Curriculum Vitae

Personal Information

Name	Sebastian Contreras
Date of Birth	April 29th, 1993
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Short bio

Sebastian Contreras studied engineering at Universidad de Chile (Chile), and received his Master's degree in 2019. He joined the Neural Systems Theory Group in 2020 as a PhD student, working on disease spread and COVID-19. Using different tools from formal analysis, he searches to uncover general principles in the dynamics of disease spread and its interaction between pandemic and infodemic. With his work, he provided basic understanding of the pandemic that was not only reflected in high-impact publications, but also found its way to public knowledge, especially on tipping point of disease spread dynamics.

Education

Jul. 2020 – Present **Ph.D. candidate in Physics**
International Max Planck Research School, Georg-August-Universität, Göttingen, Germany

Jul. 2017 – Jul. 2019 **Master of Sciences (Metallurgy)**
Universidad de Chile, Santiago, Chile: 7.0/7.0

Mar. 2012 – Jul. 2017 **Mining Engineering**
Universidad de Chile, Santiago, Chile: 7.0/7.0

Awards and academic recognition

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

Jun. 2020 – Present **Max Planck Institute for Dynamics and Self-Organization – MPRG Priesemann**
Research Assistant/PhD Student

- Modelling the challenges of containing SARS-CoV-2 via Test-Trace-and-Isolate.
- Designing long-term pandemic control strategies: metaestable equilibrium at low case numbers.
- Modelling the effect of vaccines the spreading dynamics of COVID-19.
- Modelling the interplay between information, behavior, and disease spread.
- Competition-Coinfection dynamics of concurrent diseases and variants thereof.

Jun. 2016 – Jun. 2020 **Centre for Biotechnology and Bioengineering, CeBiB** *Santiago, Chile, https://www.cebib.cl/*– Research Assistant and Researcher (Math. Modeling Group)

- Modelling the spreading dynamics of COVID-19 in Chile with a multigroup SEIRA model.
- Developing real-time estimators of the effective reproduction number of COVID-19 R_t.

(2016-2020) **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.

(2018-2020) **Project:** DMAKit: A user-friendly web platform and Python library for bringing state-of-the-art data analysis techniques to non-specific users.

Jul. 2017 – Jul. 2019 **Laboratory for Rheology and Fluid dynamics (LRF)** *Santiago, Chile* – Researcher

- Statistical characterization of floc-structures in flocculation of clays, using graphene oxide-doped flocculants, for optimizing water recovery in mineral processing plants.
- Characterization of the effect of mineralogy, clay abundance and electrolyte concentration in the rheological properties of copper sulfide tailings.
- Development of statistically-based methodology for variability assessment of rheological parameters in mineral processing.

Teaching Experience

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, obligatory course for the Ph.D. in Mechanical Engineering program.
- Dynamics of Hyper-Concentrated Suspensions (non-Newtonian fluid dynamics), optional course for the Ph.D. in Fluid Dynamics program.

Skills & Background Knowledge

Programs and Programming Languages

Matlab Programming, *Advanced*

LaTeX, *Advanced*

Python Programming, *Intermediate*

Julia Programming, *Basic*

Languages

Spanish, *Native*

English, *Fluent*

German, *Intermediate* (**B1**), aiming for **C1** by the end of my Ph.D.

Hobbies (I can bring much more than science!)

Hiking-Trekking I love outdoors and exploring in Chile (Tierra del Fuego, Torres del Paine, Patagonia, Atacama Desert, Easter Island), or around the world.

Sports Running, swimming, diving, climbing, basically anything outdoors.

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

Cooking I know many Chilean, Peruvian, and German recipes that might be worth trying!

Publications

Indexed Publications

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". *In press* in ***AStA Advances in Statistical Analysis***. 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 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.*, Iftekhar, 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., Iftehar, 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., 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

2020 Contreras, S., Biron-Lattes, J. P., Villavicencio, H. A., Medina-Ortiz, D., Llanovarced-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

2019 Contreras, S., Ihle, C., & Palza, H. "FBRM measurements of fine solid flocculation performance using graphene oxide-doped industrial flocculants in high-clay tailings". ***In Proceedings of the 29th Int. Mineral Processing Congress***.

