
# Zachary Mobille

**HA (Gus) Peed Award**

*Ph.D. Candidate, Quantitative Biosciences*

*First Year ARCS Scholar*


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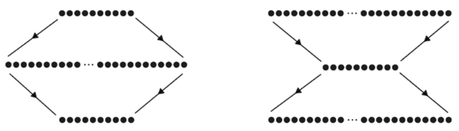
# Information coding and structural motifs in spiking neural networks

Utilizing data-driven mathematical models, we seek to understand how complex network structure and precisely-timed neural activity interact to optimize information processing in the brain.

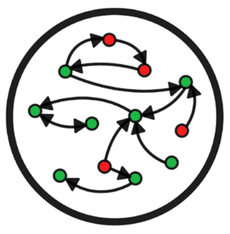
## The brain is a network with complex connectivity “motifs”

feedforward



e.g. cerebellum, early visual system

recurrent

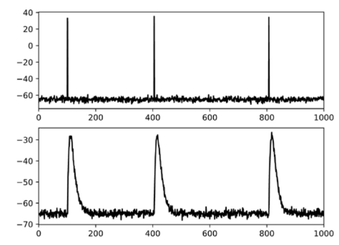


e.g. cortex

## Neurons interact at discrete “spike” times

pre-synaptic (mV)

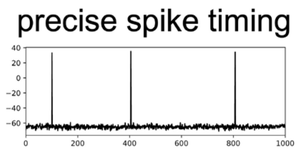
post-synaptic (mV)

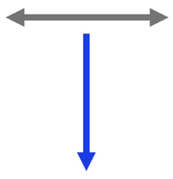



time (ms)

## Mathematical modeling approach

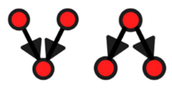
precise spike timing



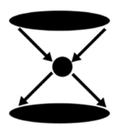



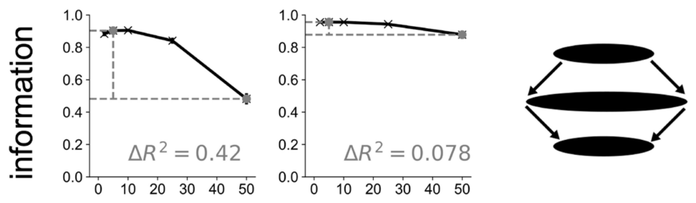
information coding

convergent & divergent structure



## Bottlenecks associated with precise timing codes

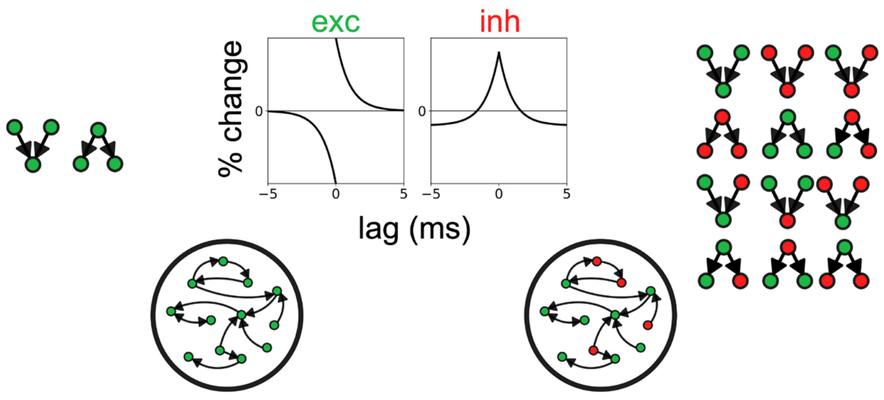







*Mobille et al (2024)*

## Extend previous theories to account for both excitatory and inhibitory neurons




## Novel information decomposition analysis on 3-neuron motifs




**Scholar Awards Celebration**

**November 13, 2024**

SCHOLAR AWARDS CELEBRATION ARCS FOUNDATION ATLANTA

*Igniting Innovation in Georgia*