

Vaibhav Thakur, MS, MA,

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EDUCATIONAL QUALIFICATION:

- PhD (continuing student): University of California – Los Angeles (Fall 2019-present)
- MS Thesis, Indian Institute of Science, Bangalore (2016-2017)
Title: Study of Kinematic Planning and Decision Making in Hand Movement
- BS-MS, Indian Institute of Science Education and Research, Pune (2012-2017)
- Jawahar Navodaya Vidyalaya, Pune (2005-2012)

ACADEMIC EMPLOYMENT HISTORY:

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| ▪ Teaching Assistant | University of California - Los Angeles | <i>March 2020 – June 2020</i> |
| ▪ Staff Research Associate II | University of California – Los Angeles | <i>Nov 2017 – Aug 2019</i> |
| ▪ Research Assistant | Indian Institute of Science, Bangalore | <i>May 2016 – Oct 2017</i> |

PUBLICATIONS:

- **Thakur, V.**, Basso, M., Ditterich, J., Knowlton, B., Implicit learning of Bayesian priors in perceptual decision-making task. ([Scientific Reports – August 2021](#))
- **Thakur, V.**, Murthy, A., Neural representations underlying the planning and execution of kinematic and dynamic movement parameters using electroencephalography. ([Thesis](#); Manuscript in progress)

PROFESSIONAL SKILLS:

- Research skills: Psychophysocal experiments, Rodent surgeries, and Computational modeling
- Model system: Humans (healthy and clinical), and Mice
- Neuroimaging: EEG, Confocal Microscopy
- Programming: Python, MATLAB, R, C++, Fortran95, Arduino
- Graphics: PyGame, QT5, Psychtoolbox, MS-Office

WORKSHOPS/SUMMER SCHOOL:

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| ▪ Neuromatch Academy Summer Workshop – Deep Learning | <i>Aug 2021</i> |
| ▪ Neuromatch Academy Summer Workshop – Computational Neuroscience | <i>July 2020</i> |
| ▪ Methods of Information Theory in Computational Neuroscience, OCNS, Seattle | <i>Jun 2018</i> |
| ▪ Computational Approaches to Memory and Plasticity (Summer School), NCBS, India. | <i>July 2017</i> |
| ▪ 1 st Workshop on Brain, Computation, and Learning, Indian Institute of Science, India. | <i>January 2017</i> |
| ▪ 4 th Cognition Workshop, organized by Indian Institute of Science, India. | <i>June 2016</i> |

SCHOLARSHIPS AND ACHIEVEMENTS:

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| ▪ CSIR NET 2016 - Junior Research Fellowship (All India Rank 141) | <i>December 2016</i> |
| ▪ Department of Science and Technology - INSPIRE fellowship | <i>August 2012 - May 2017</i> |
| ▪ Govt. of India - Navodaya Vidyalaya Samiti Education Program | <i>June 2005 – April 2012</i> |

CONFERENCES:

I) PRESENTATIONS:

- [Thakur, V., Ditterich, J., Basso, M., Knowlton, B., Different influences of explicit and implicit Bayesian priors on perceptual decision-making. Presented at Society for Neuroscience, Chicago, Oct 2019](#)
- Knowlton, B., Thakur, V., Perugini, A., Shaikh, A., Basso, M., Use of priors in perceptual decision-making in clinical subtypes of Parkinson's disease. Presented Cognitive Neuroscience Society Meeting, San Francisco, March 2019.
- [Knowlton, B., Thakur, V., Perugini, A., Basso, M., Implicit learning of Bayesian priors in perceptual decision-making task. Presented at Society for Neuroscience, San Diego, Nov 2018.](#)
- [Thakur, V., Murthy, A., Neural correlates of kinematic planning and execution. Presented at Society for Neuroscience, San Diego, 2018.](#)

II) OTHER POSTERS:

- Schorn, J., Thakur, V., Knowlton, B., Interleaved practice enhances implicit learning of motor sequences. Presented at Psychonomic Society Meeting, New Orleans, Nov 2018.
 - [McKee, C., Perugini, A., Thakur, V., Knowlton, B., Iacoboni, M., Basso, M., Shattuck, D., Isolation and characterization of medial temporal lobe-basal ganglia circuit using diffusion magnetic resonance imaging. Presented at Society for Neuroscience, San Diego 2018.](#)
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RESEARCH EXPERIENCE:

