BENIAMINO HADJ-AMAR

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Research Interests:

Theory and Methods: Bayesian Computing, Bayesian Modeling, Bayesian Nonparametrics, Bayesian Variable Selection, Change-Point Models, Graphical Models, Hidden Markov Models, Time Series

Applications: Neuroimaging and Neuroscience, Wearable sensor and Actigraphy analysis, Circadian and Sleep research.

Appointments

- **University of South Carolina**, Columbia, SC, July 2025 - Present.
  Assistant Professor (Tenure-Track).
  Department of Biostatistics.

- **Rice University**, Houston, TX, USA, November 2020 - June 2025.
  Postdoctoral Fellow.
  Department of Statistics.
  Mentor: Dr. Marina Vannucci (Rice University.)
  co-Mentor: Dr. Read Montague (Virginia Tech).

- **University of Genoa, University of Minnesota**
  November 2019-November 2020
  Research Visiting Student and Postdoctoral Associate.
  Department of Mathematics, Division of Biostatistics.
  Advisor: Professor Eva Riccomagno and Dr. Mark Fiecas.

- **University of Minnesota**, Minnesota, USA, June - September, 2018.
  Research Visiting Student.
  Division of Biostatistics, School of Public Health.
  Advisor: Dr Mark Fiecas.

- **Intelligrate**, Italy, June - August, 2014.
  Intern, Competitive Intelligence and Data Integration.
  Project: Sentiment Analysis of Twitter Data.
  Advisor: Dr. Fabrizio Malfanti.

Education

- **University of Warwick**, United Kingdom, 2016 - 2020.
  Ph.D.
  Statistics, OxWaSP (Oxford-Warwick Statistical Programme).
  Dissertation: "Bayesian Analysis of Nonstationary Periodic Time Series"
  Advisor: Professor Bärbel Finkenstädt.

- **University of Oxford**, United Kingdom, 2015 - 2016.
  Centre for Doctoral Training, OxWaSP.
  Training: Computational Statistics, Applied Statistics, Network Analysis, Probability and Approximation, Stochastic Simulation, Stochastic Processes, Machine Learning, Bayesian Inference, Time Series.

- **University of Warwick**, United Kingdom, 2014 - 2015.
  MSc Statistics (Distinction).
  Dissertation: "Simulating the Wright-Fisher Diffusion"
  Advisors: Dr Paul Jenkins and Dr Dario Spano.

- **University of Genoa**, Italy, 2011 - 2014.
  BSc Mathematical Statistics and Data Management (110/110 cum laude).
  Dissertation: "Natural Language Processing using Semantic Tools"
  Advisors: Professor Eva Riccomagno and Dr Fabrizio Malfanti.

Publications (in progress)

In progress

- **Hadj-Amar, B.**, Jewson, J., "Quasi-Bayesian Variable Selection" (to be submitted to *Journal of American Statistical Association, T&M.*)

- **Hadj-Amar, B.**, Meng, L., Krishnan, V., Vannucci., M., "Multi-Frequency Time Series Modeling with Low-Rank Gaussian Processes" (to be submitted to *Journal of American Statistical Association, T&M.*)

- **Hadj-Amar, B.**, Versace, F., Vannucci., M., "A Bayesian Approach to Group-Level Temporal Dynamics in Emotional ERP Data" (to be submitted to *PLoS Computational Biology.*)

- **Hadj-Amar, B.**, Montague, R., Vannucci., M., "Decoding Neuromodulatory Dynamics: Markov Switching Modeling of Neurotransmitter Systems" (to be submitted to *Proceedings of the National Academy of Sciences*).

- Batten S.*, **Hadj-Amar, B.***, Ahrens, M., Oster, M., Hartle A., Barbosa, L., Lohrenz T., White, J., Witcher, M., Vannucci M., Howe M., Montague R., Difeliceantonio A. "Taste evoked dopamine and norepinephrine track liking in the human amygdala" (to be submitted to *PLoS Computational Biology*).

Submitted/Revised

- **Hadj-Amar, B.**, Bornstein A. M., Guindani, M., Vannucci M., "Discrete Autoregressive Switching Processes in Sparse Graphical Modeling of Multivariate Time Series Data" (*Journal of Computational and Graphical Statistics*, revised).

- **Hadj-Amar, B.**, Vaishnav K. Vannucci M., "Frequency Selection in Bayesian Spectral Modeling of Time Series Data with Applications to Wearable Device Measurements" (*Annals of Applied Statistics*, under review).

- Charney, A.W, Liharska, L.E, Vornholt, E., Valentine, A., Lund, A., Hashemi, A., Thompson, R.C., Lohrenz, T., Johnson, J.S., Bussola, N., Cheng, E., Park, Y.J, Qasim, S., Aristel, A., Wilkins, L., Ziafat, K., Silk, H., Linares, L.M, Sullivan, B., Feng, C., Batten, S.R., Bang, D., Barbosa, L.S., Twomey, T., White, J.P,

Vannucci, M., **Hadj-Amar, B.**, Saez, I., Montague P.R., Beckmann, N.D and Kopell, B.H., "A signature of gene expression underlying human brain function" (*Molecular Psychiatry*, in revision).

