How the brain shapes its own input: using stateflow to study behavior

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Sensory responses lead to perception

- Trumpet labeled with "metal"
- Jazz performer labeled with "jazz"
- Eye labeled with "gold"
- Neural activity labeled with "action potential or 'spike'"
- Potential: 5mV, Time: 1ms
Sensory responses are not constant

- Spike rate encodes stimulus intensity
- Spike rate decreased by movement

Diagram showing the pathways from brainstem, thalamus, and cortex for sensory responses.
Perception is also affected by movement

![Brain diagram with sensory pathways](image)

- Cortex
- Thalamus
- Brainstem
- Descending sensory pathway
- Ascending sensory pathway

![Graph showing percent detected vs. stimulus intensity](image)

- Percent detected on the y-axis
- Stimulus intensity on the x-axis
- Red line indicates movement

Perception is also affected by movement.
Our model system – the rat whisker system

'Rats are curious animals that use their whiskers to explore their environment'
The active touch paradigm

With movement

- reward
- licks

- magnetic cartridge

- whisker

250 ms

Without movement

- 10 mV

- 20°
Task controller with Simulink and Stateflow
Task controller with Simulink and Stateflow
Sensory modulation during movement - the brain shapes its own responses!

Without movement vs. With movement

Sensory responses reduced early on! But via which pathway?
Do we really perceive reality?
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