Curriculum Vitae

1) DATE: September 18, 2024

2) PERSONAL DATA:

       Name: G. Sean Escola, M.D., Ph.D.
       Address: 52 Catoonah St
                      Ridgefield, CT 06877
       Phone: +1-917-587-4371
       Email: sean.escola@gmail.com

3) WORK EXPERIENCE:

Assistant Professor, Nov 2014-Jun 2024
Department of Psychiatry, Division of Systems Neuroscience
Affiliate, Center for Theoretical Neuroscience
Columbia University, New York, NY

Co-founder, Jan 2024-present
Fauna Robotics, Inc.
New York, NY

Co-founder, Jan 2017-present
CEO, Jan 2017-Mar 2020
Herophilus, Inc.
San Francisco, CA

Co-founder, Apr 2020-present
Board Member, Apr 2020-Feb 2024
Neuromatch, Inc.
Irvine, CA

Psychiatry Faculty Practice Office Attending, Jan 2021-Jun 2024
ColumbiaDoctors, New York, NY

Emergency Room Psychiatry Attending, Jul 2014-Apr 2017 & Jan 2021-Dec 2022
New York Presbyterian Hospital, New York, NY

4) EDUCATION:

College of Physicians and Surgeons, Jul 2003-May 2010
Columbia University, New York, NY
M.D., May 2010

Graduate School of Arts and Sciences, Jul 2005-Dec 2008
Integrated Program in Cellular, Molecular, and Biomedical Studies

Columbia University, New York, NY
Ph.D., Feb 2009
M.Phil., Oct 2008
Thesis: *Markov chains, neural responses, and optimal temporal computations.*
                Columbia University, 2009
Awarded: "***with distinction***"
Advisor: Dr. Liam Paninski

School of Engineering and Applied Science, Sep 2001-Dec 2002
Columbia University, New York, NY
M.S., Computer Science, Feb 2003

Columbia College, Sep 1997-Aug 2001
Columbia University, New York, NY
B.A., Biochemistry and Computer Science, Oct 2001

5) POSTGRADUATE TRAINING:

Resident House Officer, Jul 2010-Jun 2014
Department of Psychiatry
New York Presbyterian Hospital, New York State Psychiatric Institute, and
Columbia University, New York, NY
ACGME Program ID #: 4003521138

6) GAPS IN WORK, EDUCATION, OR TRAINING:

None.

7) LICENSURE:

New York State Medical License, Jun 2011-present
License #: 261908

DEA License, Jun 2011-present
Registration #: FE3336092

ABPN Board Certification in Psychiatry, Sep 2014-present
Certificate #: 68024

9) ACADEMIC SERVICE:

Co-founder and Board Member, Apr 2020-present
Neuromatch, Inc.
Neuromatch is a nonprofit that seeks to democratize and globalize neuroscience.
Founded in response to the Covid-19 pandemic when most neuroscience
conferences and summer schools were cancelled, Neuromatch Academy was
organized as team of >100 volunteer faculty and 200 Teaching Assistants to teach
an online neuroscience summer school to 2000 students around the world for 3

weeks in July 2020. Follow up courses were run in 2021, 2022, and 2023. Additionally, Neuromatch Conference replaced the cancelled SfN for 2020 and organized >100 talks and several thousand posters in Nov 2020. There have now been four Neuromatch Conferences to date. Neuromatch is adding a journal and a science consulting program to its portfolio of activities and intends to continue to grow in 2023 and beyond. I personally raised >$2m in operating funds over 2020–2023.

Associate Editor, 2018-present
Neuron, Behavior, Data Analysis, and Theory

10) PROFESSIONAL ORGANIZATIONS:

Society for Neuroscience

American Psychiatric Association

11) FELLOWSHIP AND GRANT SUPPORT:

Active support:

NIH R01, Apr 2024-Mar 2029
Translational studies in humans and mice to test a circuit-level computational model of auditory hallucinations
Direct support: $100,000 / year x 5 years
Role: PI
Grant #: 13954396

NSF AI Institute for Artificial and Natural Intelligence, Jun 2023-May 2028
Direct support: $100,000 / year, renewable annually
Role: Key personnel
Grant #: 2229929

