

Curriculum Vitae

Personal information

Name Sebastian (Seba) Contreras
Nationality Chilean/German
Current affiliation Hangzhou International Innovation Institute (H3I), Beihang University, China.
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Date of Birth April 29th, 1993
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Career summary

Jan. 2026 – present **Associate Professor (Tenure-Track)**
Hangzhou International Innovation Institute of Beihang University, Hangzhou, China.

Apr. 2026 – present **External Member**
Interdisciplinary Center for Mathematical Modeling of Infectious Disease Dynamics (IMMIDD),
University of Münster, Germany.

May. 2023 – Dec. 2025 **Postdoctoral Researcher**
MPRG Priesemann, Lead of the Infectious Disease Modeling Team
Max Planck Institute for Dynamics and Self-Organization, Göttingen, Germany, and
Georg-August-Universität, Göttingen, Germany.

Jul. 2020 – Apr. 2023 **Ph.D. in Physics (Dr. rer. nat.)**
International Max Planck Research School "Physics of Biological and Complex Systems",
Georg-August-Universität, Göttingen, Germany: highest honours (*summa cum laude*).

Jul. 2019 – Jul. 2020 **Predocctoral Researcher**
Centre for Biotechnology and Bioengineering, Universidad de Chile, Santiago, Chile.

Jul. 2017 – Jul. 2019 **Master of Science (Process Engineering)**
Universidad de Chile, Santiago, Chile: 7.0/7.0 (highest honors)

Mar. 2012 – Jul. 2017 **Civil Engineering (Diplom)**
Universidad de Chile, Santiago, Chile: 7.0/7.0 (highest honors)

Awards and academic recognition

2025 **Best doctoral dissertation in theoretical physics, University of Göttingen**
Dr. Berliner - Dr. Ungewitter - Stiftung.

2020 **Best Graduate (2019)**
Colegio de Ingenieros de Chile (Chile Engineers Association).

2018 **Outstanding student**
Master's Program, Faculty of Physical and Mathematical Sciences (FCFM), Universidad de Chile, Santiago, Chile.

Academic Experience

Jan 26 – present **Associate Professor** at the International Research Center for Complexity Sciences, H3I
Beihang University, Hangzhou, China.
Tasks: Lead of the *Complex Epidemics* lab at the department for complex networks. Supervision of
PhD students and postdoctoral researchers, and university teaching.

May 23 – Dec 25 **PostDoc** at the Max Planck Institute for Dynamics and Self-Organization.

- Tasks: Research and project lead (multi-institution subproject in a BMBF-Funded modelling consortium), supervising and advising students (up to PhD level), conducting dependent and independent research, and university teaching.
- Project: **MIBSTI**, Modeling the complex Interplay between human Behaviour and Sexually Transmitted Infections (STIs). Here, we propose a new battery of models and methods to study the simultaneous spread of different STI, where a few of them drive the behavioural response and testing recommendations.
- Project: **Designing a new university course**. In our lecture, *Spreading Processes and Learning in Living Systems*, we present the basic mechanisms of the propagation of waves in different systems, using disease spread as one of the central examples to inspire these general principles.
- Project: **Behaviour-driven desynchronisation of epidemics**. Here we explore the effects of different degrees of information (local vs global) in mitigating the spatial spread of infectious diseases.
- Jun 2020 – Apr 2023 **PhD Student** MPRG Priesemann at the Max Planck Institute for Dynamics and Self-Organization
- Thesis: *Complex Dynamics in the Spread of COVID-19*. Here, I studied the complex interplay between information, risk perception, and disease spread, and its implications for mitigation plans in the context of the COVID-19 pandemic.
- Tasks: Supervising students (M.Sc. and B.Sc.), tutoring courses on physics at the University of Göttingen, attending international conferences, and performing collaborative research. I also contributed grant proposal conceptualization, writing, and research.
- Jun 2016 – Jun 2020 **Research Assistant and Predoctoral Researcher** at the Centre for Biotechnology and Bioengineering, CeBiB, Universidad de Chile
- Project: Modelling the spreading dynamics of COVID-19 in Chile with a multigroup SEIRA model, and developing real-time estimators of the effective reproduction number of COVID-19 R_t .
- Project: Parametric definition of health in human Glucose-Insulin dynamics. Development of a novel DDE model for the human glucose-insulin dynamics and tailored inverse problem-solving techniques for parameter recognition.
- Project: DMAKit: A user-friendly web platform and Python library for bringing state-of-the-art data analysis techniques to non-specific users.

