



KC Jacobson

Ph.D. Student, Bioengineering in ChBE
Second Year ARCS Scholar Herz Global Impact Award

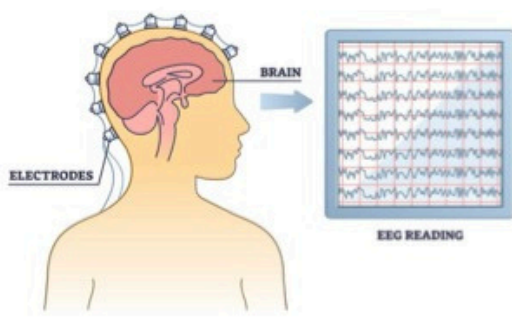


Quantifying neural & perceptual impairments in autism spectrum disorder (ASD) model mice

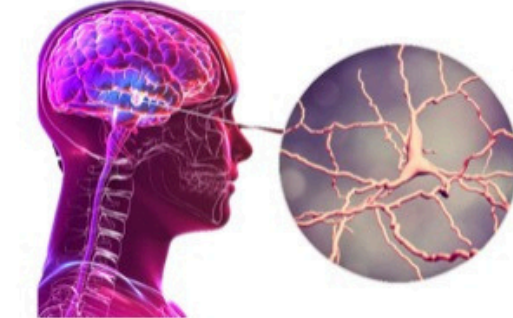
Autism spectrum disorder (ASD) affects 1/36 people¹, but finding the cause is still elusive



No large brain malformations²



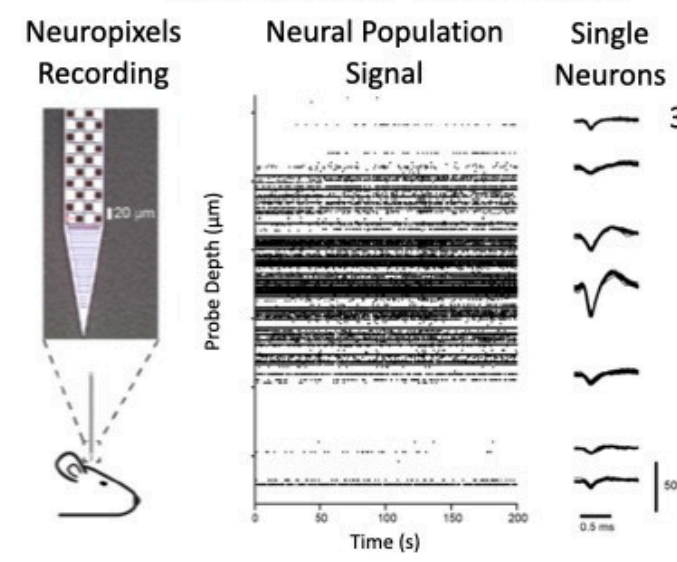
No consistent functional changes found in EEG or fMRI²



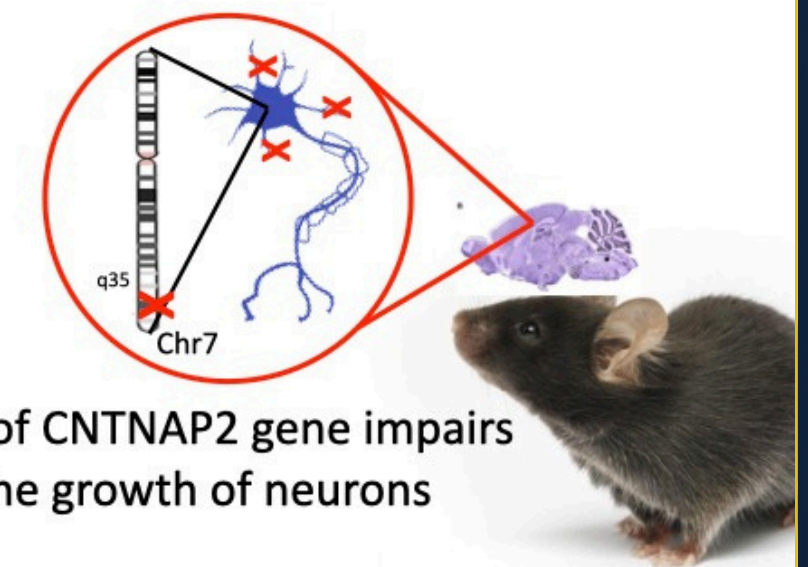
However, post-mortem studies have shown microscopic defects in individual neurons²

But how can we measure microscopic neural differences in a live brain?

