Interaction of Sensory and Response Processes in Decision Making

California State University, San Bernardino (Palm Desert Campus)

University of California, Irvine

Dual goals

Scientific Goals

New approaches to studying perceptual decision making with neurophysiological and modeling tools.

Human Capital Development

The first academic research endeavour in the Coachella Valley

Scientific Goals

1. We address the questions of whether and how sensory signals gain direct access to the motor system.
2. We establish the temporal relations among figure-ground segregation, spatial attention, and response planning as a function of different classes of stimuli and task demands.
3. We develop and assess a trial-by-trial EEG chronometric analysis.
4. We apply the EEG chronometry to paradigms with both priming and negative-priming (contrast) effects to understand the locus of opposing behavioral phenomena.
5. We provide a first-ever assessment of the time-course of object recognition in tactile perception.
6. We make use of novel cognitive studies of tactile perception to understand whether the interplay between perception, attention, and response planning generalizes across the sensory scene.

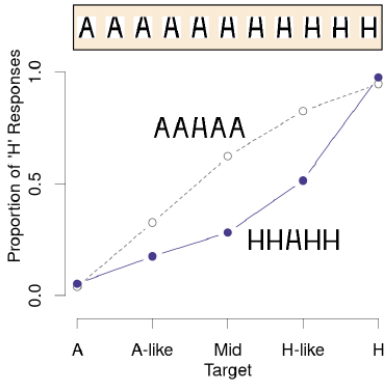
Human Capital Development

1. Our goal is to enhance STEM opportunities for underserved students at Palm Desert Campus of CSUSB by integrating the research and training programs of UCI Cognitive Sciences (PI Srinivasan and PI Rouder), with PDC (PI Gomez). PDC students are overwhelmingly Latinx (>80%), with 79% first-generation and 56% receiving Pell Grants.
2. We provide an opportunity for PDC students to gain STEM skills and to gain knowledge by contributing to active state-of-the-art research in cognitive neuroscience.
3. We help them discover new future research opportunities and directions at R1 universities and develop career goals in STEM fields.
4. We provide opportunities for UCI graduate students to develop teaching skills for students who may have fewer STEM opportunities in primary school.

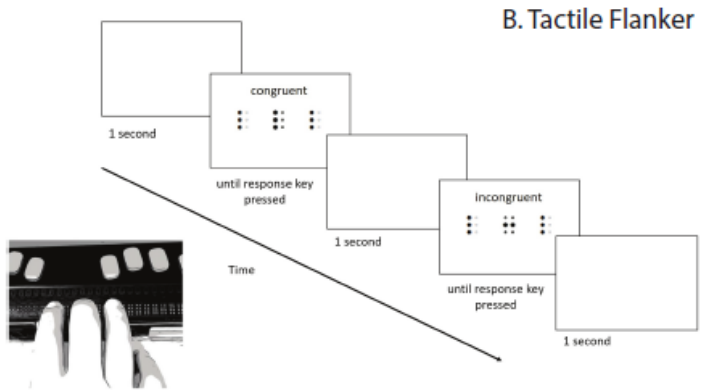
Basic question: How do we make decisions using sensory information, and how does context affect such process.

- Flanker task

- Morphed flanker task



- Tactile



Mathematical Models vs. Neurophys evidence

As a driver approaches a traffic light, a decision to brake or accelerate is made.

- The classic sequential account is that the driver first identifies the color and position of the traffic light and then decides on what motor action to take (Donders, 1868; Luce, 1986; Ratcliff, 1978; Sternberg, 1969).
- In contrast, a parallel account of decision-making posits that perceptual and motor processing are engaged in a dynamic interaction as the driver approaches the intersection.

Summer Irvine Fellowship

- Students from CSUSB came to Irvine to be apart of a part of summer experience
- Students were apart of enrichment days were they learned about current research in neuroscience and how it goes along with the current research at hand
- Students were able to expand and create their own research project
- Challenges with COVID

Summer school schedule (1 of 2)

Date	**Topic**	**Program**
July 19	Welcome meeting Virtual	All
July 20 – 21	EEG laboratory skills	PDC
July 25-28	EEG laboratory skills	PDC
August 1	EEG SOP presentation by PDC students	UCI
August 1	Demonstration of EEG recording (by PDC students with feedback from UCI students)	UCI
August 2	Basics of EEG signal processing using Python	UCI
August 2	Introduction to design of experiments and metacontrast masking	UCI
August 3	Implementation of a metacontrast masking experiment	UCI
August 3	Introduction to R for data analysis	UCI

Summer school schedule (2 of 2)

Date	**Topic**	**Program**
August 8-11	EEG experiments on Flanker task	UCI
August 8-11	Behavioral pilot studies on metacontrast masking	PDC
August 15	R data analysis of behavioral data	UCI
August 15	R data analysis of EEG data	UCI
August 16	Discussion of Fall research plan and NeuroFest	UCI
August 16	R data analysis of EEG data	UCI

Students at UCI fellowship

Experiments underway

At UCI

Studies related to the grants first specific goal: the effects of unattended stimuli on decision making using variations of the flanker task.

