Caleb Mayer

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EDUCATION AND TRAINING	**Stanford University** Postdoctoral Scholar, School of Medicine Michael Snyder Lab	**Stanford, CA** **2023-**
	University of Michigan Applied and Interdisciplinary Mathematics PhD Advisors: Daniel Forger and Sung Won Choi Dissertation: "Mathematical Modeling of Circadian Rhythms from Wearable Data across Populations and Health Conditions"	**Ann Arbor, MI** **2018-2023**
	Haverford College Bachelor of Science in Mathematics (Magna Cum Laude) Minor in Psychology Undergraduate Thesis Title: "Traveling Wave Solutions for a Cancer Stem Cell Invasion Model"	**Haverford, PA** **2014-2018**
	University of Oxford Visiting Student in Mathematics, Junior Year Abroad	**Oxford, UK** **2016-2017**
RESEARCH INTERESTS	Modeling of wearable data, circadian rhythms, biological modeling, wearables and health, data analysis, machine learning, mathematical biology, precision medicine	
RESEARCH EXPERIENCE	**Postdoctoral Scholar in Snyder Lab, Stanford University** Wearable and omics projects in Michael Snyder's lab	**Stanford, CA** **2023-**
	Graduate Student Research Assistant on NIH SBIR Grant, University of Michigan "Assessing the impact of app-delivered lighting interventions on fatigue in three populations of cancer patients" (Olivia Walch and Sung Won Choi PIs)	**Ann Arbor, MI** **2021-2023**
	Research project on early detection of fever, University of Michigan With Daniel Forger, Muneesh Tewari, Sung Won Choi, Jonathan Tyler, Christopher Flora, Dae Wook Kim	**Ann Arbor, MI** **2020-2022**
	Research project on modeling of heart rate data, University of Michigan With Daniel Forger, Clark Bowman, Jonathan Tyler, Yitong Huang	**Ann Arbor, MI** **2019-2022**
	Research project on circadian phase prediction, University of Michigan With Daniel Forger, Yitong Huang, Olivia Walch	**Ann Arbor, MI** **2018-2021**
	Graduate Student Research Assistant, University of Michigan "Understanding how the brain processes music through the Bach Trio	**Ann Arbor, MI** **2018-2019**

Sonatas" (Daniel Forger and James Kibbie PIs)

	Undergraduate thesis research on cancer cell models, Haverford College With Eric Stachura	**Haverford, PA** **2017-2018**
	Research Experience for Undergraduates (REU) at Winthrop University, cancer cell modeling With Kristen Abernathy, Zachary Abernathy	**Rock Hill, SC** **2016**
TEACHING EXPERIENCE	**Graduate Student Instructor, University of Michigan** Taught three semesters of Calculus 1 (Math 115) at University of Michigan	**Ann Arbor, MI** **2019-2020**
	Mathematics Tutor, University of Michigan Tutored students for Applied and Interdisciplinary Mathematics PhD qualifying exams, in undergraduate Linear Algebra, Differential Equations, Calculus, Analysis, and Probability	**Ann Arbor, MI** **2019**
	Undergraduate Student Grading Assistant, Haverford College Graded problem sets for Analysis 1 (2017), Linear Algebra (2018)	**Haverford, PA** **2017-2018**

HONORS AND AWARDS

2024 Peter Smereka Memorial Graduate Student Prize (best PhD thesis among applied mathematics graduate students, University of Michigan)

2022 SIAM Life Sciences Travel Award

2022 Rackham Conference Travel Grant

2018-2022 University of Michigan Mathematics Department Graduate Fellowship

2018 Undergraduate Departmental High Honors, Haverford College

2018 Phi Beta Kappa Society, Haverford College Chapter

2016-2017 Collections Exam Prizes in Mathematics, Pembroke College, Oxford

PUBLICATIONS

*: These authors contributed equally

Kim DW*, **Mayer C***, Lee MP, Choi SW, Tewari M, Forger DB Efficient assessment of real-world dynamics of circadian rhythms in heart rate and body temperature from wearable data *J R Soc Interface* (2023).