State of the art electrodes for in-vivo cellular recordings



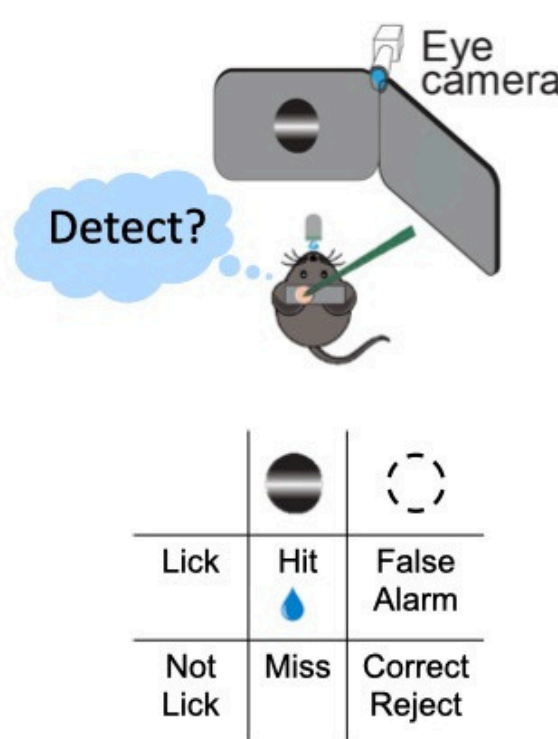
Genetic engineering to recreate human ASD risk factor genes in mice



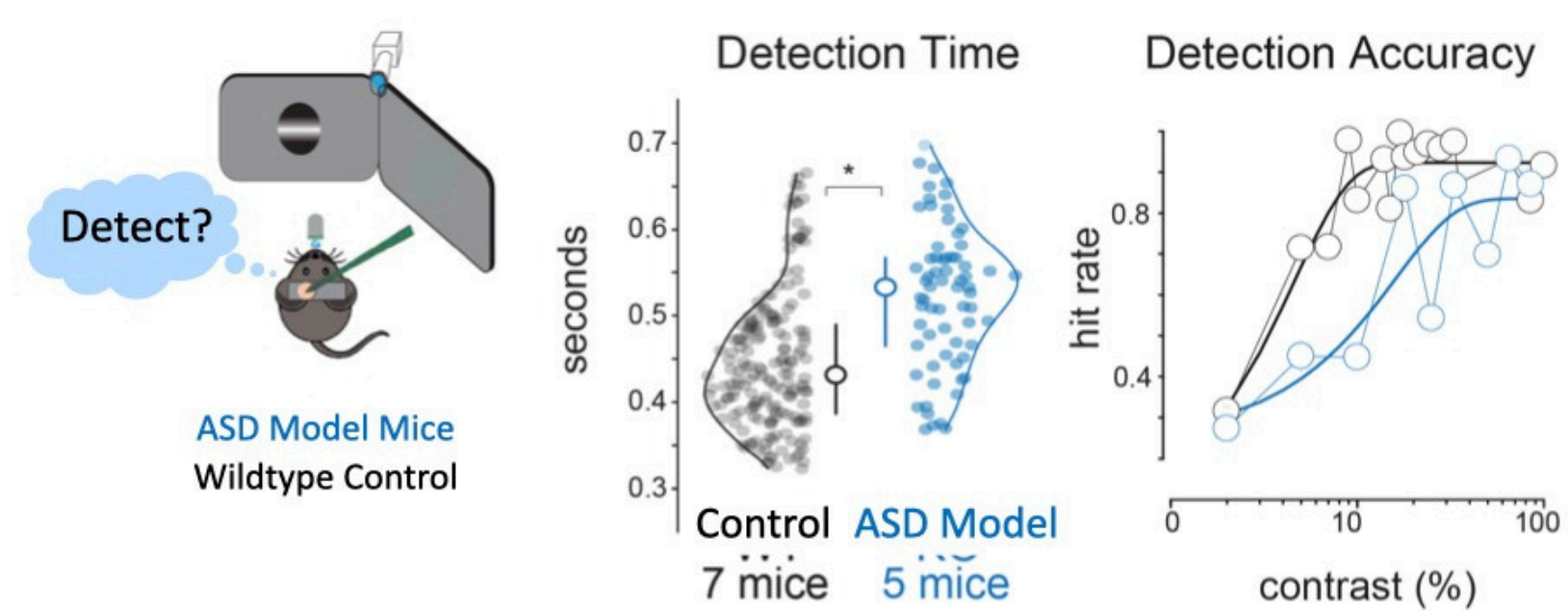
Loss of CNTNAP2 gene impairs the growth of neurons

