STATE SPACE MODELS FOR REGIONAL EPIDEMIOLGICAL INDICATORS

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Stefan Heyder: *State Space Models for Regional Epidemiolgical Indicators,*
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ABSTRACT

Short summary of the contents in English...

ZUSAMMENFASSUNG

Kurze Zusammenfassung des Inhaltes in deutscher Sprache...

PUBLICATIONS AND CONTRIBUTIONS

This thesis consists of mostly unpublished work. During my time as a PhD student I have, however, been fortunate to collarborate with many scientists on roblems in mathematical epidemiology with a focus on COVID-19, which resulted in several publications. In this section I want to clarify what my contributions to these publications were and which contributions of the present thesis are new.

[1] J. Bracher et al. "A Pre-Registered Short-Term Forecasting Study of COVID-19 in Germany and Poland during the Second Wave." In: *Nature Communications* 12.1 (1 Aug. 27, 2021), p. 5173. ISSN: 2041-1723. DOI: 10.1038/s41467-021-25207-0. URL: https://www.nature.com/articles/s41467-021-25207-0 (visited on 09/30/2021).

[2] Johannes Bracher et al. "National and Subnational Short-Term Forecasting of COVID-19 in Germany and Poland during Early 2021." In: *Communications Medicine* 2.1 (1 Oct. 31, 2022), pp. 1–17. ISSN: 2730-664X. DOI: 10.1038/s43856-022-00191-8. URL: https://www.nature.com/articles/s43856-022-00191-8 (visited on 11/16/2022).

[3] Jan Pablo Burgard, Stefan Heyder, Thomas Hotz, and Tyll Krueger. "Regional Estimates of Reproduction Numbers with Application to COVID-19." Aug. 31, 2021. arXiv: 2108.13842 [stat]. URL: http://arxiv.org/abs/2108.13842 (visited on 09/30/2021).

[4] Sara M. Grundel, Stefan Heyder, Thomas Hotz, Tobias K. S. Ritschel, Philipp Sauerteig, and Karl Worthmann. "How to Coordinate Vaccination and Social Distancing to Mitigate SARS-CoV-2 Outbreaks." In: *SIAM Journal on Applied Dynamical Systems* 20.2 (Jan. 1, 2021), pp. 1135–1157. DOI: 10.1137/20M1387687. URL: https://epubs.siam.org/doi/abs/10.1137/20M1387687 (visited on 01/21/2022).

[5] Sara Grundel, Stefan Heyder, Thomas Hotz, Tobias K. S. Ritschel, Philipp Sauerteig, and Karl Worthmann. "How Much Testing and Social Distancing Is Required to Control COVID-19? Some Insight Based on an Age-Differentiated Compartmental Model." In: *SIAM Journal on Control and Optimization* 60.2 (Apr. 2022), S145–S169. ISSN: 0363-0129, 1095-7138. DOI: 10.1137/20M1377783. URL: https://epubs.siam.org/doi/10.1137/20M1377783 (visited on 11/16/2022).

[6] Thomas Hotz, Matthias Glock, Stefan Heyder, Sebastian Semper, Anne Böhle, and Alexander Krämer. "Monitoring the Spread of COVID-19 by Estimating Reproduction Numbers over Time." Apr. 18, 2020. arXiv: 2004.08557 [q-bio, stat]. URL: http://arxiv.org/abs/2004.08557 (visited on 07/20/2020).

[7] K. Sherratt et al. *Predictive Performance of Multi-Model Ensemble Forecasts of COVID-19 across European Nations*. June 16, 2022. DOI: 10.1101/2022.06.16.22276024. URL: http://medrxiv.org/lookup/doi/10.1101/2022.06.16.22276024 (visited on 11/28/2022). preprint.

Du musst bereit sein Dinge zu tun.

— A meme on the internet, 2022.

ACKNOWLEDGMENTS

Put your acknowledgments here.

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INTRODUCTION

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EPIDEMIOLOGICAL DATA & MODELS

3

STATE SPACE MODELS

4

STATE SPACE MODELS FOR EPIDEMIOLOGICAL DATA

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CONCLUSION

Part I

APPENDIX

APPENDIX 01

A.1 SOME APPENDIX SECTION

DECLARATION

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Ilmenau, October 2023

Stefan Heyder