* : joint first author.

Publications (appeared)

- **Hadj-Amar, B.**, Krishnan, V., Vannucci M., "Bayesian Covariate-Dependent Circadian Modeling of Rest-Activity Rhythms in Patients with Epilepsy", 2025, *Data Science in Science*, 4 (1).

- Batten, S.*, Barbosa, L.*, Hartley, A.*, **Hadj-Amar, B.***, Melville, N., Bang, D., Twomey, T., White, J., Lohrenz, T., Kishida, K., Witcher, M., Vannucci, M., King- Casas, B., Chiu, P., Howe, M., Montague, R. "Emotional Words Evoke Region and Valence-Specific Patterns of Concurrent Neuromodulator Release in Human Thalamus and Cortex ", 2025, *Cell Reports*, 44(1), 115162.

- **Hadj-Amar, B.**, Jewson, J., Vannucci, M., "Bayesian Sparse Vector Autoregressive Switching Models with Application to Human Gesture Phase Segmentation", 2024, *Annals of Applied Statistics*, 18(3), 2511-2531.

- Pluta D.*, **Hadj-Amar, B.***, Li, M., Zhao Y., Versace F., Vannucci, M., "Improved Data Quality and Statistical Power of Trial-Level Event-Related Potentials with Bayesian Random-Shift Gaussian Processes", 2024, *Nature Portfolio, Scientific Reports*.

- Bang, D.*, Luo, Y.*, Barbosa, L.*, Batten, S.*, **Hadj-Amar, B.***, Twomey, T., Melville, N., White, J., Lohrenz, T., King-Casas, B., Chiu, P., Vannucci, M., Kishida, K., Witcher, M., Montague, R. "Noradrenaline estimates from human amygdala track emotional modulation of attentional salience", 2023, *Current Biology*.

- **Hadj-Amar, B.**, Jewson, J., and Fiecas, M. "Bayesian Approximations to Hidden Semi-Markov Models for Telemetric Monitoring of Physical Activity" *Bayesian Analysis*, 2023, 18(2):547-577.

- Sacchi, N., Ciceri, F., Bonifazi, F., Algeri, M., Gallina, A., Pollichieni, S., Raggio, E., **Hadj-Amar, B.**, Lombardini, L., Pupella, S., Liumbruno, G., and Cardillo, M. "Availability of HLA-allele-matched unrelated donors and registry size: estimation from haplotype frequency in the Italian population" *Journal of Human Immunology*, 2021, 82(10):758-766.

- **Hadj-Amar, B.**, Finkenstädt, B., Fiecas, F. and Huckstepp, R., "Identifying the Recurrence of Sleep Apnea Using a Harmonic Hidden Markov Model' *Annals of Applied Statistics*, 2021, 15(3):1171-1993.

- **Hadj-Amar, B.**, Finkenstädt, B., Fiecas, M., and Levi, F. and Huckstepp, R., "Bayesian Model Search for Nonstationary Periodic Time Series", *Journal of the American Statistical Association (Theory and Methods)*, 2020, 115(531):1320-1335.

* : joint first author.

Software

- **AutoNOM**: Automatic Nonstationary Oscillatory Modelling, which includes Julia scripts to model nonstationary periodic time series via a piecewise sinusoidal regression model. (Hadj-Amar et al., 2020, and GitHub)
- **HHMM**: Harmonic Hidden Markov Model, a Julia software to model time-varying periodic and oscillatory processes by means of a Bayesian non-parametric HHMM. (Hadj-Amar et al., 2021, and GitHub)
- **BayesianApproxHSMM**: a stan software (and R utilities) to model time series and sequential data using a Bayesian approximation to Hidden semi-Markov models. (Hadj-Amat et al., 2023, and GitHub)
- **mvHMM**: contains a suite of software that utilizes multivariate Bayesian hidden Markov models (HMM) for the analysis of signals from monoamine neurotransmitters. (Bang et al., 2023, and GitHub)
- **sparseVARHSMM**: a stan software (and R utilities) to model temporal and contemporaneous (e.g. spatial) dependencies in multivariate time series data using a VAR HSMM. (Hadj-Amar et al. 2024, and GitHub).
- **BayesRPAGP**: Bayesian Random Phase-Amplitude Gaussian Process. An R software for Bayesian inference of trial-level analysis of ERP data.(Pluta et al. 2024, and GitHub).