At CSU

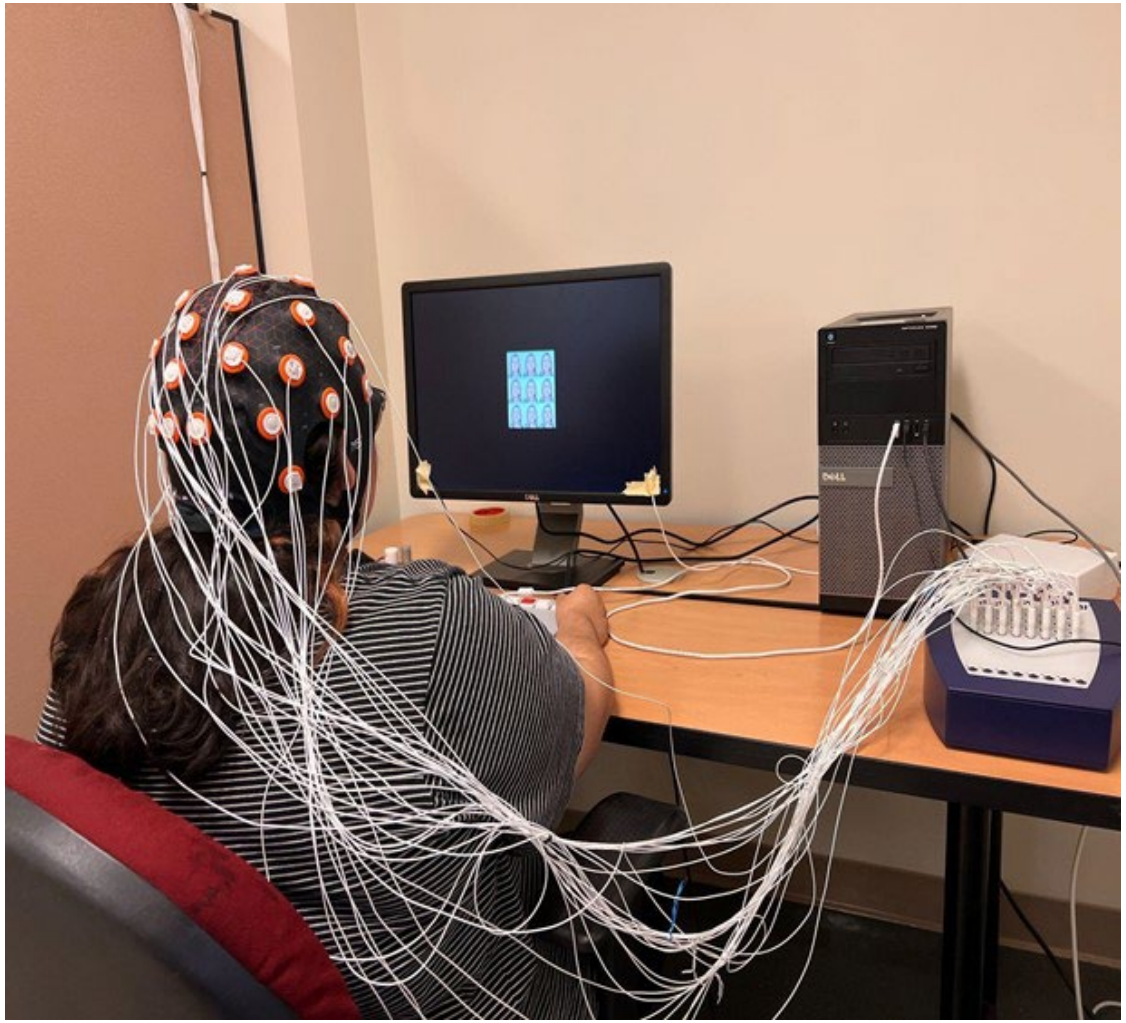
Three students are currently working on their honors theses, using paradigms that extend the experiments proposed in the grant.