Pending support:

Simons Collaborations in Neuroscience, in review
Solving sensorimotor control through realistic neuro-biomechanical simulation
Direct support (if funded): $250,000 / year x 10 years
Role: PI

Prior support:

NIH BRAIN U19, Sep 2017-Jul 2022
*"*Computational and circuit mechanisms underlying motor control"
Direct support: $250,000 / year x 5 years
Role: PI
Grant #: 5U19NS104649

NIH R01 / NSF CRCNS, Jun 2017-Sep 2022
 "Refining computational models of motor sequence learning and execution"
Direct support: $250,000 / year x 5 years
Role: PI
Grant #: 5R01NS105349

NIH Director's Early Independence Award (DP5), Sep 2014-Sep 2019
 "The internal states of neural circuits: data analysis, modeling, and disease"
Direct support: $250,000 / year x 5 years
Role: PI
Grant #: 1DP5OD019897

Leon Levy Fellowship, Jul 2010-Jun 2014
Private grant providing salary and research support during psychiatry residency training

Medical Scientist Training Program, Jul 2003-May 2010
Federal NIH grant providing full tuition plus stipend during M.D.-Ph.D. training

Master's Student/Graduate Research Assistant, Jan 2002-Dec 2002
Columbia University Department of Computer Science grant providing full tuition plus stipend during M.S. training for students actively involved in research

Master's Student/Teaching Assistant, Sep 2001-Dec 2001
Columbia University Dept. of Computer Science grant providing full tuition plus stipend during M.S. training in exchange for certain teaching obligations

12) EDUCATIONAL CONTRIBUTIONS:

Course director, Experimental and Analytical Approaches to Neuroscience Research, Spring 2021
Department of Neuroscience
Columbia University, New York
- Designed the curriculum, assignments, and organized the lecturers for a new 25-person graduate-student class that meet once weekly during the semester

Instructor, Introduction to Theoretical Neuroscience, Spring 2015; Spring 2017; Spring 2021; Spring 2022; Fall 2022
Department of Neuroscience
Columbia University, New York
- Designed the curriculum, homework, and gave lectures for a 25-person graduate-student class that meet twice weekly during the semester

Course director, Topics in Systems Neuroscience, Spring 2015; Spring 2018
Department of Neuroscience
Columbia University, New York
- Designed the curriculum, homework, and gave the lectures for a 10-person graduate-student class that meet once weekly during the semester

Instructor, Advanced Theoretical Neuroscience, Spring 2016
Department of Neuroscience
Columbia University, New York
- Designed the curriculum, homework, and gave lectures for a 15-person graduate-student class that meet twice weekly during the semester

Teaching Assistant, Introduction to Theoretical Neuroscience, Spring 2013
Center for Theoretical Neuroscience, Department of Neuroscience
Columbia University, New York, NY
- Graded problem sets and facilitated small groups for a 30-person class that met twice weekly during the semester

Instructor, Introduction to Physics, Summer 2008
Summer Medical and Dental Education Program
Columbia University, New York, NY
- Designed the curriculum, homework, and exams, and gave the lectures for a 40-person class that meet twice weekly during the summer

Instructor, Student Success Network Course, 2004-2005
College of Physicians and Surgeons
Columbia University, New York
- Prepared and gave review lectures of 20-person group of medical students eight times throughout the academic year

Instructor, Introduction to Programming in C, Fall 2001
Department of Computer Science
Columbia University, New York
- Designed the curriculum, homework, and exams, and gave the lectures for an 80-person class that meet twice weekly during the semester

Teaching Assistant, (i) Introduction to Programming; (ii) Data Structure and Algorithms; (iii) Discrete Mathematics; (iv) Artificial Intelligence; (v) Computational Complexity; (vi) Programming Languages and Translators, 1998-2001
Department of Computer Science
Columbia University, New York
- Graded problem sets and exams, and facilitated small groups for a range of introductory through advanced classes with varying class sizes

13) CLINICAL AND PUBLIC HEALTH ACTIVITIES AND INNOVATIONS:

None.

14) PATENTS AND INVENTIONS:

None.

