

Aditya Upadhyayula

Postdoctoral Fellow | Dynamic Cognition & Complex Memory Labs

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Academic Appointments

Staff Scientist | Postdoctoral Scholar — WashU, St. Louis

JULY 2026 - PRESENT | JULY 2023 - JUNE 2026

Investigating how we represent, process and remember complex experiences using eye tracking, fMRI, computational modeling and behavioral analyses

Mentor(s): [Jeffrey M. Zacks](#), PhD & [Zachariah M. Reagh](#), PhD

Postdoctoral Scholar — University of California, Davis

JULY 2021 - JUNE 2023

Worked towards understanding how scene semantics informs eye movements in naturalistic images and videos using eye tracking, computational modeling and behavioral analysis

Mentor: [John M. Henderson](#), PhD

Graduate Assistant — Johns Hopkins University

AUGUST 2016 - MAY 2021

Worked on characterizing attentional and perceptual limits of visual cognition using eye tracking, computational modeling and behavioral analysis

Mentor: [Jonathan Flombaum](#), PhD

Education

Ph.D. and M.A. in Psychological & Brain Sciences — Johns Hopkins University, Baltimore

AUGUST 2016 - MAY 2021

Thesis: Visual Time

PhD advisor: [Jonathan Flombaum](#), PhD

M.S. Electrical & Computer Engineering — North Carolina State University

JANUARY 2015 - MAY 2016

M.Sc. (Hons.) Physics and B.E. (Hons.) Electronics & Communications Engineering —

Birla Institute of Technology and Science - Pilani.

AUGUST 2008 - AUGUST 2013

Publications

*+ Equal contribution, Mentee collaborators

1. **Upadhyayula A.**, Neil Cohn. A computational framework to study Hierarchical processing in visual narratives (Cognitive Science, 2025)
2. Alan Lu, **Upadhyayula A.**, John M. Henderson. Meaning maps predict reaction time in change detection (Visual Cognition, 2025)
3. **Upadhyayula A.**, John M. Henderson. Spatiotemporal jump detections during continuous film viewing: Insights from a flicker paradigm (Attention, Perception & Psychophysics, 2024).
4. **Upadhyayula A.**, John M. Henderson. Spatiotemporal jump detections during continuous film viewing (Journal of Vision, 2023).
5. **Upadhyayula A.**, Ian B. Phillips, Jonathan I. Flombaum. Eccentricity advances arrival into visual perception (Journal of Experimental Psychology: General, 2023)
6. **Upadhyayula A.**, Jonathan I. Flombaum. A model that adopts human fixations explains individual differences in multiple object tracking (Cognition, 2020)

Manuscripts in preparation, under review, revision:

7. **Upadhyayula A.**, John M. Henderson, Jeffrey M. Zacks* & Zachariah M. Reagh* (under revision, preprint: <https://doi.org/10.1101/2025.08.30.673233>). Meaningful moments during film viewing are represented and remembered similarly across participants.
8. June Kim*, **Upadhyayula A.***, Joshua Koh, Jeffrey M. Zacks, Zachariah M. Reagh⁺, Alexander Barnett⁺ (under revision, preprint: https://osf.io/preprints/psyarxiv/dcfvw_v1). Key moments scaffold the semantic structure of narratives.
9. **Upadhyayula A.**, Zachariah M. Reagh & Jeffrey M. Zacks. (under review, preprint: https://osf.io/preprints/psyarxiv/wn4d5_v2). Key Moments and Event Boundaries in Film Comprehension And Memory.
10. Sophie (Xing) Su, **Upadhyayula A.**, Jeffrey M. Zacks (in prep). Semantic information shapes gaze patterns during naturalistic movie viewing: Evidence from computational models of vision and language.
11. **Upadhyayula A.***, Heather Bailey*, Sophie (Xing) Su, Shaney Flores, Zachariah M. Reagh, Jeffrey M. Zacks (in prep). Behavioral and Neural correlates of situation model updating in the aging brain.