- **Understanding of neural microcircuit of decision-making using optogenetic and electrophysiology:**
Advisor: [Prof. Michele Basso](#), Professor, University of California, Los Angeles. *Oct 2018-Present*
 - Training mice to perform perceptual decision-making task.
 - Automated training procedure with own python based software.
 - We will use optogenetic technique to excite/inhibit neurons in SC and observe if it has an effect on decision-making process.
- **Use of priors in perceptual decision-making task in clinical subtypes of Parkinson's disease:**
Advisor: [Prof. Barbara Knowlton and Prof. Michele Basso](#), Professor, University of California, Los Angeles. *Apr 2017 – Present*
 - Previous literature shows that Parkinson's patients are impaired at learning perceptual biases.
 - In this experiment, we collected the data from two sub-type of Parkinson's patients with different brain regions impaired. Based on their performance we can deduce the possible brain regions involved in this learning impairment.
- **Strategies for implicit learning of motor sequences and transfer of learning:**
Advisor: [Prof. Barbara Knowlton](#), Professor, University of California, Los Angeles. *Jan 2017 – May 2019*
 - In this study, we are trying to compare the benefits of interleaved versus blocked practice in motor learning task.
 - My part was to help in designing the experiment paradigm based on previously known sequential reaction time task and implement the task.

▪ **Implicit learning of Bayesian priors using perceptual decision-making task:**

Advisor: Prof. Barbara Knowlton and Prof. Michele Basso, Professor, University of California, Los Angeles.
Nov 2017 – March 2021

- Through this study we tried to understand if the perceptual biases can be learned implicitly and what is the mechanism behind it.
- For this we designed the experiment paradigm based on glass-pattern stimulus and collected data from healthy human subjects.
- Furthermore we used drift diffusion model to understand the mechanism of this learning.

▪ **Study of kinematic planning and initiation of hand movement using electroencephalography:**

Advisor: Prof. Aditya Murthy, Professor, CNS, Indian Institute Science (IISc). *May 2016 - Oct 2017*

- Studied the neural representations underlying the planning and execution of movement parameters such as kinematics and dynamics in humans.
- Successfully initiated EEG study in the lab for the first time and the corresponding analysis pipeline is self-developed with the help of previous literature.
- The results support the idea that kinematic information is dominant in premotor cortex during planning and feedforward movement and moves to parietal cortex during online control.

▪ **Modeling and simulation of purinergic signaling in astrocytes:**

Advisor: Dr. Suhita Nadkarni, Assistant Professor, Biology Dept., IISER Pune *Jan 2016 – Apr 2016*

- The purine nucleosides modulate cell (neuron and astrocyte) activity by an increase in calcium level via P2Y receptors.
- Similar signaling mechanisms are implicated in memory, learning, and feeding behaviors.
- I tried to model and understand how this type of receptors modulate the synaptic transmission in neurons by changes in calcium concentration.

▪ **The role of Formin2 in the retrograde flow of filopodia and lamellipodia:**

Advisor: Dr. Aurnab Ghose, Assistant Professor, Biology Dept., IISER Pune *Aug 2015 – Nov 2015*

- Retrograde flow is the net rearward flow of actin network in the cell. This process is essential for cell development and movement.
- I tried to find out how Formin knockout modulates the retrograde flow in lamellipodia and filopodia using confocal microscopy.

▪ **Quantification and state space modeling of learning of kinematics and dynamics in motor learning Task:**

Advisor: Prof. Aditya Murthy, Professor, Indian Institute Science. *May 2015 – Jul 2015 and Dec 2015*

- We recorded the hand movements and EMG of human subjects during task.
- Tried to identify which movement parameter is learnt in perturbed environments.
- In both kinematic and dynamic perturbation, the maximum deviation from the planned movement seems to be the learned parameter.

▪ **The role of DEP domain on Formin's cellular localization in neurons:**

Advisor: Dr. Aurnab Ghose, Associate Professor, Biology Dept., IISER Pune *Jan 2015 - Apr 2015*

- DEP domain is known for gene regulation, cytoskeleton regulation, and calcium regulation.
 - Formin is known for the polymerization of actin monomers and also contains the DEP domain.
 - I tried to find the role of DEP in the localization of the fmn2 protein.
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