

Jennifer K Briggs

PH.D. BIOENGINEERING CANDIDATE UNIVERSITY OF COLORADO DENVER | ANSCHUTZ MEDICAL CAMPUS

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About Me

I am an National Science Foundation Graduate Research Fellow (NSF GRFP) and Special Interest Group in High Power Computing Association for Computing Machinery (SIGHPC ACM) Fellow at the University of Colorado Anschutz Medical Campus | Departments of Bioengineering and Biomedical Informatics. With 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, machine learning, and data assimilation to biomedicine, with a particular interest in advancing mechanistic insights and building clinical decision support tools for the cerebral vascular and glucose endocrine systems.

Education

University of Colorado Anschutz

Bioengineering Ph.D. Candidate

• 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, Network Analysis and Modeling, Data Science and Analysis of Time-Dependent Biomedical Data, Complex Systems Methods, Numerical and Analytical Methods of Engineering, Random Processes for Engineers

Aurora, Co

2020-Present

Sante Fe Institute

Complexity Systems Summer School

• Month long intensive education on state of the art Complexity Science

• **Projects:** Transmission dynamics under spatially clustered immunity, Chaos and Control Reading Group

Sante Fe, NM

2022

Pepperdine University

Double Major: Bachelor of Science in Physics and Sports Medicine, **Minor:** Applied mathematics

• **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

Malibu, CA

2016-2020

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)

Skills

Programming Languages MATLAB (expert), Python (proficient), R, IDL, C++ (experienced)

Data Science Statistical analysis, multivariate analysis, data assimilation, network theory, information theory

Computational Modeling Dynamical systems modeling, physiological simulations, agent based models

High-Performance Computing NVIDIA clusters, parallel processing, Linux

Leadership Highly organized, motivated, and efficient leader with interdisciplinary experience

Scientific Writing & Communication Manuscript preparation, scientific presentations to interdisciplinary audiences, grant writing

Research Experience (publications below)

Complexity and Dynamical Systems in Biomedicine

Departments of Bioengineering and Biomedical Informatics, University of Colorado Anschutz

Aurora, Co

2020-Present

• **Mechanistic Machine Learning:** Identified significant gaps in current neurocritical care clinical decision support algorithms. Developed a novel delayed differential equations model within a mechanistic machine learning pipeline to estimate currently immeasurable physiological metrics and forecast cerebral blood flow, enhancing treatment strategies and supporting personalized, data-driven decision-making in neurocritical care.

• **Precision Medicine Development:** Performed large-scale uncertainty analysis using multimodal time-series data from neurocritical care patient electronic health records. Identified patient-specific biases in existing precision care algorithms. Developed a novel optimized algorithm to reduce bias (*Patent Pending*)

• **Image Processing:** Created automated and semi-automated algorithms to enhance cell masking accuracy in calcium imaging of densely packed organoids.

• **High Powered Computational Modeling:** Modeled cellular signaling pathways using an Nvidia cluster environment. Applied high-dimensional time-series analysis, network theory, and information theory to uncover mechanisms of emergent beta cell communication with applications in diabetes research.

- **Multimodel timeseries and Image analysis:** Analyze magnetospheric-ionospheric interactions and discovered never-before-documented ionospheric phenomena *See Press Release Below.*

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 [READ HERE](#)
- **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 synchronicity 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](#)
- **Briggs, J. K.**, Fasel, G. J., Silveira, M., Sibeck, D. G., Lin, Y., & Sigernes, F. (2020). Dayside auroral observation resulting from a rapid localized compression of the Earth's magnetic field. *Geophysical Research Letters*, 47(19), e2020GL088995. [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 Coalition 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 independently 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** 2024-Present
 Research Mentor
- 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

Professional References

Richard Benninger, Ph.D.:

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David Albers, Ph.D.:

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Soojin Park, M.D.:

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