Grants, Awards & Honors

The role of prediction, Semantics and memory in determining key moments of complex experiences —

December 2025 (USD 2,500)

Departmental grant, Psychological & Brain Sciences, WashU

PI, The role of key moments in event perception and memory – January 2025-27 (USD 100,000)

Funding Agency: McDonnell Center for Systems Neuroscience

G. Stanley Hall Scholar Award – Awarded to a student who has demonstrated exceptional scholarly progress in dissertation research (USD 500)

Travel Award – Object Perception Attention and Memory, satellite event of Psychonomics Society (USD 250)

Collaborative Research Award – Department of Psychological & Brain Sciences, JHU (USD 1000)

Robert S. Waldrop Graduate Student Fellowship

Conferences

1. **Upadhyayula A.**, Zachariah Reagh. Cueing with key moments to facilitate narrative recall. Cognitive Neuroscience Society 2026.
2. Sophie Su, **Upadhyayula A.** Semantic information shapes gaze patterns during naturalistic movie viewing. Vision Sciences Society 2025.
3. June Kim, **Upadhyayula A.**, Jeffrey M. Zacks, Alexander Barnett, Zachariah M. Reagh. Complex experiences are represented as a subset of key moments which capture their underlying semantics. Cognitive Neuroscience Society 2025.
4. **Upadhyayula A.**, John M. Henderson, Jeffrey M. Zacks, Zachariah Reagh. Meaningful moments during film viewing are represented and remembered similarly across participants. Society for Neuroscience 2024.
5. **Upadhyayula A.**, John M. Henderson, Jeffrey M. Zacks, Zachariah Reagh. Intersubject neural similarity and pattern reinstatement during recall are enhanced at meaningful moments during film viewing. Cognitive Neuroscience Society 2024.
6. Alan Lu, **Upadhyayula A.**, John M. Henderson. Meaning maps predict reaction time in change blindness paradigm. Psychonomics 2023.
7. **Upadhyayula A.**, John M. Henderson. Time marches on: Impaired detection of spatiotemporal discontinuities during film viewing. Vision Sciences Society 2022.
8. **Upadhyayula A.**, Neil Cohn. Hierarchical structure in processing visual narratives: A computational investigation. Cognitive Sciences Society 2020.
9. **Upadhyayula A.**, Ian Phillips, Jonathan Flombaum. Space and time dissociate in the construction of visual now. Vision Sciences Society 2020.
10. Ian Phillips, **Upadhyayula A.**, Jonathan Flombaum. Tachypsychia - subjective expansion of time - happens in immediate memory, and not in perceptual experience. Vision Sciences Society 2020.
11. **Upadhyayula A.**, Jonathan Flombaum. Two distortions of perceived space and time. Object Perception & Memory (OPAM) 2019.
12. **Upadhyayula A.**, Jonathan Flombaum. The visual now across the visual field. Capitol Area Cognition Action & Perception 2019.
13. **Upadhyayula A.**, Jonathan Flombaum. Object size affects multiple object tracking performance (but not via close frequency encounters). Vision Sciences Society 2018.

Selected & Invited talks

1. Key moments synchronize brain activity during comprehension, support later recall, and scaffold narrative meaning (upcoming Context & Episodic Memory Symposium, 2026).
2. The relationship between key moments and event boundaries during naturalistic movie viewing. Psychonomic Society, 2025.
3. Meaningful moments during film viewing are represented and remembered similarly across participants. Psychonomic Society, 2024.
4. Aly & Baldassano labs. Columbia University, PI: Miriam Aly & Christopher Baldassano, 2024
5. Barnett Lab, University of Toronto, PI: Alex Barnett, 2023
6. Encounters with semantic violations do not interfere with immediately subsequent scene-viewing behavior, Psychonomic Society, 2023. Presented on behalf of Alan Lu due to unforeseen circumstances.
7. Event & Memory Cognition group, WashU in St. Louis, PI: Jeffrey M. Zacks & Zachariah M. Reagh. 2023.
8. Isik Lab, Johns Hopkins University, PI: Leyla Isik, 2023.
9. Abstract Representations in Neural Architecture (ARENA) group, Germany, PI: Melissa Vo, Maria Toneva, Christian Feibach, Gemma Roig, Matthias Kaschube, 2023.
10. Cognitive and Neural Computation Lab, Yale University, CT, PI: Ilker Yildirim 2021
11. Visual Cognition Group, UC Davis, PI: John Henderson, 2021
12. Ma Lab, New York University, PI: Wei ji Ma, 2021
13. Tilburg joint workshop on pictorial narrative comprehension, Tilburg University, Netherlands, 2020
14. Cognitive tools lab, University of California San Diego, PI: Judith Fan, 2020
15. Mid Atlantic meeting on Memory & Action, Villanova University, 2019
16. Capitol Area conference on Cognition, Action & Perception, Georgetown University, 2018