Mayer C, Walch O, Forger DB, and Hannay K Impact of light schedules and model parameters on the circadian outcomes of individuals *J. Biol. Rhythms* (2023).

Mayer C*, Tyler J*, Fang Y, Flora C, Frank E, Tewari M, Choi SW, and Forger DB Consumer-grade wearables identify changes in multiple physiological systems during COVID-19 disease progression *Cell Reports Medicine* (2022).

Huang Y, **Mayer C**, Walch OJ, Bowman C, Sen S, Goldstein C, Tyler J, and Forger DB Distinct circadian assessments from wearable data reveal social distancing promoted internal desynchrony between circadian markers *Front. Dig. Health* (2021).

Cislo C, Clingan C, Gilley K, Rozwadowski M, Gainsburg I, Bradley C, Barabas J, Sandford E, Olesnavich M, Tyler J, **Mayer C**, DeMoss M, Flora C, Forger DB, Cunningham JL, Tewari M, Choi SW Monitoring beliefs and physiological measures in students at risk for COVID-19 using wearable sensors and smartphone technology *JMIR Res. Protoc.* (2021).

Flora C, Tyler J, **Mayer C**, Warner DE, Khan SN, Gupta V, Lindstrom R, Mazzoli A, Rozwadowski M, Braun TM, Ghosh M, Forger DB, Choi SW, and Tewari M High-frequency temperature monitoring for early detection of febrile adverse events in patients with cancer *Cancer Cell* (2021).

Bowman C, Huang Y, Walch OJ, Fang Y, Frank E, Tyler J, **Mayer C**, Stockbridge C, Goldstein C, Sen S, and Forger DB A method for characterizing daily physiology from widely used wearables *Cell Reports Methods* (2021).

Huang Y, **Mayer C**, Cheng P, Siddula A, Burgess HJ, Drake C, Goldstein C, Walch O, and Forger DB Predicting circadian phase across populations: a comparison of mathematical models and wearable devices *Sleep* (2021).

Mayer C, and Stachura E Traveling wave solutions for a cancer stem cell invasion model *DCDS-B* (2021).

Clingan CA, Dittakavi M, Rozwadowski M, Gilley KN, Cislo CR, Barabas J, Sandford E, Olesnavich M, Flora C, Tyler J, **Mayer C**, Stoneman E, Braun T, Forger DB, Tewari M, and Choi SW Monitoring health care workers at risk for COVID-19 using wearable sensors and smartphone technology: Protocol for an observational mHealth study *JMIR Research Protocols* (2021).

Cheng C, Walch O, Huang Y, **Mayer C**, Sagong C, Castelan AC, Burgess HJ, Roth T, Forger DB, and Drake CL Predicting circadian misalignment with wearable technology: validation of wrist-worn actigraphy and photometry in night shift workers *Sleep* (2021).

Abernathy K, Abernathy Z, Dougherty-Bliss R, **Mayer C**, and Whiteside H Global dynamics of a cancer stem cell treatment model *International Journal of Dynamical Systems and Differential Equations* (2019).

Patent Applications

Forger DB, Tyler J, **Mayer C**, Srijan S, Fang Y, Flora C, Choi SW, Tewari M Systems and methods for enhancing infection detection and monitoring through decomposed physiological data, US Application (2023).

In Preparation

Kim DW*, **Mayer C***, Flora C, Choi SW, Tewari M, and Forger DB Real-time anomaly detection in circadian time-series data using Kalman filter.

Mayer C, Walch O, Dempsey W, Hannay K, Clingan C, Bowen Z, Rozwadowski M, Reichert ZR, Henry NL, Alumkal JJ, Tewari M, Forger DB, and Choi SW A circadian and app-based personalized lighting intervention for the reduction of cancer-related fatigue.

Mayer C, Simko S, Kibbie J, Forger DB Analysis of the performed trio sonatas by J.S. Bach reveals the structure of neuronal encoding of music.

