Michael D. Nunez, Ph.D.

Assistant Professor (Universitair docent 2)
Psychology Department: Psychological Methods Group
University of Amsterdam (Universiteit van Amsterdam)

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www.michaeldnunez.com   github.com/mdnunez   scholar.google.com/citations?user=99mJqt4AAAAJ

EMPLOYMENT HISTORY

Assistant Professor (Universitair docent 2)   July 2021 - Present
Psychological Methods Group
Department of Psychology
University of Amsterdam (Universiteit van Amsterdam)
I develop my own research program on neurocognitive modeling, decision-making and other topics. I also teach graduate and undergraduate courses, as well as mentor Masters and Bachelor students.

Assistant Project Scientist, Cognition and Individual Differences Lab, Human Neuroscience Lab   Aug 2020 - June 2021
PIs: Prof. Joachim Vandekerckhove, Prof. Ramesh Srinivasan
Department of Cognitive Sciences
University of California, Irvine
I developed and found parameter estimates of neurocognitive models using human EEG and behavioral data.

Assistant Project Scientist, Fuster Laboratory of Cognitive Neuroscience (FLCN)   Feb 2019 - July 2020
PI: Prof. Michele A. Basso
Department of Psychiatry and Biobehavioral Sciences
University of California, Los Angeles (UCLA)
I studied decision making from recordings of neurons, intracranial data, and behavioral data in Rhesus macaques.

Assistant Project Scientist, Cognition and Individual Differences Lab, Human Neuroscience Lab   May 2018 - Feb 2019
PIs: Prof. Joachim Vandekerckhove, Prof. Ramesh Srinivasan
Department of Cognitive Sciences
University of California, Irvine
I sought to estimate unidentified cognitive models of human decision making with experimental behavior and scalp-recorded EEG.

Associate Specialist, Laboratory of Computational and Translational Neuroscience   Sep 2017 - May 2018
PI: Prof. Beth A. Lopour
Department of Biomedical Engineering
University of California, Irvine
I classified and statistically modeled markers of epilepsy in human patients using electric potentials recorded directly from the cortex.

Graduate Student Researcher, Human Neuroscience Lab, Cognition and Individual Differences Lab   Aug 2012 - Aug 2017
PIs: Prof. Ramesh Srinivasan, Prof. Joachim Vandekerckhove
Department of Cognitive Sciences
University of California, Irvine
I tested the veracity of combined electrocortical and cognitive models of human visual attention and decision-making. This was typically performed in a hierarchical Bayesian statistical framework with statistical models of EEG and human behavior.

Teaching Assistant, Cognitive Sciences Department   Sep 2012 - Dec 2016
University of California, Irvine
I was responsible each academic quarter to fulfill the duties of a teaching assistant as needed by the instructor of the course. I held discussion courses for undergraduates each week as well as provided office hours and graded papers, homework, and exams.

Research Assistant, Psychology Department   2011 - 2012
PI: Prof. Edward Golob

Tulane University, New Orleans, LA
I sought to advance understanding of normal cognitive aging by exploring condition differences in auditory EEG Event Related Potentials obtained from Independent Component Analysis (ICA).

EDUCATION
University of California, Irvine
2017 - Ph.D. in Psychology w/ Concentration in Cognitive Neuroscience   Cognitive Sciences Department
2017 - M.S. in Cognitive Neuroscience

University of California, Irvine
2015 - M.S. in Statistics   Statistics Department

Tulane University, New Orleans, LA
2010 - B.S. in Mathematics and Economics (Double Major), Minor in Psychology   Mathematics Department

