

# Leyla Isik

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## Academic Appointments

**Johns Hopkins University**, Clare Boothe Luce Assistant Professor 2019-present

Department of Cognitive Science

Secondary appointment: Biomedical Engineering

**Center for Brains, Minds, and Machines**, Postdoctoral Associate 2015-2019

**Massachusetts Institute of Technology**, McGovern Institute for Brain Research

Advisor: Nancy Kanwisher

**Boston Children's Hospital, Harvard Medical School.**

Advisor: Gabriel Kreiman

## Education

**Massachusetts Institute of Technology**, Ph.D. Computational Biology 2015

Advisor: Tomaso Poggio

Thesis title: The dynamics of invariant object and action recognition in the human visual system.

**Johns Hopkins University**, B.S. Biomedical Engineering 2010

## Publications

(mentees underlined)

Beyond linear regression: mapping models in cognitive neuroscience should align with research goals. Ivanova, A., Schrimpf, M., Anzellotti S., Zaslavsky N., Fedorenko E., and **Isik, L.** *Neurons, Behavior, Data, and Theory* (2022).

Social-affective features drive human representations of observed actions. Dima, D., Tomita, T., Honey, C., and **Isik, L.** *eLife* (2022).

Prospective Learning: Back to the Future. Vogelstein, J., Verstynen, T., Kording, K., **Isik, L.**, *et al.*, arXiv:2201.07372 (2022).

Functional selectivity for social interaction perception in the human superior temporal sulcus during natural viewing. Lee Masson, M. and **Isik, L.**, Neuroimage (2021).

Disentangled face representations in deep generative models and the human brain. Soulos, P. and **Isik, L.**, NeurIPS SVRHM workshop (2020).

The speed of human social interaction perception. **Isik, L.**, Mynick, A., Pantazis D., and Kanwisher N., Neuroimage (2020).

How face perception unfolds over time. Dobs, K., **Isik, L.**, Pantazis D., and Kanwisher, N., Nature Communications (2019).

Fast, invariant representations for human action in the visual system. **Isik, L.\***, Tacchetti, A.\*, and Poggio, T., The Journal of Neurophysiology (2018).

What is changing when: Decoding visual information in movies from human intracranial recordings. **Isik, L.**, Singer, J., Madsen, J.R., Kanwisher, N., and Kreiman G., Neuroimage (2018).

General transformations of object representations in human visual cortex. Ward, E., **Isik, L.**, and Chun, M., The Journal of Neuroscience (2018).

Invariant recognition dictates neural representations of visual input. Tacchetti, A., **Isik, L.**, and Poggio, T., Annual Reviews of Vision Science (2018).

Invariant recognition drives neural representations of action sequences. Tacchetti, A.\*, **Isik, L.\***, and Poggio, T., PLoS Computational Biology (2017).

Perceiving social interactions in the posterior superior temporal sulcus. **Isik, L.**, Koldewyn, K., Beeler, D., and Kanwisher N., Proceedings of the National Academy of Sciences (2017).

Eccentricity-dependent deep neural networks: Modeling invariance in human vision. Chen, F., Roig, G., **Isik, L.**, Boix, X., and Poggio T., Computational Principles of Natural and Artificial Intelligence. AAAI Spring Symposium Series (2017).

The dynamics of invariant object recognition in the human visual system. **Isik, L.**, Meyers, E.M., Leibo, J.Z., and Poggio, T., The Journal of Neurophysiology (2014).

Computational role of eccentricity dependent cortical magnification. Poggio, T.A., Mutch, J. and **Isik, L.**, arXiv:1406.1770 (2014).

Learning and disrupting invariance in visual recognition with a temporal association rule. **Isik, L.**, Leibo, J.Z., and Poggio, T., Frontiers in Computational Neuroscience (2012).

Cancer-specific high-throughput annotation of somatic mutations: computational prediction of driver missense mutations. Carter, H., Chen, S., **Isik, L.**, Tyekucheva, S., Velculescu, V.E., Kinzler, K.W., Vogelstein, B., and Karchin, R., Cancer Research (2009).

## Research Funding

NIH R21 (2022-2024). *The neural basis of social interaction perception and its disruption in autism*. PI.