15) PUBLICATIONS:

* indicates (co-)first or (co-)senior author

Submitted and Accepted:

Yuriy Shymkiv, Jordan P. Hamm, **Sean Escola**, and Rafael Yuste. "Slow network dynamics underlie context processing and novelty detection in auditory cortex". 1st round review at ***Neuron***

Kevin Mizes, Jack Lindsey, **Sean Escola***, and Bence P. Ölveczky. "The role of motor cortex in motor sequence execution depends on task demands." Accepted at ***Nature Neuroscience***

Kaushik Lakshminarasimhan, Marjorie Xie, Jeremy Cohen, Britton Sauerbrei, Adam Hantman, Ashok Litwin-Kumar, and **Sean Escola***. "Specific connectivity optimizes learning in thalamocortical loops." ***Cell Reports*** 2024 https://doi.org/10.1016/j.celrep.2024.114059

Sean Escola*, Kaushik Lakshminarasimhan, and Laureline Logiaco. "Models of thalamocortical interactions in motor control." In Martin Usrey and Murray Sherman (Eds.), "The Cerebral Cortex and Thalamus", 2023 https://doi.org/10.1093/med/9780197676158.003.0034

Kevin Mizes, Jack Lindsey, **Sean Escola***, and Bence P. Ölveczky. "Dissociating the contributions of sensorimotor striatum to automatic and visually guided motor sequences." ***Nature Neuroscience*** 2023 https://doi.org/10.1038/s41593-023-01431-3

Anthony Zador, **Sean Escola***, et al. "Toward Next-Generation Artificial Intelligence: Catalyzing the NeuroAI Revolution." ***Nature Communications*** 2023 https://doi.org/10.1038/s41467-023-37180-x

Alex Rogozhnikov, Pavan Ramkumar, Saul Kato, **Sean Escola***. "Hierarchical confounder discovery in the experiment–machine learning cycle." ***Cell Patterns***, 2022 https://doi.org/10.1016/j.patter.2022.100451

Laureline Logiaco, Larry Abbott, **Sean Escola***. "A model of flexible motor sequencing through thalamic control of cortical dynamics." ***Cell Reports***, 2021 https://doi.org/10.1016/j.celrep.2021.109090

Tara van Viegen, Athena Akrami, Kate Bonnen, Eric DeWitt, …, **Sean Escola***, Megan Peters. "Neuromatch Academy: Teaching Computational Neuroscience with global accessibility." ***Trends in Cognitive Science***, 2021 https://doi.org/10.1016/j.tics.2021.03.018

James Murray, **Sean Escola***. "Remembrance of things practiced with fast and slow learning in cortical and subcortical pathways." ***Nature Communication***, 2020 https://doi.org/10.1038/s41467-020-19788-5

Brian DePasquale, Christopher Cueva, Kanaka Rajan, **Sean Escola**, Larry Abbott. "full-FORCE: A target-based method for training recurrent networks." ***PLoS ONE***, 2018 https://doi.org/10.1371/journal.pone.0191527

James Murray, **Sean Escola***. "Learning multiple variable-speed sequences in striatum via cortical tutoring." ***eLife***, 2017 https://doi.org/10.7554/eLife.26084.001

Sean Escola*, Alfredo Fontanini, Don Katz, Liam Paninski. "Hidden Markov models for the stimulus-response relationships of multi-state neural systems." ***Neural Computation***, 2011 https://doi.org/10.1162/NECO_a_00118

Sean Escola*, Michael Eisele, Ken Miller, Liam Paninski. "Maximally reliable Markov chains under energy constraints." ***Neural Computation***, 2009 https://doi.org/10.1162/neco.2009.08-08-843

Ilya Nemenman, **Sean Escola**, WS Hlavacek, PJ Unkefer, C Unkefer. "Reconstruction of metabolic networks from high-throughput metabolite profiling data: in silico analysis of red blood cell metabolism." ***Annals of the New York Academy of Sciences***, 2007 https://doi.org/10.1196/annals.1407.013

Unpublished pre-prints:

Mizes, Kevin GC, Jack Lindsey, **Sean Escola***, and Bence P. Ölveczky. "Motor cortex is required for flexible but not automatic motor sequences." ***bioRxiv*** 2023 https://doi.org/10.1101/2023.09.05.556348