Teaching Experience

- Oct. 2022 – present **Georg-August-Universität Göttingen** *Göttingen, Germany* – Teaching Assistant, Lecturer
- Spreading Processes and Learning in Living Systems, (B.Sc. level). Lecturer
 - Current Topics in Theoretical Physics, (M.Sc. level). Lecturer
 - Introduction to Physics of Complex Systems, (M.Sc. level). TA
- Jul. 2013 – Jul. 2019 **Universidad de Chile** *Santiago, Chile* – Teaching Assistant, Lecturer
- Ordinary Differential Equations, undergraduate course with ~ 100 students per semester.
 - Mathematical Methods in Engineering, and non-Newtonian fluid dynamics, courses for the Ph.D. programs in Mechanical Engineering and Fluid Dynamics, respectively.

Languages

Programming

Julia, R, Python, MATLAB.

Speaking

Spanish, English, German.

Hobbies

Sports Diving, running, swimming, hiking, and basically anything outdoors.

Music I play the piano and sing, and before dedicating my life to science, I played the Cello professionally.

Selected Publications

- 2026 Contreras, S.*, Dönges, P., Müller, L., Mallick, P., Paltra, S., Hvid, U., Kettlitz, RJN., ..., & Priesemann, V. "Mechanics of Pandemics". *eClinicalMedicine* 98, 104101. doi: 10.1016/j.eclinm.2026.104101
- 2025 Müller, L., Mallick, P., Marín-Carballo, A.B., Dönges, P., Kettlitz, R.J.N., Klett-Tammen, C.J., Kretzschmar, M., Priesemann, V. & Contreras, S.* "Testing Paradox May Explain Increased Observed Prevalence of Bacterial STIs among MSM on HIV PrEP: A Modeling Study". *Proceedings of the National Academy of Sciences* 122(44), e2524944122. doi:-10.1073/pnas.2524944122
- 2025 Oróstica, K. Y., Mardones, F., Bernal, Y. A., Molina, S., ..., Contreras, S.* & Armisen, R.* "Advances in Machine Learning for Tumour Classification in Cancer of Unknown Primary: A Mini-Review". *Cancer Letters* 611, 217348. doi:-10.1016/j.canlet.2024.217348.
- 2023 Dehning, J.*, Mohr, S. B.*, Contreras, S., Dönges, P., Iftekhhar, E., Schulz, O., Bechtle, P., & Priesemann, V. "Impact of the Euro 2020 championship on the spread of COVID-19". *Nature Communications* 14(1), 122. doi:-10.1038/s41467-022-35512-x
- 2021 Contreras, S. & Priesemann, V. "Risking further COVID-19 waves despite vaccination". *The Lancet Infectious Diseases* 21(6), 745-746 (2021) doi: 10.1016/S1473-3099(21)00167-5
- 2021 Contreras, S.*, Dehning, J.*, Loidolt, M.*, Spitzner, FP., Urrea-Quintero, J., Mohr, SB., Wilczek, M., Zierenberg, J., Wibral, M., & Priesemann, V. "The challenges of containing SARS-CoV-2 via test-trace-and-isolate". *Nature Communications* 12(2021) 371. doi: 10.1038/s41467-020-20699-8

Editorial work

Editor *Nature's Scientific Reports* (Editorial Board Member), *Nature's Scientific Reviews* (Founding Editorial Board Member).

Reviewer Journal referee for *Nature Communications* (IF 14.7), *Communications Medicine* (IF 5.4), *Communications Physics* (IF 5.4), *Journal of Translational Medicine* (IF: 8.4), *PLoS Computational Biology* (IF 3.8), *BMC Bioinformatics* (IF 2.9), *BMC Infectious Diseases* (IF 3.4), *Computers in Biology and Medicine* (IF 7.7), *IEEE Communications Magazine* (IF 8.3), *Heliyon* (IF 3.4), *Chaos, Solitons & Fractals* (IF 5.3), and *Frontiers in Medicine* (IF 3.1), among others.

