MELISSA FRANCH, PH.D. CURRICULUM VITAE

Postdoctoral Fellow
Department of Neurosurgery
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EDUCATION AND TRAINING

2023– **Postdoctoral research**
Baylor College of Medicine, Houston, TX
Advisors: Benjamin Hayden, Ph.D. and Sameer Sheth, M.D./Ph.D
Project: "Single neuron encoding of semantics during language comprehension in individuals with and without autism."

- Identified a vectorial coding regime for semantics in the human hippocampus. (Franch et al., 2025, *Nature Neuroscience*, in review. See also bioRxiv)
- Helped characterize brain-wide encoding of nouns and verbs (Aliko, Franch, et al., *Nature*, in review. See also bioRxiv)
- Helped determine a shared neural subspace for generalizing semantics across speaking and listening during natural conversations (Chavez, Franch et al., *Nature Human Behavior*, submitted. See also bioRxiv).
- Discovered reduced semantic contextualization and predictive coding in individuals with autism during natural language comprehension. (Franch et al., in prep)

2017–2023 **Ph.D. in Neuroscience**
The University of Texas MD Anderson Cancer Center UTHealth Houston Graduate School of Biomedical Sciences (GSBS), Houston, TX
Dissertation title: "Cortical representations of learning social cooperation in freely moving macaques."
Advisor: Valentin Dragoi, Ph.D.
Thesis committee: Xaq Pitkow, Ph.D., Fabricio Do Monte, Ph.D., Harel Shouval, Ph.D., and Danielle Garsin, Ph.D.

- Discovered improved neural coding and communication during viewing social cues and decision-making supports learning cooperation in freely moving macaques. (Franch et al., 2024, *Nature*)
- Helped identify latent neural representations of task variables used to predict choice during foraging in freely moving macaques. (Shahidi, Franch, et al., 2024, *Nature Neuroscience*)

2008–2012 **Bachelor of Science degrees awarded with Magna Cum Laude: Biological Sciences and Science Education**
North Carolina State University, Raleigh, NC
Undergraduate research advisors: Karla Thrall, Ph.D and Charles Hardin, Ph.D

HONORS AND AWARDS

2025 Autism Research Institute Research Grant Award
2025 Autism Research Institute Robert L. Hendren Award
2025 F32 NIH NIDCD
2025 Autism Research Institute Grant – invitation to submit
2024 NIH BRAIN Initiative Scholar Spotlight - 10th annual BRAIN Initiative conference
2023 Michael R. Blackburn Outstanding Dissertation Award from GSBS
2023 Dean's Research Scholarship Award GSBS
2022 Investing in Student Futures Scholarship GSBS
2021 Dee S. and Patricia Osborne Endowed Scholarship in the Neurosciences for best lecture
2021 F31 NIH NIMH
2020 Terry J. Crow Ph.D. Scholarship in the Neurosciences for best candidacy exam
2020 Russell and Diana Hawkins Family Foundation Discovery Fellowship
2020 UTHealth*Leads* – leadership program fellow
2019 Society for Neuroscience Hot Topic Award
2018 Dee S. and Patricia Osborne Endowed Scholarship in the Neurosciences for best lecture
2012 NCSU Most Outstanding Senior in Science Education Award

2012 NCSU Burroughs Wellcome Scholarship recipient

PREPRINTS AND SUBMITTED MANUSCRIPTS

Franch, M., Mickiewicz, E. A., Belanger, J., Chericoni, A., Chavez, A. G., Katlowitz, K., ... & Hayden, B.Y. (2025). A vectorial code for semantics in human hippocampus. ***Nature Neuroscience*** (in review). See also: *bioRxiv*

Aliko, S., **Franch, M.,** Kewenig, V., Wang, B., Cooper, G., Glotfelty, A., Hayden, B.Y., Small, S.L., and Skipper, J.I. (2024). The entire brain, more or less, is at work: Language regions are artefacts of averaging. ***Nature*** (in review).

Katlowitz, K. A., Shah, S., **Franch, M.**, Adkinson, J., Belanger, J. L., Mathura, R. K., ... & Sheth, S. A. (2025). Learning and language in the unconscious human hippocampus. ***Nature*** (in review). See also: *bioRxiv*

Chavez, A. G., **Franch, M.**, Mickiewicz, E., Baltazar, W., Belanger, J., Devara, D., ... & Hayden, B. Y. (2025). Mirror manifolds: partially overlapping neural subspaces for speaking and listening. ***Nature Human Behavior*** (submitted). See also: *bioRxiv*

Parajuli, A., **Franch, M.** and Dragoi, V. (2024). Sparseness facilitates image encoding across visuo-frontal networks in freely moving macaque. ***Nature Communications*** (in review).

Milton, R. Slapik, M., Egranov, S. Parajuli, A., **Franch, M.,** and Dragoi, V. (2025). Locomotor activity enhances visuo-frontal communication during natural viewing. ***Nature Neuroscience*** (in review).

Franch, M., Mickiewicz, E. A., Katlowitz, K., Zhu, H., Belanger, J., …& Hayden., B.Y. (2025). Neural signatures of impaired semantic contextualization in autism. (in prep)

PUIBLICATIONS

Franch, M., Yellapantula, S., Parajuli, A. *et al.* (2024). Visuo-frontal interactions during social learning in freely moving macaques. ***Nature*** 627, 174–181.