PROFESSIONAL SKILLS
- **Neuroimaging**:
  - EEG (recording with EGI and ANT hardware and software, OpenVibe, ICA artifact correction, ERPs, SSVEPs, source analysis, Brain-Computer Interfaces, custom Python and MATLAB functions, EEGLAB, etc.)
  - ECoG / iEEG (analysis of intracranial recordings from epileptic patients using custom Python and MATLAB functions)
  - Single unit electrophysiology (implantation of depth electrodes, finding of receptive fields, electrical noise reduction)
  - fMRI (operating the MRI machine, nibabel, nilearn, SPM, analyzing structural MRI images, BrainSight)
  - Brain-Computer Interfaces / Adaptive Neurotechnologies (OpenVibe, Visual Evoked Potentials, SSVEPs, familiarity with BCI hardware, BCI startup company involvement)
  - Eye tracking (infrared eye tracking of pupil and infrared reflection, eye tracking in monkeys using implanted eye coils)
- **Modeling**:
  - Neurocognitive models / Model-based Cognitive Neuroscience (mathematical cognitive models of brain and behavior)
  - Mathematical Psychology (mathematical cognitive models of human and Rhesus macaque behavior)
  - Computational Neuroscience (statistical models of scalp and intracranial EEG, LFPs and population activity)
- **Mathematics**: Classical and Bayesian Multivariate Statistics, Machine Learning, Neural Networks, Time Series, Signal Processing, Linear Algebra, Multivariate Calculus, etc.
- **Programming**:
  - Python (ipython, Numpy, Scipy, Tensorflow, public Github scripts)
  - R (RStudio, built MCMC samplers, public Github scripts)
  - MATLAB (advanced knowledge, full public Github repositories, experimental designs)
  - C++ (working knowledge, building experimental stimuli)
  - JAGS, STAN, Github, git, Linux Bash, html (lab website maintenance), julia (learning), REX/VEX
- **Experimental design:** Design and implementation for human participants and Rhesus macaques
- **Teaching:** Teaching of undergraduate students in statistics, experimental design, scientific writing, etc.
- **Mentorship:** Mentoring of undergraduate, graduate students, and laboratory assistants from diverse backgrounds
- **Data analysis:** Preparing and organizing large data sets, dimension reduction, statistical modeling, etc.
- **Open science**: Sharing of code and data with github.com and osf.io, preregistration of scientific experiments, sharing of open-access papers, conference posters, etc. on preprint and postprint websites
- **Animal lab / Veterinary care:** Hands-on experience caring for, cleaning implants of, training, and building experiments for Rhesus macaques. Preparing and recording neural data from the cortex and midbrain in Rhesus macaques using depth electrodes. Some experience working with rats for behavioral experiments from the National Course in Adaptive Neurotechnology 3-week course. Also some hands-on surgical experience with implanting ECoG grids and nerve cuff stimulators in rats from the same course.

PUBLICATIONS
- Jun, E. J.*, Bautista, A. R.*, **Nunez, M. D.***, Allen, D. C., Tak, J. H., Alvarez, E., Basso, M. A. (2021). Causal role for the primate superior colliculus in the computation of evidence for perceptual decisions. *Nature Neuroscience*, doi: 10.1038/s41593-021-00878-6 *Contributed Equally
- Lui, K. K., **Nunez, M. D.**, Cassidy, J. M., Vandekerckhove, J., Cramer, S. C., & Srinivasan, R. (2020). Timing of readiness potentials reflect a decision-making process in the human brain. *Computational Brain & Behavior*, 1-20.
- **Nunez, M. D.,** Charupanit, K., Sen-Gupta, I., Lopour, B. A., Lin, J. J. (2020). Towards automatic classification of pathological epileptic tissue with interictal high-frequency oscillations. *bioRxiv*, 122416.