Conference attendances

Selected conferences

- 2026 Invited Speaker at the 17th Dynamical Systems applied on Biology and Natural Sciences, 2–6 February 2025, Granada, Spain.
- 2025 Invited Speaker at the STATPHYS29 satellite meeting "Complexity Living Systems", 9–12 July, Palermo, Italy. *Testing as an Active Intervention to Control Epidemics*
- 2025 Organizer of a mini-symposium at the 16th Dynamical Systems applied on Biology and Natural Sciences, 20–24 January 2025, Napoli, Italy. *Complex Dynamics and Control in Behaviour-Driven Epidemics*
- 2024 Lecturer at the CLIMADEMIC Summer School 2024 *How climate change can drive the emergence of future pandemics*, 22–26 July 2024, Berlin, Germany. *Mathematical Models of Infectious Disease Spread*
- 2023 Invited Speaker at the CASUS workshop *Data science and the COVID-19 pandemic – What have we learned so far?*, 5–7 June 2023, Görlitz, Germany. *Mechanics of Pandemics*

Indexed publications

- 2026 Contreras, S.*, Dönges, P., Müller, L., Mallick, P., Paltra, S., Hvid, U., Kettlitz, RJN., ..., & Priesemann, V. "Mechanics of Pandemics". **eClinicalMedicine** 98, 104101. doi: 10.1016/j.eclinm.2026.104101
- 2026 Boehler, L.-I., Koepfel, L., ..., Contreras, S., ..., & Denking, C. "Impact of non-pharmaceutical interventions targeted at COVID-19 pandemic on influenza burden—a systematic review and meta-analysis". **Influenza and Other Respiratory Viruses** 20(8), e70301. doi: 10.1111/irv.70301
- 2026 Mallick, P., Müller, L., Marín-Carballo, A.B., Dönges, P., & Contreras, S.* "Stability and bifurcations of a minimal model for the effect of risk compensation in epidemics of sexually transmitted infections". **Chaos, Solitons and Fractals** 210(1), 118649. doi: 10.1016/j.chaos.2026.118649
- 2025 Müller, L., Mallick, P., Marín-Carballo, A.B., Dönges, P., Kettlitz, R.J.N., Klett-Tammen, C.J., Kretzschmar, M., Priesemann, V. & Contreras, S.* "Testing Paradox May Explain Increased Observed Prevalence of Bacterial STIs among MSM on HIV PrEP: A Modeling Study". **Proceedings of the National Academy of Sciences** 122(44), e2524944122. doi:-10.1073/pnas.2524944122
- 2025 Kettlitz, R.J.N., Harries, M., Contreras, S., Reinecke, J., Wieder, M. S., von Lengerke, T., Castell, S., Lange, B., & Klett-Tammen, C. J. (2025) Self-reported poliomyelitis vaccination and documentation in adults indicates high uptake: A digital German epidemic panel, December 2024. **BMC Public Health** 25(1), 3514. doi:-0.1186/s12889-025-24865-9
- 2025 Zunker, H., Dönges, P., Lenz, P., Contreras, S.*, & Kühn, M. J.* (2025). "Risk-mediated dynamic regulation of effective contacts de-synchronizes outbreaks in metapopulation epidemic models". **Chaos, Solitons & Fractals** 199, 116782. doi:-10.1016/j.chaos.2025.116782
- 2025 Oróstica, K. Y., Mardones, F., Bernal, Y. A., Molina, S., ..., Contreras, S.* & Armisen, R. "Advances in Machine Learning for Tumour Classification in Cancer of Unknown Primary: A Mini-Review". **Cancer Letters** 611, 217348. doi:-10.1016/j.canlet.2024.217348.
- 2025 Wagner, J., Bauer, S., Contreras, S., Fleddermann, L., Parltitz, U., & Priesemann, V. "Societal feedback induces complex and chaotic dynamics in endemic infectious diseases". **Physical Review Research** 7, 013308. doi:-10.1103/PhysRevResearch.7.013308.
- 2024 Oróstica, KY.*, , Mohr, SB.*, Dehning, J.*, Medina-Ortiz, D., Bauer, S. , ..., & Contreras, S.* "Early Mutational signatures and transmissibility of SARS-CoV-2 Gamma and Lambda variants in Chile". **Scientific Reports** 14, 16000. doi:-10.1038/s41598-024-66885-2.
- 2024 Medina-Ortiz, D., Contreras, S., Fernández, D., Soto-García, N., Moya, I., Cabas-Mora, G., & Olivera-Nappa, Á., "Protein Language Models and Machine Learning Facilitate the Identification of Antimicrobial Peptides". **International Journal of Molecular Sciences** 25(16), 8851. doi:-10.3390/ijms25168851.
- 2023 Contreras, S., Iftekhar, & Priesemann, V. "From emergency response to long-term management: the many faces of the endemic state of COVID-19". **The Lancet Regional Health Europe** 30: 100664. doi:-10.1016/j.lanepe.2023.100664
- 2023 Dehning, J.*, Mohr, S. B.*, Contreras, S., Dönges, P., Iftekhar, E., Schulz, O., Bechtle, P., & Priesemann, V. "Impact of the Euro 2020 championship on the spread of COVID-19". **Nature Communications** 14(1), 122. doi:-10.1038/s41467-022-35512-x
- 2023 Contreras, S., Oróstica, K. Y., Daza-Sanchez, A., Wagner, J., Dönges, P., Medina-Ortiz, D., Jara, M., Verdugo, R., Conca, C., Priesemann, V., & Olivera-Nappa, Á. "Model-based assessment of sampling protocols for infectious disease genomic surveillance". **Chaos, Solitons & Fractals** 167, 113093. doi: 10.1016/j.chaos.2022.113093