How do we link neural activity to behavior in an animal model?

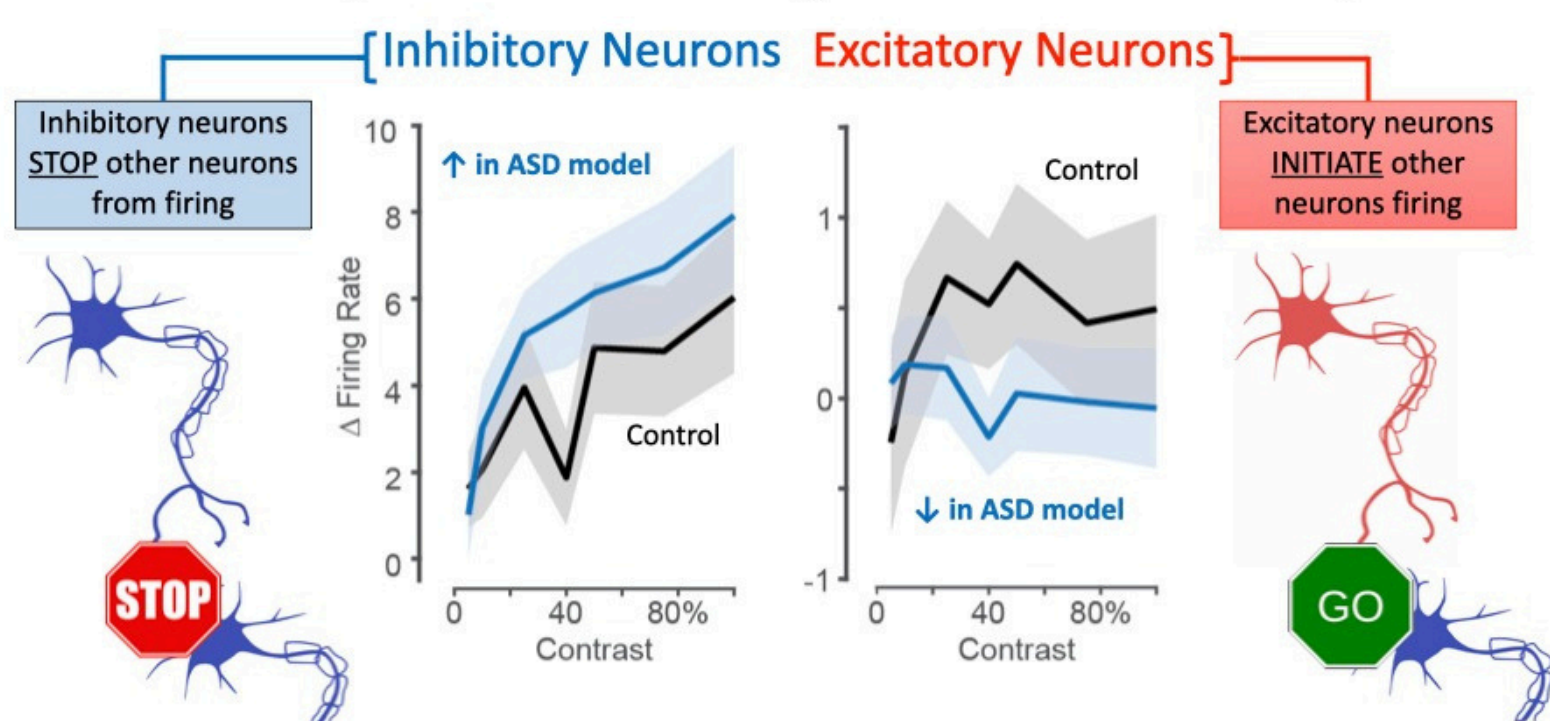
- ~90% of people with autism experience hyper- or hypo-sensitivity to sensory stimuli⁴
- The visual processing system is highly conserved across mammals
- Train ASD model mice in a visual detection task to test sensitivity to stimuli at a range of contrasts, and directly link behavior to simultaneous neural recordings