- **Nunez, M. D.**, Gosai, A., Vandekerckhove, J., & Srinivasan, R. (2019). [The latency of a visual evoked potential tracks the onset of decision making](#). *NeuroImage*, doi: 10.1016/j.neuroimage.2019.04.052.
- Nunez, P. L., **Nunez, M. D.**, & Srinivasan, R. (2019). [Multi-Scale Neural Sources of EEG: Genuine, Equivalent, and Representative. A Tutorial Review.](#) *Brain Topography*, 1-22.
- Schubert, A. L., **Nunez, M. D.**, Hagemann, D., & Vandekerckhove, J. (2019). [Individual differences in cortical processing speed predict cognitive abilities: A model-based cognitive neuroscience account](#). *Computational Brain & Behavior*, *2*(2), 64-84.
- Bridwell, D. A., Cavanagh, J. F., Collins, A. G., **Nunez, M. D.**, Srinivasan, R., Stober, S., & Calhoun, V. D. (2018). [Moving Beyond ERP Components: A Selective Review of Approaches to Integrate EEG and Behavior](#). *Frontiers in Human Neuroscience*, *12*, 106.
- **Nunez, M. D.**, Vandekerckhove, J., & Srinivasan, R. (2017). [How attention influences perceptual decision making: Single-trial EEG correlates of drift-diffusion model parameters](#). *Journal of Mathematical Psychology.* 76:B, (pp. 117-130), doi: 10.1016/j.jmp.2016.03.003
- **Nunez, M. D.** (2017). *[Refining understanding of human decision making by testing integrated neurocognitive models of EEG, choice and reaction time](#)* (Doctoral dissertation, UC Irvine).
- **Nunez, M. D.**, Nunez, P. L., & Srinivasan, R. (2016) [Electroencephalography (EEG), neurophysics, experimental methods, and signal processing.](#) In Ombao, H., Linquist, M., Thompson, W. & Aston, J. (Eds.) Handbook of Neuroimaging Data Analysis (pp. 175-197), Chapman & Hall/CRC. Advance online publication. doi: 10.13140/rg.2.2.12706.63687
- **Nunez, M. D.**, Srinivasan, R. & Vandekerckhove, J. (2015). [Individual differences in attention influence perceptual decision making](#). *Frontiers in Psychology.* 8:18. doi: 10.3389/fpsyg.2015.00018

CONFERENCE PUBLICATIONS
- **Nunez, M. D.**, Gosai, A., Vandekerckhove, J. & Srinivasan, R. (2017). [EEG measures of neural processing speed reflect human visual encoding time](#) Conference on Cognitive Computational Neuroscience. New York, New York. September 2017.
- Charupanit, K. **Nunez, M. D.**, Bernardo, D., Bebin, E. M., Krueger, D. Northrup, H., Sahin, M., Wu, J. Y., & Lopour, B. A. (2018). Automated Detection of High Frequency Oscillations in Human Scalp Electroencephalogram. International Conference of the IEEE Engineering in Medicine and Biological Society. Honolulu, Hawaii. July 2018.

