Jennifer K Briggs

Ph.D. Bioengineering Candidate University of Colorado Denver | Anschutz Medical Campus

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About Me

I am an NSF Graduate Research Fellow and SIGHP Association for Computing Machinery Fellow at the University of Colorado Anschutz Medical Campus, Departments of Bioengineering and Biomedical Informatics. With my expertise in statistical inference, dynamical systems theory, and computational physiology, I bring a cross-disciplinary approach to both teaching and research. My work focuses on applying innovative computational methods from complexity science, non-linear dynamics, and data assimilation/mechanistic machine learning to biomedicine, with a vision in advancing mechanistic insights and building clinical decision support tools for the cerebral vascular and glucose endocrine systems.

Education

University of Colorado Anschutz — *Aurora, Co*
Bioengineering Ph.D. Candidate — *2020-Present*
- Advised by Dr. David Albers (Ph.D. Mathematical Physics) and Dr. Richard Benninger (Ph.D. Physics)
- **GPA:** 4.0
- **Topics:** Data Assimilation, Machine Learning, Timeseries Analysis, Mathematical Modeling of Physiology, Complexity Theory
- **Relevant Classes:** Physics of Computation and Information - James Crutchfield; Network Analysis and Modeling - Aaron Clauset; Data Science and Analysis of Time-Dependent Biomedical Data - David Albers; Complex Systems Methods -Allison Goodwell; Numerical and Analytical Methods of Engineering - Vitaly Kheyfets and Melike Sirlanci; Random Processes for Engineers - Alireza Vahid

Sante Fe Institute — *Sante Fe, NM*
Complexity Systems Summer School — *2022*
- Month long intensive education on state of the art Complexity Science
- **Projects:** Transmission dynamics under spatially clustered immunity, Chaos and Control Reading Group

Pepperdine University — *Malibu, CA*
Double Major: Bachelor of Science in Physics and Sports Medicine **minor**: Applied mathematics — *2016-2020*
- **GPA:** 3.9/4.0, *Suma Cum Laude*
- **Notable awards**: Natural Science Student of the Year, Physics Student of the Year, Edison Achievement Scholarship, Faculty and Staff Scholarship, Pepperdine Grant, Rosemarry Raitt Endowed Scholarship, Natural Science Award

Fellowships

2024-2027 **Concordia Coalition for Diabetes,** Diabetes Center, University of Colorado | Anschutz Medical Campus

2022-2026 **Special Interest Group of High Power Computing Fellowship**, Association of Computational Machinery

2021-2025 **National Science Foundation Graduate Research Program Fellowship**, Physics of Living Systems

2020-2025 **Bioengineering Fellowship**, University of Colorado | Anschutz Medical Campus

2020-2025 **Werner and Kitty Hirs Fellowship**, University of Colorado | Anschutz Medical Campus

2020 **Hertz Fellowship**, Honorable Mention (Second Round Interview)

Research Experience (publications below)

Complexity and Dynamical Systems in Biomedicine — *Aurora, Co*
Departments of Bioengineering and Biomedical Informatics, University of Colorado Anschutz — *2020-Present*
- Advisors: David Albers and Richard Benninger. Additional Mentors: Tellen Bennet M.D., Jane Reusch M.D., Melike Sirlanci Ph.D., Soojin Park M.D.
- Developing clinical decision support tools for treatment of neurocritical care patients using a novel physiologically informed cerebral hemodynamics model, data assimilation/mechanistic machine learning, and time series analysis.
- Investigating mechanisms underlying cellular communication and blood flow in diabetes using microscopy, network theory, and computational modeling.

Heliospheric Research Intern — *Greenbelt, Maryland*
NASA Goddard, Code 674 — *2019*
- Advisors: David Sibeck and Gerard Fasel
- Through big data analysis techniques, discovered a never documented phenomenon in the dayside ionosphere and corresponding magnetospheric signatures.
- Manipulated, graphed, and analyzed data using IDl and Python

Publications

Published (Listed in Chronological Order)

• Stroh, J. N., Foreman, B., Bennett, T. D., **Briggs, J.K.,** Park, S., & Albers, D. (2024). Intracranial pressure-flow relationships in traumatic brain injury patients expose gaps in the tenets of models and pressure-oriented management. Frontiers in Physiology. 2024;15. Read here

• Fasel, G.J., Lee, L.C., Lake, E., Csonge, D., Yonano, B., Bradley, O., **Briggs, J.K.**, Lee, S.H., Mann, J., Sigernes, F. & Lorentzen, D., (2024). Correlation between the solar wind speed and the passage of poleward-moving auroral forms into the polar cap. Frontiers in Astronomy and Space Sciences, 2024;10,

• **Briggs, J. K.,** Gresh, A., Marinelli, I., Kravets, V., Dwulet, J. M., Albers, D. J., & Benninger, R. K. (2023). Beta-cell intrinsic dynamics rather than gap junction structure dictates subpopulations in the islet functional network. Elife, 12 (2023): e83147. Read here