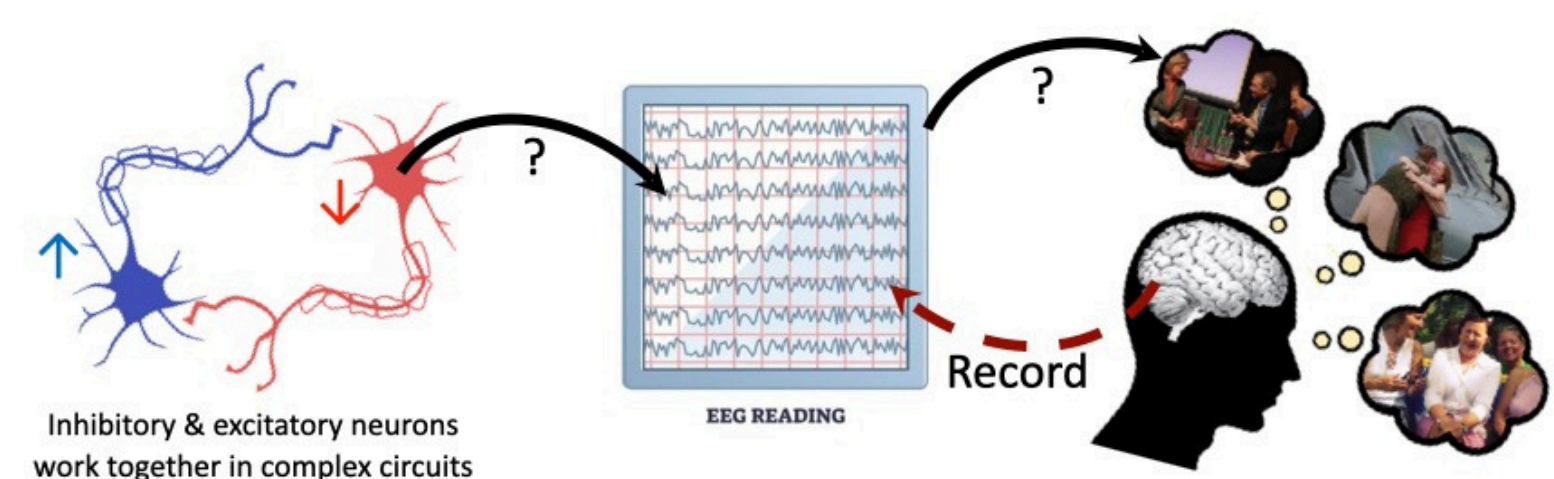
Validation of Model: ASD model mice exhibit decreased performance in our behavioral task



Decreased behavioral performance linked to different patterns in single neuron activity



Goal/Future Steps: Understand how single neurons come together to form brain-wide activity to create behavior in both health & disease



Significance: Finding measurable, brain-wide signatures of ASD would improve quantitative diagnostics

ACKNOWLEDGMENTS: ADVISOR: Dr. Bilal Haider **FINANCIAL CONTRIBUTIONS:** Simon's Foundation Autism Research Initiative (SFARI), ARCS Foundation Award **PRELIMINARY DATA:** Del Rosario J, Speed A, Arrowood H, Motz C, Pardue M, Haider B. Diminished Cortical Excitation and Elevated Inhibition During Perceptual Impairments in a Mouse Model of Autism. Cereb Cortex. 2021 Jun 10;31(7):3462-3474. doi: 10.1093/cercor/bhab025. PMID: 33677512; PMCID: PMC8525192. Grant affiliation: Simon's Foundation Autism Research Initiative (SFARI)

Scholar Awards Celebration
November 15, 2023



Igniting Innovation in Georgia