CONFERENCE PRESENTATIONS / INVITED TALKS
- **Nunez, M. D.**, Srinivasan, R., Vandekerckhove, J. [Recovering parameters of joint models of human EEG and behavior during decision making](#). Presented at the Virtual Meeting of the Society for Mathematical Psychology, July 2021.
- **Nunez, M. D.** Integrative cognitive models of human EEG and behavior during perceptual decision making: Are they useful? Presented to the Integrative model-based cognitive neuroscience research unit at the University of Amsterdam, the Netherlands.
- **Nunez, M. D.**, Srinivasan, R., Vandekerckhove, J. [Joint computational modeling of human EEG and behavior reveal individual differences in cognition during perceptual decision making.](#) Presented at the Australasian Mathematical Psychology Conference, February 2021.
- **Nunez, M. D.**, Charupanit, K., Sen-Gupta, Lin, J. J., Lopour, B. A. [Classification of sleep stages with high frequency oscillations](#). Presented at the Virtual Meeting of the Society for Mathematical Psychology, July 2020.
- **Nunez, M. D.** [Accurate time measurement of processing stages during simple human decision making](#). Presented at the Society for Mathematical Psychology. University of Wisconsin, Madison, WI, July 2018.
- **Nunez, M. D.** Best practices for navigating through the noise in EEG analysis. Presented at the Army Research Lab. Los Angeles, CA, June 2018.
- **Nunez, M. D.**, Srinivasan, R. & Vandekerckhove, J. Model-based cognitive neuroscience for the chronometry of simple human decision making. Presented at the Society for Mathematical Psychology. University of Warwick, England, UK July 2017.
- **Nunez, M. D.**, Srinivasan, R. & Vandekerckhove, J. Integrated models of both cognition and electrocortical activity predict human decision making. Presented at the Society for Mathematical Psychology. New Brunswick, NJ, August 2016.
- **Nunez, M. D.** An integrated neurocognitive model to inform targeted restoration of patient decision making. Presented at the Summer Course in Adaptive Neurotechnologies. Albany, NY, July 2016.
- **Nunez, M. D.**, Srinivasan, R. & Vandekerckhove, J. Informing cognitive models of visual decision making with EEG measures of attention. Presented at the Australian Mathematical Psychology Conference. Hobart, TAS, Australia, February 2016.
- **Nunez, M. D.**, Srinivasan, R. & Vandekerckhove, J. Integrating EEG with cognitive modeling to explain individual differences in perceptual decision making. Presented at the Luce Graduate Student Conference. Irvine, CA, May 2014.
- Vandekerckhove, J., **Nunez, M. D.**, Baribault, B., & Srinivasan, R. Joint models for behavioral and neural data. Presented at the Annual Meeting of the Society for Mathematical Psychology, Quebec City, Canada, July 2014.

- Vandekerckhove, J., **Nunez, M. D.**, Baribault, B., & Srinivasan, R. Latent variable methods for data fusion. Presented at the Annual Summer Interdisciplinary Conference, Moab, UT, June 2014.

CONFERENCE POSTERS
- **Nunez, M. D.,** Tisby, M. K., Lui, K. K., Vandekerckhove, J., Srinivasan, R. A macro-level perspective on evidence accumulation during decision making. Presented at the Society for Neuroscience Global Connectome Virtual Event, January 2021.
- **Nunez, M. D.**, Kapre, K., Grimaldi, P., Hakwan, L., Basso, M. A. Prefrontal cortex neuronal ensemble activity encodes confidence. Presented at the Summer School for Primate Cognitive Neuroscience. Bad Bevensen, Germany, August 2019.
- **Nunez, M. D.**, Charupanit, K., Lin, J. J., Lopour B. A. Temporal dynamics of high frequency oscillations at slow and fast time scales in patients with epilepsy. Presented at the American Epilepsy Society. New Orleans, LA, December 2018.
- **Nunez, M. D.,** Scambray, K. A., Lui, K. K., Vandekerckhove, J., Srinivasan, R. The time course of brain signals reflect different cognitive processes during human decision making. Presented at the Society for Neuroscience. San Diego, CA, November 2018.
- **Nunez, M. D.,** Vandekerckhove, J., Srinivasan, R. The cognitive chronometry of rapid human decision making. Presented at the Society for Neuroscience. Washington, DC, November 2017.
- **Nunez, M. D.,** Gosai, A., Vandekerckhove, J., Srinivasan, R. Variability in performance during perceptual decision making is related to attentional filtering. Presented at the Society for Neuroscience. San Diego, CA, November 2016.
- **Nunez, M. D.,** Vandekerckhove, J., Srinivasan, R. Informing hierarchical Bayesian models of visual decision making with EEG. Presented at the SAMSI: Challenges in Functional Connectivity Workshop. Reighley-Durham, NC, April 2016.
- **Nunez, M. D.,** Vandekerckhove, J., Srinivasan, R. Single-trial EEG measures of attention predict psychological differences during decision making. Presented at the Society for Neuroscience. Chicago, IL, October 2015.
- **Nunez, M. D.,** Srinivasan, R. & Vandekerckhove, J. Single-trial EEG measures of visual attention explain evidence accumulation during perceptual decision making. Presented at Society for Mathematical Psychology. Newport Beach, CA, July 2015.
- Schubert, A. L., **Nunez, M. D.,** Frischkorn, G. T., Hagemann, D. A model-based cognitive neuroscience account of the chronometry of human decision making. Presented at Psychologie und Gehirn. Trier, Germany, June 2017.