Alex Rogozhnikov, Pavan Ramkumar, Saul Kato, **Sean Escola***. "Demuxalot: scaled up genetic demultiplexing for single-cell sequencing." ***bioRxiv***, 2021 https://doi.org/10.1101/2021.05.22.443646

Laureline Logiaco, **Sean Escola***. "Thalamocortical motor circuit insights for more robust hierarchical control of complex sequences." ***arXiv***, 2020 https://arxiv.org/abs/2006.13332

Kevan Shah, Rishi Bedi, Alex Rogozhnikov, Pavan Ramkumar, Zhixiang Tong, Brian Rash, Morgan Stanton, Jordan Sorokin, …, Gaia Skibinski, Saul Kato, **Sean Escola***. "Optimization and scaling of patient-derived brain organoids uncovers deep phenotypes of disease." ***bioRxiv***, 2020 https://doi.org/10.1101/2020.08.26.251611

Thesis:

Sean Escola*. *Markov chains, neural responses, and optimal temporal computations*. Dissertation of Columbia University in the City of New York, 2009.

16) INVITED AND PEER-SELECTED POSTERS AND TALKS:

Escola S. Learning and dynamics in neural systems with low-rank structure. *Brown University*. 2023 Sep 21.

Escola S. Subcortical consolidation of motor sequences. *Northwestern University*. 2023 May 12.

Escola S. Subcortical consolidation of motor sequences. *University of Chicago*. 2023 May 11.

Escola S. Motor learning and virtual neuroscience. *Cold Spring Harbor Laboratory*. 2022 Dec 5.

Escola S. What is the computational role of the BG in motor function? *Champalimaud Center for the Unknown*. 2022 Mar 23.

Escola S. Circuit level theories in motor learning. *Columbia Dept of Psychiatry Grand Rounds*. 2022 Feb 2.

Escola S. Circuit level theories in motor learning. *Mount Sinai School of Medicine*. 2021 Nov 17.

Escola S. Thalamic control of cortical dynamics in a model of flexible motor sequencing. *Neurotuscany*. 2021 Aug 27.

Escola S. Thalamic control of cortical dynamics for sequence behaviors. *New York Genome Center*. 2021 June 21.

Escola S. Thalamic control of cortical dynamics in a model of flexible motor sequencing. Oral presentation at: *Neuromatch 3*. 2020 Oct 17.

Escola S. Practice and the corticostriatal and thalamostriatal pathways. Oral presentation at: *Gordon Research Conference: Thalamocortical interactions*. 2020 Feb 17; Ventura, CA.

Escola S. Practice makes perfect. Oral presentation at: *Harvard University*. 2019 Oct 25; Cambridge, MA.

Escola S. Recurrent inhibition in striatum enables transfer of time-flexible skills to basal ganglia. Oral presentation at: *Baylor University*. 2017 Jan 27; Houston, TX.

Escola S. Recurrent inhibition in striatum enables transfer of time-flexible skills to basal ganglia. Oral presentation at: *The University of California at San Francisco*. 2017 Jan 13; San Francisco, CA.

Escola S. Temporal scaling and learning in basal ganglia. Oral presentation at: *The University of Oregon*. 2016 Oct 6; Eugene, OR.

Escola S. Temporal scaling and learning in basal ganglia. Oral presentation at: *The Gatsby Tri-Center Meeting 2016*. 2016 Jun 7–9; London, UK.

Escola S. Sequence generating recurrent neural networks: a novel view of cortex, thalamus, and the basal ganglia. Oral presentation at: *Harvard Center for Brain Science*. 2016 May 18; Cambridge, MA.

Escola S and Abbott LF. Sequence generating recurrent neural networks: a novel view of cortex, thalamus, and the basal ganglia. Poster session presented at: *Swartz Meeting 2015*. 2015 Aug 2–Aug 5; Janelia Farms, VA.

Escola S. Sequence generating recurrent neural networks: a novel view of cortex, thalamus, and the basal ganglia. Oral presentation at: *Champalimaud Centre for the Unknown*. 2015 Jul 24; Lisbon, Portugal.