Submitted Manuscripts

2021 Contreras, S.*, Dönges, P.*, Wagner, JM.*, Bauer, S.*, Mohr, SB., Iftekhar, EN., Kretzschmar, M., Mäs, M. , Calero Valdez, Á., & Priesemann, V. "The winter dilemma". `https://arxiv.org/abs/2110.01554`.

2021 Oróstica, KY.*, Contreras, S.*, Mohr, SB., Dehning, J., Medina-Ortiz, D., Bauer, S. , ..., & Priesemann, V. "Mutational signatures and transmissibility of SARS-CoV-2 Gamma and Lambda variants". `https://arxiv.org/abs/2108.10018`.

Editorial work

Reviewer Journal referee for *The Lancet Infectious Diseases* (1), *IEEE Communications Magazine* (2), *The Lancet Regional Health - Europe* (2), *PLoS Computational Biology* (2), *PLoS ONE* (2), *Mathematical Medicine and Biology* (2) *Chaos, Solitons & Fractals* (8), *Communications Physics* (2), *Communications Medicine* (1), *Scientific Reports* (4), *Heliyon* (2), *Computers in Biology and Medicine* (3), *Frontiers in Medicine* (1), *BMC Bioinformatics* (1) and *Frontiers in Public Health* (2). I have also reviewed book chapters (2) in the *Studies in Systems, Decision and Control* Springer series.

References

Academic references

Dr. Viola Priesemann
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Prof. Dr. Álvaro Olivera-Nappa
Principal researcher (Math. Modeling & Protein Engineering), CeBiB, and Assistant Professor, Department of Chemical Engineering, Biotechnology and Materials, Universidad de Chile
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Conference attendances

International conferences

2021 Speaker in the I Madeira COVID-19 Modellers Encounter. 27 September - 2 October 2021, Madeira, Portugal. *Spreading dynamics of COVID-19: Compartmental models and beyond* (eng)

2019 Speaker in the 6th International Seminar on Tailings Management, Tailings 2019, Santiago, Chile. Oral presentation: Characterization of the effect of clay mineralogy and content on the rheological behavior of copper sulfide tailings (eng).

2018 Speaker in the 29th International Mineral Processing Congress, 17-21 September 2018, Moscow, Russia. Oral presentation: Characterization of the effect of clay mineralogy and content on the rheological behavior of copper sulfide tailings (eng).

National conferences

2021 Speaker in the XIII Workshop CeBiB: Metabolic Engineering, Bioinformatics and Genomics for Biotechnological Applications. 29 June, 1-2 July 2021, online. *Spreading Dynamics of Infectious Diseases: A Tale of Tipping-Points* (eng)

2019 Poster presentation in the XI Workshop CeBiB: Metabolic Engineering, Bioinformatics and Genomics for Biotechnological Applications. 27-29 November 2019, Hotel Termas de Puyehue, Los Lagos Region, Chile. Poster: DMAKit, a user-friendly web platform for bringing state-of-the-art data analysis techniques to non-specific users (eng).

2019 Speaker in the X Workshop CeBiB: Metabolic Engineering, Bioinformatics and Genomics for Biotechnological Applications. 29-31 July 2019, Sheraton Hotel, Santiago, Chile. Oral presentation: Mathematical modeling and data mining: Applications and tool development (spa).

2017 Speaker in the VII Workshop CeBiB: Metabolic Engineering, Bioinformatics and Genomics for Biotechnological Applications. 29 November - 1 December 2017, Hotel Antofagasta, Antofagasta Region, Chile. Oral presentation: Mathematical modeling of the human glucose-insulin system (eng).

2017 Attended to the XIV Congress on Pipeline of Concentrate, Slurry, Tailings and Water. 23-24 November 2019, Hotel Sheraton Miramar, Valparaiso Region, Chile.