NSF AI Institute Planning Grant (2020-2022). *BI4ALL: Understanding Biological Intelligence for Active Lifelong Learning*. Co-I (PI: Konrad Kording).

Google Faculty Research Award (2019). *Deep learning models of human social interaction perception*. PI.

NSF STC award (2019-202) *A Center for Brains, Minds, and Machines: The Science and the Technology of Intelligence*. Co-I (PI:Tomaso Poggio).

## Honors and Awards

Faculty Research Award, Google AI, 2019.

American Physiological Society *APSselect* award for the article "A fast, invariant representation for human action in the visual system", 2018.

Mark Gorenberg Graduate Student Fellowship, McGovern Institute for Brain Research MIT, 2013-2014.

National Science Foundation Graduate Research Fellowship, 2010-2013.

MIT Graduate Women of Excellence Award, 2013.

Teresa Keng Graduate Teaching Prize, MIT Biology Dept., 2012.

Women in Machine Learning NeurIPS Student Travel Grant, 2012.

## Invited Talks

CVPR NeuroVision Workshop 2022. "The neural computations underlying human social visions and lessons for computer vision."

UC Santa Barbara Mellichamp Mind-Machine Summit 2022. "The neural basis of human social interaction perception."

University of Michigan Cognitive Area Talk 2022. "The neural basis of human social interaction perception."

American University Cognition and Cognitive Neuroscience Seminar Series 2021. "The neural basis of social interaction perception."

John Hopkins University Mind/Brain Institute Bodian Seminar Series 2021. "The neural basis of human social interaction perception."

Cognitive Computational Neuroscience (CCN) Workshop 2021. "Discriminative vs. generative computations in high level vision".

University of Regensburg Cognitive Neuroscience Seminar 2021. "The representational space of human action and social interaction perception."

Social and Affective Neurosciences (SANS) 2021. "Social interaction perception in natural vision."

Dartmouth Center for Cognitive Neuroscience Talk Series 2021. "The representational space of human action and social interaction perception."

UC Merced Mind, Technology, & Society Talk Series 2021. "The neural basis of human social interaction perception."

University of Alabama Birmingham, BrainCore Seminar 2021. "The neural computations underlying human social interaction perception"

NeurIPS workshop on Shared Visual Representations in Humans and Machines 2020. "Social visual representations in humans and machines."

Cognitive Computational Neuroscience (CCN) Workshop 2020. "Extracting high-level visual and social information from the human brain using linear models".

Capital Area Cognition, Attention, and Perception Conference 2020. "The speed of human social interaction perception."

Morgan State ASCEND Scholars Seminar 2019. "The computational neuroscience of social vision."

Rutgers University Women in Neuroscience Seminar 2018. "The neuroscience of artificial intelligence."

Bernstein Computational Neuroscience Workshops 2018. "The neural dynamics of human action and interaction perception."

International Biomagnetism Conference 2018. "Rapid detection of social interactions in the human brain."

Cognitive Neuroscience Society 2018. "Fast, invariant representations for human action in the visual system."

Johns Hopkins University Biomedical Engineering Special Seminar 2018. "The Computational and Neural Basis of Social Vision: Perceiving Human Actions and Interactions."

UC Santa Barbara Psychological and Brain Science Seminar 2018. "The Computational Neuroscience of Social Vision: Perceiving Human Actions and Social Interactions."

Northwestern University Psychology Colloquium 2018. "The Computational Neuroscience of Social Vision: Perceiving Human Actions and Social Interactions."

Boston University Biomedical Engineering Seminar Series 2018. "The Computational and Neural Basis of Social Vision: Perceiving Human Actions and Interactions."

Johns Hopkins University Cognitive Science Seminar 2017. "Perceiving Human Actions and Social Interactions."

UC Irvine Cognitive Science Seminar 2017. "The Computational Neuroscience of Social Vision: Perceiving Human Actions and Social Interactions."

Affective Brain Lab, University College London/MIT, 2015. "The neural dynamics of invariant action recognition."

Cognitive Neuropsychology Lab, Harvard University, 2015. "The dynamics of invariant object and action recognition in the human visual system."

Brain Image Analysis Research Group, Carnegie Mellon University, 2014. "The dynamics of invariant object and action recognition in the human visual system."