- 2022 Oróstica, K. Y., Saez-Hidalgo, J., de Santiago, P. R., Rivas, S., Contreras, S., Navarro, G., Asenjo, J., Olivera-Nappa, A., & Armisen, R. "Total mutational load and clinical features as predictors of the metastatic status in lung adenocarcinoma and squamous cell carcinoma patients". *Journal of Translational Medicine* **20**, 373. doi: 10.1186/s12967-022-03572-8
- 2022 Medina-Ortiz, D., Contreras, S., Amado-Hinojosa, J., Almonacid-Torres, J., Navarrete, M., Asenjo, J. & Olivera-Nappa, A. "Combination of digital signal processing and assembled predictive models facilitates the rational design of proteins". *Frontiers in Molecular Biosciences* 9:898627. doi: 10.3389/fmolb.2022.898627
- 2022 Contreras, S., Dehning, J., & Priesemann, V. "Describing a landscape we are yet discovering". *AStA Advances in Statistical Analysis* **106**, 399-402. doi: 10.1007/s10182-022-00449-5
- 2022 Olivera-Nappa, A.*, Contreras, S.*, Tevy, MF., Medina-Ortiz, D., Leschot, A., Vigil, P., & Conca, C. "Patient-wise methodology to assess glycemic health status: applications to quantify the efficacy and physiological targets of polyphenols on glycemic control". *Frontiers in Nutrition* 9:831696. doi: 10.3389/fnut.2022.831696
- 2022 Dönges, P.*, Wagner, J.*, Contreras, S.*, Iftexhar, EN.*, Bauer, S., Mohr, SB., Dehning, J., Calero Valdéz, A., Kretzschmar, M., Mäs, M., Nagel, K., & Priesemann, V. "Interplay between risk perception, behaviour, and COVID-19 spread". *Frontiers in Physics* 10:842180. doi: 10.3389/fphy.2022.842180
- 2022 Oróstica, KY., Contreras, S.*, Sánchez-Daza, A., Fernandez, J., Priesemann, V., & Olivera-Nappa, A. "New year, new SARS-CoV-2 variant: resolutions on genomic surveillance protocols to face Omicron". *The Lancet Regional Health – Americas* **7**, 100203. doi: 10.1016/j.lana.2021.100203
- 2022 Contreras, S., Olivera-Nappa, Á., & Viola Priesemann "Rethinking COVID-19 vaccine allocation: it is time to care about our neighbours". *The Lancet Regional Health–Europe* **12**, 100277. doi: 10.1016/j.lanepe.2021.100277
- 2022 Sanchez-Daza, A., Medina-Ortiz, D., Olivera-Nappa, Á., & Contreras, S. "COVID-19 modeling under uncertainty: Statistical data analysis for unveiling true spreading dynamics and guiding correct epidemiological management". Book chapter in Springer Series *Studies in Systems, Decision and Control*. doi: 10.1007/978-3-030-72834-2_9
- 2021 Contreras, S.*, Dehning, J.*, Mohr, SB.*, Spitzner, FP.*, Bauer, S.* & Priesemann, V.* "Low case numbers enable long-term stable pandemic control without lockdowns". *Science Advances* **7**(41): eabg2243. doi: 10.1126/sciadv.abg2243
- 2021 Bauer, S.*, Contreras, S.*, Dehning, J., Linden, M., Iftexhar, E. Mohr, SB., Olivera-Nappa, Á., & Priesemann, V. "Relaxing restrictions at the pace of vaccination increases freedom and guards against further COVID-19 waves in Europe". *PLoS Computational Biology* **17**(9): e1009288. doi: 10.1371/journal.pcbi.1009288
- 2021 Contreras, S. & Priesemann, V. "Risking further COVID-19 waves despite vaccination". *The Lancet Infectious Diseases* **21**(6), 745-746 (2021) doi: 10.1016/S1473-3099(21)00167-5
- 2021 Contreras, S.*, Dehning, J.*, Loidolt, M.*, Spitzner, FP., Urrea-Quintero, J., Mohr, SB., Wilczek, M., Zierenberg, J., Wibrall, M., & Priesemann, V. "The challenges of containing SARS-CoV-2 via test-trace-and-isolate". *Nature Communications* **12**(2021) 371. doi: 10.1038/s41467-020-20699-8
- 2020 Contreras, S., Biron-Lattes, J. P., Villavicencio, H. A., Medina-Ortiz, D., Llanovarcid-Kawles, N., & Olivera-Nappa, A. "Statistically-based methodology for correcting delay-induced errors on the evaluation of COVID-19 pandemic". *Chaos, Solitons & Fractals* **139**(2020), 110087. doi: 10.1016/j.chaos.2020.110087
- 2020 Contreras, S., Villavicencio, H. A., Medina-Ortiz, D., Biron-Lattes, J. P., & Olivera-Nappa, A. "A multi-group SEIRA model for the spread of COVID-19 among heterogeneous populations". *Chaos, Solitons & Fractals* **136**(2020), 109925. doi: 10.1016/j.chaos.2020.109925
- 2020 Medina-Ortiz, D., Contreras, S., Quiroz, C., & Olivera-Nappa, A. "DMAKit: A user-friendly web platform for bringing state-of-the-art data analysis techniques to non-specific users". *Information Systems* **93**(2020), 101557. doi: 10.1016/j.is.2020.101557