Teaching

- **Rice University**, Department of Statistics
  Stat 525 - Bayesian Statistics (Fall 2022, Fall 2023).
  Offered a 3-lab module on MCMC (20 students)
- **Rice University**, Department of Statistics
  Stat 411 - Advanced Statistical Methods (Spring 2022, Spring 2023).
  Offered a 3-lab module on MCMC (20 students)
- **University of Warwick**, Department of Statistics
  Teaching Assistant (30 students)
  ST220 - Introduction to Mathematical Statistics (Autumn 2016, 2017, 2018).
  ST104 - Statistical Laboratory (Spring 2017, 2018).
- **University of Oxford**, Department of Statistics
  Teaching Assistant (10 students)
  Time Series and Stochastic Processes (OxWaSP Module)
  Spectral Analysis of Time Series (Spring 2018).
- **University of Warwick**, Department of Computer Science
  Teaching Assistant (temporary, 20 students)
  CS 342 - Machine Learning (Spring 2018).

Mentoring

Ph.D. Students

- Nick Di (Rice University, Spring 2024)
  Project: *Functional Graphical Modeling.*
- Enyu Li (Rice University, Spring 2024)
  Project: *Scalable Random Phase-Amplitude Gaussian Processes.*

Masters Students

- Changhe Ji, (Rice University, Fall 2023)
  Project: *Bayesian modeling of activity data using hidden Markov models.*
- Lenka Sefcakova, David Vallmanya (Pompeu Fabra University, Barcelona, Summer 2023)
  Dissertation: *Variational Inference for Hidden Semi-Markov Models.*
- Alex Susskind, Jack Zhang, Laura Jabr, and Sebastian DiPrampero (Rice Univeristy, Capstone design project mentor, Spring 2023)
  Project: *A Machine-Learning Approach to Predicting Thermodilution Cardiac Output With Arterial Waveforms.*

Reviewer

- Annals of Applied Statistics (1)
  Journal of Machine Learning Research (1)
  Bayesian Analysis (1)
  Statistics and Computing (2)
  Econometrics and Statistics (2)
  BMC Bioinformatics (1)
  Statistics in Medicine (1)
  Proceedings of the National Academy of Sciences (1)
  Biometrical Journal (1)

Awards

- ISBA, Travel Award, 2022.
  University of Warwick, Department of Statistics, OxWaSP Studentship, 2015.
  University of Warwick, Department of Statistics, MSc Bursary, 2014.

Presentations

- **Invited Talks**
  CMStatistics 2025, London, UK - December 2025.
  Statistical Methods in Imaging Conference, Rice University - May 2025.
  University of South Florida - February 2025.
  University of Houston, February 2025.
  University of California, Santa Barbara, February 2025.
  University of Las Vegas - January 2025.
  University of Cincinnati - January 2025.
  St. Jude Research Hospital (Virtual) - December 2024.
  VirginiaTech - November 2024.
  University of South Carolina - October 2024.
  UTHealth (Biostatistics), Houston, TX - October 2023.
  Rice University, Houston, TX, USA - February 2021.
  CMStatistics 2020. Virtual Conference - December 2020.
  Incontro di Statistica Matematica, Sestri Levante, Italy - January 2020.
  Math Young Researchers Meeting, Genoa, Italy - November 2019.

- **Contributed Talks**
  Conference of Texas Statisticians, Houston, TX - March 2025.
  Greek Stochastics, Corfu, Greece - August 2019.
  NeuroImaging Group Meeting, Minneapolis, MN, USA - June 2018.
  Statistics Seminar, University of Genoa, Italy - April 2018.
  Young Researchers Meeting, University of Warwick, UK - March 2018.

- **Posters**
  ISBA 2022, Montreal, QC, Canada - June 2022

BaYSM 2022, Montreal, QC, Canada - June 2022
JSM 2018, Vancouver, BC, Canada - August 2018
BayesComp, Barcellona, Spain - March 2018.
Greek Stochastics, Milos, Greece - August 2017.
OxWaSP Amazon Workshop, Berlin, Germany - March 2017.

Professional Activities

- (2023-2024) *Treasurer* for the junior section of *International Society for Bayesian Analaysis* (j-ISBA). I have been involved in promoting and providing a forum for early-career Bayesian researchers, by organizing conferences, workshops, and sessions at statistical meetings.

Advisory Committee

- (2023-2024) *Liaison* for the Blackwell-Rosenbluth Award, an award for junior researchers in different areas of Bayesian statistics. The award aims at recognizing outstanding junior Bayesian researchers based on their overall contribution to the field and to the community.

Editorial Duties

- (2023-2025) *Co-Editor*, "New Trends in Bayesian Statistics", Conference Proceedings Book by Nature Springer.

Organization of Conferences

- (2023) *Organizing Committee:* Bayesian Young Statisticians Meeting (BAYSM), the official conference of j-ISBA.

- (2025) *Organizing Committee:* Bayesian Young Statisticians Meeting (BAYSM), the official conference of j-ISBA.

Technical Skills

- **Coding Languages**
  Proficient: R, Julia, STAN
  Familiar: Python, Matlab, C.

- **Languages**
  Italian (mother-tongue), English (proficient) and Spanish (intermediate).

- **Hobby and Sports**
  Calisthenics.
  Music.
  Meditation.