Shahidi, N., **Franch, M.,** Parajuli, A. *et al.* Population coding of strategic variables during foraging in freely moving macaques. (2024). ***Nature Neuroscience*** 27, 772–781.

Monsivais, D., Choi, H. A., Kitagawa, R., **Franch, M.**, & Cai, C. (2018). A retrospective analysis of surgical outcomes for acute subdural hematoma in an elderly cohort. ***Interdisciplinary Neurosurgery****, 14*, 130-134

INVITED TALKS

2025 *Neural coding of semantics during language comprehension*. UCL AI Institute and Oxford University Cortex Club Seminar, UK

2025 *Single neuron encoding of audio-visual speech comprehension.* SungKyunKhan University, South Korea, virtual presentation

2024 *Single neuron encoding of audio-visual speech comprehension*. NIH BRAIN Initiative Annual Conference. Scholar Spotlight talk, Rockville, MD

2024 *The visual primates that we are: 'Learning by watching' in children and monkeys*. IEEE Conference on Development and Learning. Austin, TX

2023 *Neural correlates of learning cooperation in freely moving rhesus macaques.* German Neuroscience Society (Neurowissenschaftliche Gesellschaft) annual meeting. Goettingen, Germany

2022 *Cortical Circuits for Information Processing and Decision Making*. Blackrock Neurotech Webinar

SELECT PRESENTATIONS

2025 *Neural signatures of reduced semantic contextualization in autism.* Human Single Neuron Meeting, Pasadena, CA

2025 *Vectorial representations of word meaning in the brain.* LLMs and the Brain conference, Rice University, Houston, TX

2025 *Neural signatures of reduced semantic contextualization in autism*. Society for the Neurobiology of Language Meeting, Washington DC

2025 *Vectorial coding of semantics in the human hippocampus during listening and conversations.* NETI workshop for the neuroscience of naturalistic behaviors, Austin, TX

2024 *Single cell and population coding regimes for language semantics in human cortex.* Society for Neuroscience Conference, Chicago, IL

2024 *Single cell and population coding regimes for language semantics in human cortex.* Gordon Research

Conference – The Frontal Cortex, Holderness, NH

2024 *Single cell and population coding regimes for language semantics in human cortex*. Rice University Neural Interface Symposium, Houston, TX

2022 *Neural correlates of cooperation in freely moving rhesus macaques*. Society for Neuroscience Conference, San Diego, CA

2021 *Neural representation of visually guided decision making in freely moving, socially interacting, and foraging non-human primates*. Blackrock Neurotech Research Webinar

2018 *Large-scale recording of neural population activity during social cognition in freely moving non-human primates*. NIH BRAIN Initiative Investigators Meeting, Washington, DC

2010 *Proline-rich polypeptides enhance survivability of whole-body radiation exposure in mice*. Department of Energy Science and Energy Research Challenge, Argonne National Lab, Chicago, IL

RESEARCH EXPERIENCE

2016 – 2017 Clinical Research Coordinator, Neurosurgery team and Dr. Ryan Kitagawa, M.D, UTHealth, Houston, TX

2015 – 2016 Research Technician II, Neurobiology, Franks lab, Duke University, Durham, NC

2013, 2014 Post-Bachelors Research Associate, Thrall lab, Pacific Northwest National Lab, Richland, WA

2010 Undergraduate Research Intern for the Department of Energy Pre-Service Teacher Internship, Thrall lab, Pacific Northwest National Laboratory, Richland, WA

TEACHING

2018 – present Undergraduate and graduate student mentor, UTHealth, Rice University, and Baylor College of Medicine

2025 Lecturer, Systems Neuroscience Course (ECE 477/677), Rice University, Houston TX
The Neurobiology of Language

2019 – 2020 Teaching Assistant, UTHealth School of Dentistry
Graduate Neuroanatomy (GS14 1181)

2012 – 2015 Teacher, Millbrook Magnet Public High School, Raleigh, NC
Academic Biology
Honors Biology
International Baccalaureate (IB) Biology

2011 High School Teacher, Beijing Royal School, Changping District, Beijing, China
English

SERVICE

2024 – present Volunteer, Interviewer and audio editor for *Stories of WiN* (Women in Neuroscience) media

2025 Panelist, "*Selecting a postdoc and mentor/mentee relationships"* GSBS Neuro Symposium

2022 – 2025 Volunteer, FIRST robotics mentor to Pearland, TX robotics team 5414, Pearadox

2021 Moderator, MD Anderson UTHealth GSBS State of the School Address with Dean, Dr. Michael Blackburn, PhD

2021-2022 Representative, Neuroscience Program Steering Committee

2021 Volunteer, Blodgett Urban Community Gardens

2020-2022 Representative, UTHealth Graduate Student Education Committee

2020 Volunteer, Graduate School of Biomedical Sciences Science Night

2019 Volunteer, Graduate School of Biomedical Sciences Summer Biomedical Academy

2019 Volunteer, UTHealth Brain Night for Kids

2018 – 2021 Representative, Neuroscience Program Student Council

2013 – 2015 Coach, North Carolina Science Olympiad

RELEVANT TRAINING

2018 – 2020 Gulf Coast Consortia Theoretical and Computational Neuroscience Consortium-NeuroNex Workshop

2020 Neuromatch Academy online school for computational neuroscience; observer track