• **Briggs, J. K.,** Schonblum, A., Landsman, L., & Benninger, R. K. (2022). Going With the Flow: Pericyte-Regulated Islet Blood Flow Influences Glucose Homeostasis. Diabetes, 71(8), 1611-1613. Read here

• Adams, M. T., Dwulet, J. M., **Briggs, J. K.,** Reissaus, C. A., Jin, E., Szulczewski, J. M., ... & Blum, B. (2021). Reduced synchroneity of intra-islet Ca2+ oscillations in vivo in Robo-deficient β cells. Elife, 10, e61308. Read here

• Dwulet, J. M., **Briggs, J. K.,** & Benninger, R. K. (2021). Small subpopulations of β-cells do not drive islet oscillatory [Ca2+] dynamics via gap junction communication. PLoS computational biology, 17(5), e1008948. Read here

• Fasel, G. J., **et al.** "Correlation between the solar wind speed and the passage of poleward-moving auroral forms into the polar cap." Frontiers in Astronomy and Space Sciences 10 (2024): 1233060. Read here

Submitted

• Jin, E.*, **Briggs, J.K.***, Benninger, R.K., & Merrins, M.J. Glucokinase activity controls subpopulations of β-cells that alternately lead islet Ca2+ oscillations bioRxiv (Submitted 2024) *Equal Contribution Read here

• **Briggs, J.K.**, Jin, E., Merrins, M. J., & Benninger, R.K. CRISP: Correlation-Refined Image Segmentation Process bioRxiv (Submitted 2024) Read here

• Gresch. A., Huewel. J. D., **Briggs, J. K.,** ... Duefer. Martina. Resolving spatiotemporal electrical signaling within the islet via CMOS microelectrode arrays. bioRxiv (Submitted 2023) Read here

• **Briggs, J. K.,** Stroh, J. N., Foreman, B., Park, S., TRACK-TBI Study Investigators, Bennett, T. D., & Albers, D. J. Personalizing the Pressure Reactivity Index for Neurocritical Care Decision Support. (Submitted medRxiv) Read here

Conferences and Invited Talks

Biomedical Engineering Society Annual Meeting	**Briggs, J. K.**, Stroh, J. N., Foreman, B., Park, S., Bennett, T., Albers, D. J. (2024, October). Engineering a Cerebral Hemodynamics Model within a Data Assimilation Pipeline to Enhance Clinical Decision Support in Neurocritical Care
Concordia Coallition for the Study of Diabetes	**Briggs, J. K.**, (2024, September). Computational Methods for Diabetes Research
European Association for the Study of Diabetes	**Briggs, J. K.**, Jin, E., Merrins, M., Benninger, R. K., (2024, September). High-speed 3D Lightsheet Calcium Imaging of Pancreatic Islets Sheds New Light on Beta Cell Heterogeneity
University of Colorado Department of Biomedical Informatics Annual Retreat	**Briggs, J. K**, (2024, August). Cerebral Hemodynamics Modeling to Enhance Clinical Decision Support in Neurocritical Care
American Diabetes Association	Reusch, J.E.B, **et al.**, (2024, June). Endothelial Injury Predicts Carbohydrate Metabolism Trajectories after COVID-19
Diabetes Day	**Briggs, J. K.**, Jin, E., Merrins, M., Benninger, R. K., (2024, March). High-resolution 3D Calcium Time Course Imaging Sheds New Light on Beta Cell Heterogeneity (*Awarded Best Talk)
American Diabetes Association	**Briggs, J. K.**, Jin, E., Merrins, M., Benninger, R. K., (2023, July). Islet Ca2+ Dynamics, Heterogeneity, and Consistency in Three Dimensions with Activators of Pyruvate Kinase
Invited Talk: Columbia University Irving Medical Center Department of Neurocritical Care	**Briggs, J. K.** (July 2023) Two Neurovascular Feedback Informed Precision Medicine Approaches For Neurocritical Care Patients
Invited Talk: Columbia University Department of Biomedical Informatics	**Briggs, J. K.** (July 2023) Bioinformatics for Informed Precision Medicine Approaches For Neurocritical Care Patients
Invited Talk: UC Davis	**Briggs, J. K.** (June 2023) Complex Systems Methods Provide Insight into Islet Heterogeneity and Function.
SIAM Dynamical Systems	**Briggs, J. K.**, Stroh, J. N., Foreman, B., Park, S., Bennett, T., Albers, D. J., (2023, June).A Cerebral Hemodynamic Model with Temporally Informed Vascular Regulation Processes to Guide Clinical Decision Support
Intracranial Pressure Monitoring	**Briggs, J. K.**, Stroh, J. N., Foreman, B., Park, S., Bennett, T., Albers, D. J., (2022, November). New Model of Cerebral Hemodynamics which Includes Cerebral Vascular Feedback to Aid in Clinical Decision Support
Intracranial Pressure Monitoring	**Briggs, J. K.**, Stroh, J. N., Foreman, B., Park, S., Bennett, T., Albers, D. J., (2022, November). Defining Optimal Methodology and Quantifying Uncertainty in Pressure Reactivity Index for Clinical Decision Support
American Medical Informatics Association	**Briggs, J. K.**, Stroh, J. N., Foreman, B., Park, S., Bennett, T., Albers, D. J., (2022, November). Defining Optimal Methodology and Quantifying Uncertainty in Pressure Reactivity Index for Clinical Decision Support
European Association for the Study of Diabetes Annual Meeting	**Briggs, J. K.**, Kravets, K., Dwulet, J.M., Albers, D.J., Benninger, R. K. (2022, September). Quantifying the relationship between emergent islet function, gap junctions, and beta cell dynamics: a network theory approach *Travel Grant Recipient
Biophysical Society Annual Meeting	**Briggs, J. K.**, Kravets, K., Dwulet, J.M., Benninger, R. K. (2022, February). Probing the Relationship Between Functional And Structural Networks in the Pancreatic Islet.
Biophysical Society Annual Meeting	Dwulet, J.M., **Briggs, J. K.**, Benninger, R. K. (2022, February). The role of highly functional β-cell subpopulations in the multicellular islet.
American Geophysical Union Fall Conference	**Lau, J.**, et al. (2019, December). Ionospheric Response to a Transient Event at the Magnetopause.
American Geophysical Union Fall Conference	Fasel, G.J., **et al.** (2019, December). East-West Brightening in Poleward-Moving Auroral Forms and the Interplanetary Magnetic Field By -Component.
American Geophysical Union Fall Conference	Butler, K., **et al.** (2019, December). Dayside Auroral Oval Shifts Due to Enhanced Solar Wind Dynamic Pressure.
American Geophysical Union Fall Conference	Mann, J.C., **et al**. (2019, December). Dayside Auroral Oval Shifts Due to Enhanced Solar Wind Dynamic Pressure.
American Geophysical Union Fall Conference	Fasel,G.J., **et al.** (2017, December). What Solar Wind Conditions Produce Poleward Moving Auroral Forms?