Teaching

Instructor — Cognitive Neuroscience, Johns Hopkins University, **SPRING 2020**

Instructor — Research Methods, Johns Hopkins University, **FALL 2019**

Instructor — Design & Experimental Analysis, Johns Hopkins University, **SPRING 2019**

Teaching Assistant — Sensation & Perception, Johns Hopkins University, **FALL 2018**

Teaching Assistant — Introduction to Cognitive Psychology, Johns Hopkins University, **SPRING 2018**

Teaching Assistant — Introduction to Psychology, Johns Hopkins University, **FALL 2017**

Skills

Programming — Python, Javascript, R, Matlab, C, Java

Methodology — Eye Tracking, Computational modeling, functional Magnetic Resonance Imaging (fMRI),

Psychophysics, Electro Encephalography (EEG)

Software – **jsPsych, Psychopy, PyTorch, Nilearn, Plotly**, Tensorflow, Experiment Builder, EEGLAB, Eyelink systems, NLTK, Spacy

Students Mentored (**Graduate** and **Undergraduate**)

1. **Sophie Garthe (WashU, St. Louis)**
MAY 2025 - PRESENT
Characterizing the effects of key moments on recall as a part of the Mc Donnell Systems Neuroscience grant awarded to Aditya Upadhyayula.
2. **June Kim (University of Toronto)**
MAY 2024 - MAY 2026
Key moments capture the semantics underlying continuous experiences.
3. **Alan Lu (University of California, Davis)**
MAY 2022 - MAY 2023
Using meaning maps to quantify semantic information in visual processing during change detection task.
4. **Sophie Su (WashU, St. Louis)**
DECEMBER 2024 - JUNE 2026
Using CLIP embeddings and eye fixation maps to capture semantic information of the underlying experience during naturalistic movie viewing.

Professional Service

Ad Hoc Reviewing – Cognitive Science; Psychological Review; Attention, Perception & Psychophysics; Visual Cognition; Timing & Time perception; Psychology of Aesthetics, Creativity, and the Arts; Scientific Reports; Memory & Cognition; Psych Bulletin & Review, Journal of Cognitive Neuroscience; Language, Cognition & Neuroscience; Scientific Reports.

Membership– Vision Sciences Society, Cognitive Neuroscience Society, Cognitive Sciences Society, Psychonomics, Society for Neuroscience

Departmental Service - Colloquium planning and organizing committee, JHU - (2018-2019), Graduate recruitment committee, JHU - (2017-18)

Community Service - Judge, WashU Endure symposium (2024-2025), Judge, California State University - Student Research Competition - (2022-23)

Press

Psychonomic Society's [blogpost](#) on spatiotemporal discontinuity processing in films using flicker paradigm.

References

Prof. Jonathan Flombaum (Ph.D. thesis advisor)

– Johns Hopkins University (flombaum@jhu.edu)

Prof. John Henderson

– University of California, Davis (johnhenderson@ucdavis.edu)

Prof. Jeffrey Zacks

– WashU, St. Louis (jzacks@wustl.edu)

Prof. Zachariah Reagh

– WashU, St. Louis (zreagh@wustl.edu)