PRESENTATIONS 2024 AIM Seminar/Smereka Prize Lecture: *Mathematical Modeling of Circadian Rhythms from Wearable Data* (Invited seminar).

2023 SIAM Student Seminar at Oregon State *Mathematical Modeling of Circadian Rhythms from Wearable Data* (Invited talk).

2023 Society for Mathematical Biology Annual Meeting *Mathematical Modeling of Circadian Rhythms Across Populations with Consumer-Grade Wearable Data* (Contributed Talk).

2022 SIAM Life Sciences *Analysis of data from consumer-grade wearables to examine circadian rhythms across populations and light schedules* (Invited minisymposium presentation).

2022 Society for Research on Biological Rhythms *Trends in circadian markers from real-world wearable data in response to the COVID-19 pandemic* (Invited symposium presentation).

2021 Michigan Institute for Data Science: Data Science and Machine Learning for Artists Workshop (with Kerby Shedden, Sean Anderson, and Olivia Fan) *Analysis of the performed trio sonatas by J.S. Bach*.

2021 Analytic and Modeling Unit (AMU) Journal Club *Analysis of circadian rhythms from commonly used wearable devices.*

2021 Michigan Center for Applied and Interdisciplinary Mathematics Graduate Student Seminar *Modeling circadian phase in humans.*

2019 Michigan Institute for Data Science Mini-symposium on Data Science for Music *Understanding how the brain processes music through the Bach Trio Sonatas* (with Daniel Forger, James Kibbie, and Sarah Simko).

2019 University of Michigan Organ Conference: Building Bach - His Foundations and Futures. *Understanding how the brain processes music through the Bach Trio Sonatas* (with Daniel Forger, James Kibbie, and Sarah Simko).

2017 Joint Mathematics Meetings: AMS Contributed Paper Session on

SELECTED PRESS REPORTS	Topics in Analysis, III *Global dynamics of a cancer stem cell treatment model* (with Robert Dougherty-Bliss and Heidi Whiteside).

"Math equation could alert us to COVID-19 infections more quickly than a test" Dan Grossman, Denver 7 news (April 2022) https://www.denver7.com/news/national/math-equation-could-alert-us-to-covid-19-infections-more-quickly-than-a-test

"Can Wearables Track the Severity of COVID Symptoms?" Cara Murez, U.S. News and World Report (Health News) (April 2022) https://www.usnews.com/news/health-news/articles/2022-04-19/can-wearables-track-the-severity-of-covid-symptoms

"Smartwatch heart rate data can help track COVID-19 progression, study finds" Brian Dunleavy, UPI (April 2022) https://www.upi.com/Health_News/2022/04/19/COVID-19-smartwatch-disease-progression-study/8191650374568/

"Wearables devices can track COVID-19 disease progression, UMich study finds" Jingqi Zhu, the Michigan Daily (May 2022) https://www.michigandaily.com/research/wearable-devices-can-track-covid-19-disease-progression-umich-study-finds/

PROFESSIONAL ACTIVITY

2024 Stanford Cardiovascular Institute Summer Program Application Review Committee

2023-2024 Stanford Science Pen Pals Writer

2023 Stanford Grant Writing Academy Bootcamp Participant

2022-2024 Reviewer for Scientific Reports (1 article), BMC Digital Health (2 articles), BMC Medical Informatics and Decision Making (1 article), npj Mental Health (1 article), npj Digital Medicine (1 article), Journal of Biological Rhythms (1 article)

2022 Peer Mentor for Marjorie Lee Browne Scholar, University of Michigan Mathematics

2021 Certificate for Introduction to Data Science in Python, through University of Michigan and Coursera

2018, 2021 Inquiry Based Learning (IBL) teaching workshop participant at University of Michigan

Member of Society for Industrial and Applied Mathematics, Society for Research on Biological Rhythms, American Mathematical Society (2019-2023)

TECHNICAL SKILLS

Proficient in MATLAB, Python, LaTeX, Adobe Illustrator

Familiar with R, Linux