## Selected Conference Presentations

Developmental differences in social brain responses during movie viewing. Shirahatti, A. and **Isik, L.**, Poster: Cognitive Computational Neuroscience 2022.

Social Inference from Relational Visual Information: An Investigation with Graph Neural Network Models. Malik, M. and **Isik, L.**, Poster: Cognitive Computational Neuroscience 2022.

Hierarchical representations of naturalistic social interactions in the lateral visual pathway. McMahon, E., Bonner, M., and **Isik, L.**, Poster: Cognitive Computational Neuroscience 2022.

Disentangled face representations in deep generative models and the human brain. Soulos, P. and **Isik, L.**, Poster: Cognitive Computational Neuroscience 2022.

Social inference from relational visual information. Malik, M. and **Isik, L.**, Selected Talk: Vision Science Society (VSS) 2022.

Naturalistic two-person social perception in the brain. McMahon, E., Bonner M., and **Isik L.** Poster: Vision Science Society (VSS) 2022.

Neural basis of remembering details of a social versus non-social scene shown in a natural movie. Lee Masson, H., Chang, L., Chen, J. and **Isik L.** Poster: Vision Science Society (VSS) 2022.

A data-driven investigation of human action representations. Dima, D., Tomita, T., Honey C., Hebart M., and **Isik, L.**, Poster: Vision Sciences Society (VSS) 2021.

Selective processing of social interactions during natural movie viewing. Lee Masson, H. and **Isik, L.**, Poster: Vision Sciences Society (VSS) 2021.

A large-scale naturalistic dataset of two-person social actions. McMahon, E., Bonner, M., and **Isik, L.**, Poster: Vision Sciences Society (VSS) 2021.

A multi-regression model of social perception during natural movie viewing. Chang, L., Lee Masson, H., and **Isik, L.**, Poster: Vision Sciences Society (VSS) 2021.

Disentangled face representations in deep generative models and the human brain. Soulos, P. and **Isik, L.**, Poster: NeurIPS workshop on Shared Visual Representations in Humans and Machines (SVRHM) 2020.

The representational space of action perception. Dima, D., Tomita, T., Honey, C., and **Isik, L.**, Poster: Vision Sciences Society (VSS) 2020.

Disentangling the features of human action perception. Dima, D., Tomita, T., Honey, C., and **Isik, L.**, Talk: Capital Area Cognition, Attention, and Perception Conference 2020.

The speed of social interaction perception in the human brain. **Isik, L.**, Mynick, A., Pantazis, D., and Kanwisher, N. Poster: Cognitive Computational Neuroscience (CCN), Philadelphia, PA 2018.

The neural dynamics of social perception. **Isik L**, Mynick A, Koldewyn K, and Kanwisher N. Poster: Vision Sciences Society (VSS), St. Petersburg, FL, 2018.

Invariant recognition drives neural representations of actions. **Isik, L.**, Tacchetti A., and Poggio T. Poster: Cognitive Computational Neuroscience (CCN), New York, NY, 2017.

Fast, invariant representations for action in the human visual system. **Isik, L.**, Tacchetti, A., and Poggio T. Talk: The International Conference on Biomagnetism (Biomag), Seoul, South Korea, 2016.

Probing human intracranial visual responses with commercial movies. **Isik, L.**, Singer, J., Madsen, J.R., Kanwisher, N., and Kreiman, G. Poster: Vision Sciences Society (VSS), St. Petersburg, FL, 2016.

Invariant representations for action in the human visual system. **Isik, L.**, Tacchetti, A., and Poggio, T. Poster: Computational and Systems Neuroscience (COSYNE), Salt Lake City, UT, 2015.

Invariant representations for action in the human visual system. **Isik, L.**, Tacchetti, A., and Poggio, T. Poster: Society for Neuroscience, Washington D.C., 2014.

Readout of dynamic action sequences with MEG decoding. **Isik, L.**, Tacchetti, A., and Poggio, T. Poster: International Conference on Biomagnetism, Halifax, Canada, 2014.

Decoding invariant visual information with MEG sensor and source data. **Isik, L.**, Han, Y., and Poggio, T. Poster: NeurIPS Workshop on Machine Learning and Interpretation in Neuroimaging, Lake Tahoe, NV., 2013.