- 2020 Contreras, S., Castillo, C., Olivera-Nappa, A., & Ihle, C.F. "A new statistically-based methodology for variability assessment of rheological parameters in mineral processing". **Minerals Engineering** 156(2020), 106494. doi: 10.1016/j.mineng.2020.106494
- 2020 Contreras, S., Villavicencio, H. A., Medina-Ortiz, D., Saavedra, C. P., & Olivera-Nappa, A. "Real-time estimation of Rt for supporting public-health policies against COVID-19". **Frontiers in Public Health** 8, 556689. doi: 10.3389/fpubh.2020.556689
- 2020 Medina-Ortiz, D., Contreras, S., Barrera-Saavedra, Y., Cabas-Mora, G., & Olivera-Nappa, A. "Country-Wise Forecast Model for the Effective Reproduction Number Rt of Coronavirus Disease". **Frontiers in Physics** 8, 304. doi: 10.3389/fphy.2020.00304
- 2020 Contreras, S., Medina-Ortiz, D., Conca, C., & Olivera-Nappa, A. "A novel synthetic model of the glucose-insulin system for a patient-wise inference of parameters from small size OGTT data". **Frontiers in Bioengineering and Biotechnology** 8, 195. doi: 10.3389/fbioe.2020.00195
- 2020 Medina-Ortiz, D., Contreras, S., Quiroz, C., & Olivera-Nappa, A. "Development of supervised learning predictive models for highly non-linear biological, biomedical and general datasets". **Frontiers in Molecular Biosciences** 7, 13. doi: 10.3389/fmolb.2020.00013

Submitted Manuscripts

- 2026 Contreras, S.*, Dönges, P., Filinski, M. ..., & Priesemann, V. "Household size can explain 40% of the variance in cumulative COVID-19 incidence across Europe". arXiv preprint. doi: 10.48550/arXiv.2602.15447
- 2026 Amaral Lind, R., Ghanbernejad, F., & Contreras, S.*. "Synergistic Effects of Behavioral Feedback and Seasonality Generate Chaos in Cooperative Multi-Pathogen Systems".
- 2026 Kettlitz, R.JN., Fang, F. ..., & Contreras, S.. "Quantifying the Reliability and Resilience of Epidemiological Sensor Networks Based on Longitudinal Cohort Surveillance".
- 2026 Fang, F., Pósai, M., Contreras, S.*, & Bonamassa, I*. "Fragility of transport networks to path fragmentation".
- 2026 Xie, C., Zhan, X-X., Contreras, S., Zhao, Z., & Cao, X. "Robust Resource Allocation in Spatio-temporal Space-Air-Ground Integrated Networks via Feedback-Based Particle Swarm Optimization".
- 2025 Harries, M., Klett-Tammen, C. J., Rodiah, I., Dulovic, A., ..., Contreras, S., ..., & Lange, B. "Improving prediction of RSV infection dynamics and disease burden based on population-based assessments with novel multiplex tools – a RESPINOW study". medRxiv preprint doi: 10.1101/2024.11.20.24317653