Teaching

University of Colorado Anschutz — *Aurora, Co*
Analytical Methods and Machine Learning: Teaching Assistant — *2022-2023*
- Topics included: measure theory, linear algebra, dynamical systems, differential equations, time series analysis, regression, regularization, support vector machines, etc.
- Wrote and taught weekly recitations, assisted professor in lesson planning, graded homework and exams

University of Colorado Anschutz — *Aurora, Co*
Bioengineering Lab: Teaching Assistant — *2022-2023*

University of Colorado Denver Bioengineering Empowerment Program — *Aurora, Co*
Guest Lecturer — *2021-2022*
- Provided guest lectures on informatics and the scientific process to underrepresented high school student

High School AP Calculus and Independent Research Methods — *Aurora, Co*
Private Tutor — *2022-Present*
- Private tutoring and mentoring indpendently and through Polygence

Self Employed — *Malibu, Ca*
Physics, Mathematics, and Physiology Tutor — *2017-2020*

Emily Shane Foundation in partnership with the boys and girls club — *Malibu, Ca*
Academic mentor for low income students — *2017*

Additional Experience

Polygence
Research Mentor — *2024-Present*

University of Colorado Anschutz — *Aurora, Co*
Member of Department of Biomedical Informatics Seminar Committee — *2024-Present*

University of Colorado Anschutz — *Aurora, Co*
Member of Department of Biomedical Informatics Educational Committee — *2022-Present*

New Life Community Church — *Aurora, Co*
High School Mentor for 50 highschoolers — *2020-Present*

Clear Direction Mentoring — *Aurora, Co*
STEM Mentor for underrepresented, underprivileged high schoolers — *2021-2022*

Pepperdine University — *Malibu, Ca*
Pepperdine Physics Club President — *2018-2020*
- Organized, planned and executed large events with emphasis on enhancing community and sharing science with public
- Applied for grants and apprehend funding to hold events

Mission at Natuvu Creek — *Vanua Levu, Fiji*
Medical and Educational Volunteer — *June 2018*
- Diagnosed and treated medical and dental needs for 100 citizens of Vanua Levu, Fiji
- Taught astronomy, math, and physics a class of high school students

Pepperdine University — *Malibu, Ca*
Spiritual Life Resident Advisor (On-Call) — *2017–2018*

Press

- 2022 ACM SIGHPC Computational and Data Science Fellowship Winners
- Briggs receives NSF Graduate Research Fellowship
- American Geophysical Union 'Postcards from the edge of space: New images, new phenomena, and new insights.' AGU Press Release 10 Dec. 2019 Forbes, Business Insider, NASA