FUNDED GRANT PROPOSALS
- *NSF Methodology, Measurement, and Statistics Proposal 2021 "Exploratory and confirmatory neurocognitive modeling with latent variables"* (~$345K USD) I wrote this grant proposal along with Joachim Vandekerckhove and Ramesh Srinivasan based on a new modeling framework and preliminary results.
- *NSF Cognitive Neuroscience Proposal 1850849 "Critical tests of neurocognitive relationships"* ($675K USD) I wrote this grant proposal along with Joachim Vandekerckhove and Ramesh Srinivasanl based on my work on the previous grant.
- *NSF Cognitive Neuroscience Proposal 1658303 "Estimation of unidentified cognitive models with physiological data"* ($337K USD) I wrote this grant along with Joachim Vandekerckhove and Ramesh Srinivasan based on my PhD advancement materials.

SOFTWARE
- **https://github.com/mdnunez/artscreenEEG** - MATLAB repository to perform basic artifact correction on electroencephalographic (EEG) data
- **https://github.com/mdnunez/pyhddmjags** - Python repository for example Hierarchical Drift Diffusion Model (HDDM) code using JAGS
- **https://github.com/mdnunez/encodingN200** - Pre-calculated EEG measures, raw behavioral data, MATLAB stimulus code, and MATLAB, Python, R, and JAGS analysis code for paper The latency of a visual evoked potential tracks the onset of decision making
- **https://github.com/mdnunez/ERPIQRT** - MATLAB and Python analysis code for the paper Individual differences in cognitive abilities are predicted by cortical processing speed: A model-based cognitive neuroscience account
- **https://github.com/mdnunez/sozhfo** - Python and MATLAB analysis code for the paper Towards automatic classification of pathological epileptic tissue with interictal high-frequency oscillations
- **https://github.com/mdnunez/RPDecision** - MATLAB analysis and modeling code for the paper Timing of readiness potentials reflect a decision-making process in the human brain
- **https://github.com/mdnunez/mcntoolbox** - The purpose of Mathematical Cognitive Neuroscience Toolbox is to provide users interested in cognitive neuroscience and mathematical psychology a set of example MATLAB and R scripts for data analysis and experimentation.
- **https://github.com/mdnunez/bayesutils** - Python utilities for exploration of convergence and graphical posterior estimation of pystan and pyjags output.

- **https://github.com/mdnunez/electroencephalopy** - A code repository containing simple Python scripts for EEG analysis using numpy and scipy

TEACHING / PEDAGOGY

- *Introductory Statistics*, **Falls of 2012 and 2014:** I taught lab and discussion sections as well as met with students individually and in group review sessions.
- *Experimental Methods*, **Winter 2012, Spring 2013, Winter 2013:** I was responsible for lab and discussion sections as well as helping students with their writing and research projects.
- *Probability and Statistics III in MATLAB,* **Spring 2015:** I held discussion sections and office hours and taught students statistical algorithms and topics such as bootstrapping.
- *History of Neuroscience,* **Fall 2016:** I answered student questions and graded quizzes and exams.
- *Neuromatch Academy Project Mentor*, **Summer 2021:** I advised 5 PhD students from various backgrounds on a project to use High Frequency Oscillations (HFOs) in the Fusiform Face Area using ECoG/iEEG data to predict face perception.

PROFESSIONAL MEMBERSHIPS

- Society for Neuroscience (active)
- Society for Mathematical Psychology (active)
- American Epilepsy Society (inactive)