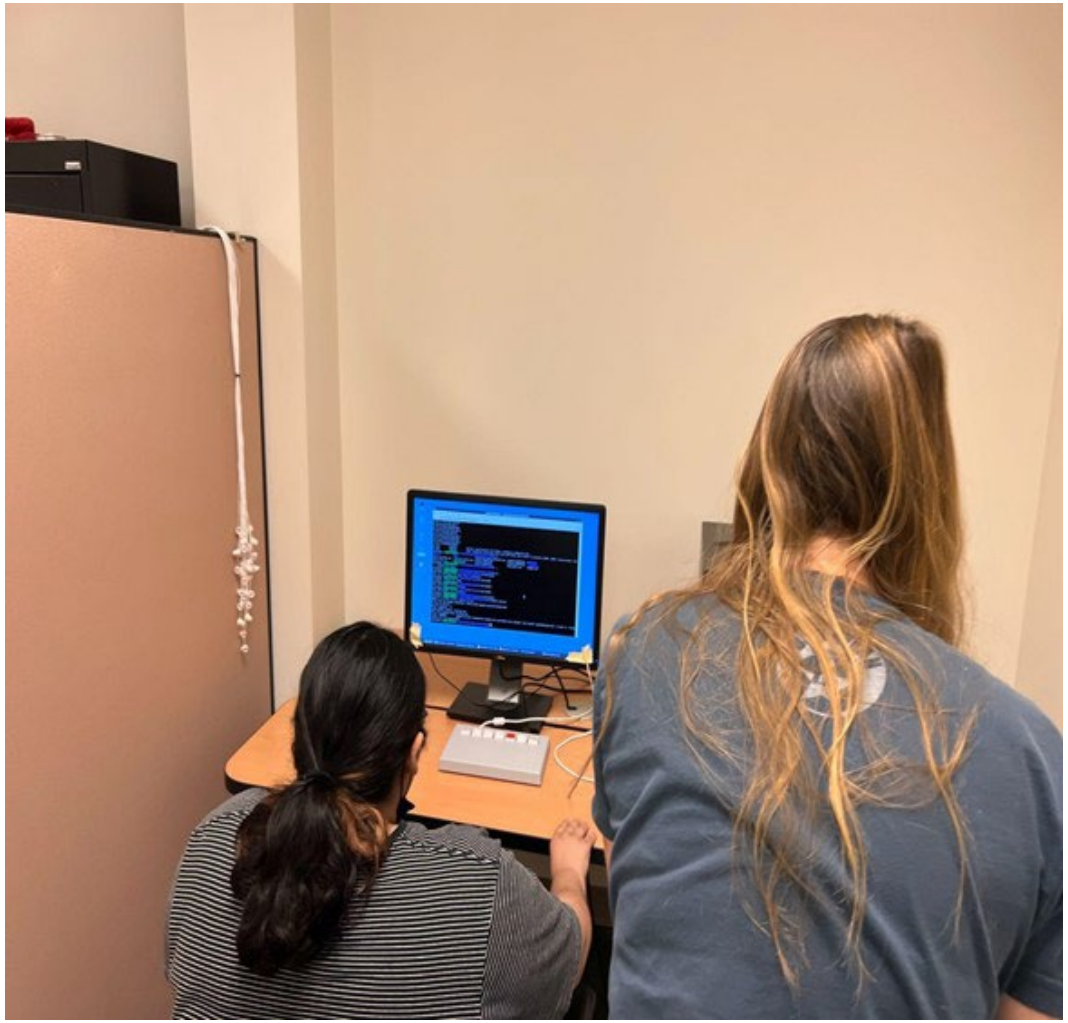
Electronics components

One project that is in development makes use of novel cognitive studies of tactile perception to understand whether the interplay between perception, attention, and response planning generalizes across the sensory modalities.

Students develop the tactile interfaces for experiments.

Student Conducting Experiment





What will be next?

Neurofest

Students will create a science based science fair where they will show the community what they have done with their experiments. This will bring the community more awareness of the fields of research in neuroscience. The community will also be exposed to science research and the benefits of it. This will be held in early Spring 2023 in the Coachella Valley.

Challenges

- COVID
- Recruiting students at the beginning was quite a challenge; but once a critical mass was achieved, it stopped being a problem; now PDC lab has 8 undergraduates consistently working on projects
- CSU system teaching load
- Adjusting expectations

Thank you for your time!