Escola S. Sequence generating recurrent neural networks: a novel view of cortex, thalamus, and the basal ganglia. Oral presentation at: *École normale supérieure*. 2015 Jul 21; Paris, France.

Escola S and Abbott LF. Sequence generating recurrent neural networks: a novel view of cortex, thalamus, and the basal ganglia. Poster session presented at: *Computational and Systems Neuroscience 2015*. 2015 Mar 5–Mar 8; Salt Lake City, UT.

Escola S and Abbott LF. Sequence generating recurrent neural networks: a novel view of cortex, thalamus, and the basal ganglia. Oral presentation at: *The Gatsby Tri-Center Meeting 2014*. 2014 Jun 1–3; Jerusalem, Israel

Escola S and Abbott LF. Self-monitoring of network activity in multi-state recurrent neural networks. Oral presentation at: *Computational and Systems Neuroscience 2014*. 2014 Feb 27–Mar 2; Salt Lake City, UT.

Escola S and Abbott LF. Sequences and state transitions in neural networks. Oral presentation at: *2013 Sloan–Swartz Meeting for Computational Neuroscience*. 2013 Jul 26–28; Waltham, MA.

Escola S and Abbott LF. A network model for flexible sequence generation. Oral presentation at: *Leon Levy Neuroscience Symposium 2013*. 2013 Apr 29; New York City, NY.

Escola S and Abbott LF. Internally generated transitions in multi-state recurrent neural networks. Poster session presented at: *Computational and Systems Neuroscience 2013*. 2013 Feb 28–Mar 3; Salt Lake City, UT.

Escola S and Paninski L. Hidden Markov models for the stimulus-response relationships of multi-state neural systems. Poster session presented at: *Computational and Systems Neuroscience 2010*. 2010 Feb 25–28; Salt Lake City, UT.

Escola S and Paninski L. Hidden Markov models for the complex stimulus-response relationships of multi-state neurons. Poster session presented at: *Bernstein Symposium 2008*. 4th annual conference of the German Bernstein Network for Computational Neuroscience; 2008 Oct 8–10; Munich, Germany.

Escola S, Eisele M, Miller K, and Paninski L. Maximally reliable Markov chains under energy constraints, or How to build a clock. Oral presentation at: *Bernstein Symposium 2008: Bernstein PhD Symposium.* 4th annual conference of the German Bernstein Network for Computational Neuroscience; 2008 Oct 10–11; Munich, Germany.

Escola S, Eisele M, Miller K, and Paninski L. Maximally reliable Markov chains under energy constraints. Poster session presented at: *Sloan-Swartz Meeting 2008*. Annual conference of the Sloan-Swartz Centers for Theoretical Neurobiology; 2008 Jul 19–22; Princeton, NJ.

Escola S, Eisele M, and Paninski L. Maximally reliable Markov chains under energy constraints. Poster session presented at: *Computational and Systems Neuroscience 2008*. 2008 Feb 28–Mar 2; Salt Lake City, UT.

Escola S and Paninski L. HMMs applied toward the inference of neural states and the improved estimation of linear RFs. Poster session presented at: *Computational and Systems Neuroscience 2007*. 2007 Feb 22–25; Salt Lake City, UT.

Escola S and Paninski L. HMMs applied toward the inference of neural states and the improved estimation of linear RFs. Poster session presented at: *Grand Challenges in Neural Computation*. 2007 Feb 18–21; Santa Fe, NM.

17) TRIVIA:

Burning Man Ultra-Marathon 50k, Aug 2017
Time: ~4.5 hours

Burning Man Ultra-Marathon 50k, Aug 2016
Time: ~5 hours

TCS New York City Marathon, Nov 2014
Time: 3:40:31

Bach Society, Sep 2012-Dec 2013
Tenor

Walt Disney World Marathon, Jan 2012
Time: 3:44:51

Columbia Swing Dance Performance Troupe, Sep 2008-May 2009

112th Boston Marathon, Apr 2008
Time: 3:44:17

Columbia Swing Dance Club, Sep 2007-May 2010

Bard Hall Players, Sep 2003-May 2010