A spatiotemporal profile of invariant object recognition in the human visual system. **Isik, L.**, Meyers, E.M., Leibo, J.Z., and Poggio, T. Talk: Society for Neuroscience, San Diego, CA, 2013.

The dynamics of invariant object recognition. **Isik, L.**, Meyers, E.M., Leibo, J.Z., and Poggio, T. Poster: Computational and Systems Neuroscience (COSYNE), Salt Lake City, UT, 2013.

Decoding visual stimuli with magnetoencephalography. **Isik, L.**, Meyers, E.M., Leibo, J.Z., and Poggio, T. Poster: Women in Machine Learning Workshop, Lake Tahoe, NV., 2012.

Detecting invariant visual signals with MEG decoding. **Isik, L.**, Meyers, E.M., Leibo, J.Z., and Poggio, T. Poster: Society for Neuroscience, New Orleans, LA, 2012.

A hierarchical model of peripheral vision. **Isik, L.**, Leibo, J.Z., Lee, S.W., Mutch, J., and Poggio, T. Poster: Society for Neuroscience, Washington D.C., 2011.

## Teaching

JHU Cognitive Science Department, Visual Cognition. Spring 2020-2022.

JHU Cognitive Science Department, Computational Social Cognition. Fall 2021.

MIT Biology Department, 7.QBWx Quantitative Biology Workshop. Instructor for section on "Introduction to Machine Learning and Biology". January 2014, January 2016. Available on EdX.

Brains, Minds, and Machines, Summer Course, Marine Biological Laboratory. Teaching Assistant (Profs. Tomaso Poggio, Gabriel Kreiman, Nancy Kanwisher, Josh Tenenbaum, and Boris Katz). Summers 2014, 2015.

## Advising

### *JHU*

Haemy Lee Masson (Postdoc) 2020-present.

Diana Dima (Postdoc) 2019-2021.

Kathy Garcia (PhD) 2022-present.

Hannah Small (PhD) 2021-present.

Manasi Malik (PhD) 2021-present.

Emalie McMahan (PhD) 2019-present.

Paul Soulos (MA, PhD) 2019-present.

Angira Shirahatti (MA) 2021-present.

Gemma Nicholson (MA) 2019-2020.

Victoria Liu (undergraduate, 2023) 2021-present.

Josh Kim (undergraduate 2023) 2021-present.

Jihoon Kim (undergraduate 2024) 2021-present.

Lucy Chang (undergraduate, 2023) 2020-present.

Cora Mentor Roy (undergraduate, 2021) 2020-2021.

Emmanuel Ochieng (undergraduate, 2022) 2020-present.

Susan Liu (undergraduate, 2023) 2020-2021.

Melody Lee (undergraduate, 2023) 2020-2021.

Bethany Kemp (undergraduate, 2023) 2020-2021.



*MIT/Harvard*

Elizabeth Eastman (undergraduate, MIT, 2018; Master of Engineering, MIT, 2019) 2018-2019.

Felix Sosa (undergraduate, University of Central Florida, MIT) 2018.

Yue Zhang (undergraduate, Tsinghua University) Summer 2017.

Aditya Karhade (medical student, Harvard Medical School, 2019) 2016-2017.

Francis Chen (Master of Engineering, MIT 2017) 2016-2017.

Manon Remy (undergraduate Polytech Nice Sophia, 2017) Summer 2016.

Kaley Jenney (undergraduate Emmanuel College 2017) 2015-2016.

Yena Han (undergraduate, MIT, 2014; Master of Engineering, MIT, 2015) 2012-2015.

Caroline Mak (undergraduate, MIT, 2018) 2014-2015.

Heejung Kim (undergraduate, MIT, 2013) 2012-2013.

Toby Clark (undergraduate, Duke, 2013) Summer 2013.

**Service**

Cognitive Computational Neuroscience (CCN) Conference Program Committee. 2020-present. Co-Chair 2021-present.

Associate Editor PLoS Computational Biology. 2019-present.

Neuromatch Academy research team mentor. 2020.

Ad-hoc reviewer: PNAS, Neuron, Nature Neuroscience, Nature Communications, Journal of Neuroscience, Neuroimage, Cerebral Cortex, PLoS Computational Biology, eLife, IEEE Transactions, Scientific Reports, PLoS ONE.

Graduate Women at MIT, Executive co-chair. 2013-2015.