Schmid N, Fernandes Del Pozo D, Waegeman W, Hasenauer J (2025) Assessment of uncertainty quantification in universal differential equations. *Philos Trans A Math Phys Eng Sci*; 383(2293):20240444. doi:10.1098/rsta.2024.0444	https://pubmed.ncbi.nlm.nih.gov/40172556/	uncertainty quantification, universal differential equations, scientific machine learning

Citation	Link	Keywords
Maddu S, Cheeseman BL, Sbalzarini IF , Müller CL (2022) Stability selection enables robust learning of differential equations from limited noisy data. *Proc. A*; 478 (2262): 20210916. https://doi.org/10.1098/rspa.2021.0916	https://royalsocietypublishing.org/rspa/article/478/2262/20210916/54488/Stability-selection-enables-robust-learning-of	stability selection, sparse regression, PDE identification
Heinrich V, Simpson WD 3rd, Francis EA (2017) Analytical Prediction of the Spatiotemporal Distribution of Chemoattractants around Their Source: Theory and Application to Complement-Mediated Chemotaxis. *Front Immunol*.; 8:578. Published 2017 May 26. doi:10.3389/fimmu.2017.00578	https://pmc.ncbi.nlm.nih.gov/articles/PMC5445147/	chemotaxis, reaction–diffusion, mathematical model, single-cell, host–pathogen
Niemann J-H, Klus S, Schütte C (2021) Data-driven model reduction of agent-based systems using the Koopman generator. PLoS ONE 16(5): e0250970. https://doi.org/10.1371/journal.pone.0250970	https://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0250970	ABM, PDEs, data-driven reduction
Lorenzi T, Painter KJ (2025) Pattern formation within phenotype-structured chemotactic populations. *Proc. A* 1; 481 (2324): 20250483. https://doi.org/10.1098/rspa.2025.0483	https://royalsocietypublishing.org/doi/abs/10.1098/rspa.2025.0483	PDEs, pattern formation, chemotaxis, non-local advection-diffusion-reaction eqs.
Kejie C, Kai-Rong O (2021) Random Walks of a Cell With Correlated Speed and Persistence Influenced by the Extracellular Topography, *Frontiers in Physics,* Volume 9, 10.3389/fphy.2021.719293	https://www.frontiersin.org/journals/physics/articles/10.3389/fphy.2021.719293/full	Random walks, complex environments, PRWs, Cell migration
Ohno K, Kobayashi Y, Uesaka M *et al.* (2021) A computational model of the epidermis with the deformable dermis and its application to skin diseases. *Sci Rep* **11**, 13234. https://doi.org/10.1038/s41598-021-92540-1	https://www.nature.com/articles/s41598-021-92540-1	ABM, skin modelling, skin disease, cellular layer

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