A system-level computational model of decision-making and learning in the lateral and medial sub-regions of Orbitofrontal Cortex

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Abstract

Orbitofrontal Cortex

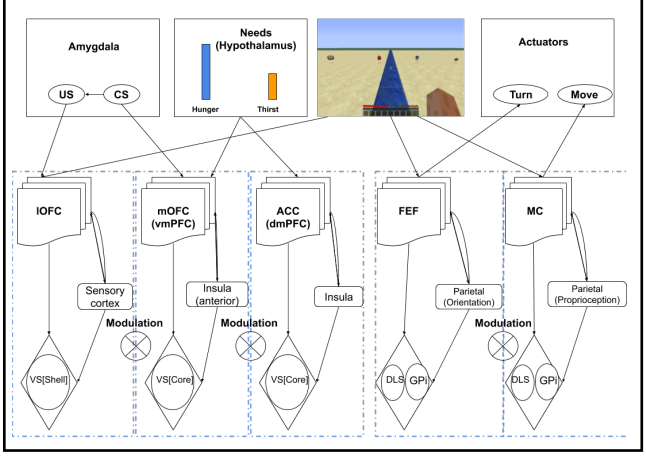
Flexible and adaptive animal behavior through value-based decision making and learning

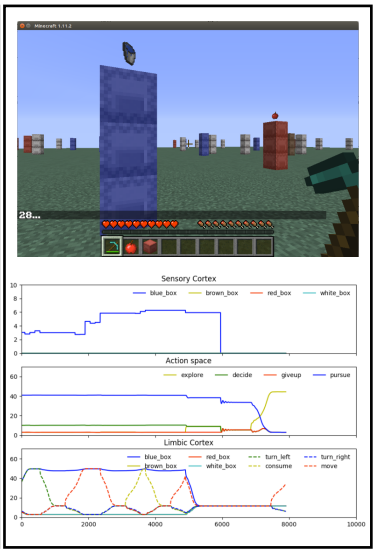
Pavlovian valuation with basolateral amygdala (BLA)

Instrumental valuation with Anterior Cingulate Cortex (ACC) and Ventral Striatum (VS)

Closed-loop dynamics with the Basal Ganglia (BG) and the Thalamus - Limbic (CtxBG) Loops

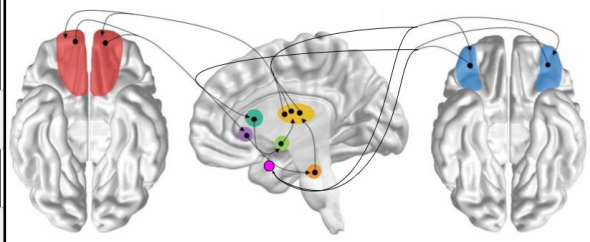
Limbic and sensori-motor loop interactions (Krack et al., 2010)



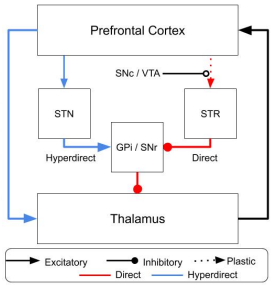


Lateral	Medial
Projections from Sensory areas and Amygdala	Projections from visceral areas like Lateral Hypothalamus
External features [1]	Internal motivation[1]
Outcome Identity[2]	Outcome Value[3]
After feedback[1]	Before feedback[1]
Credit Assignment[3]	Value Comparison[4]

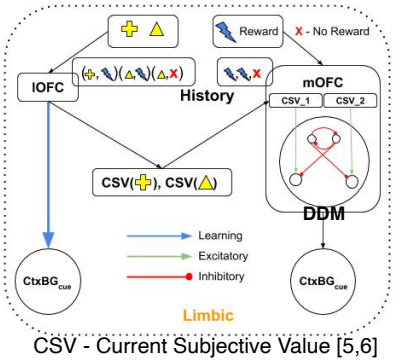
Medial and Lateral Thalamo-BG closed-loop connectivity (Fettes et al., 2017)



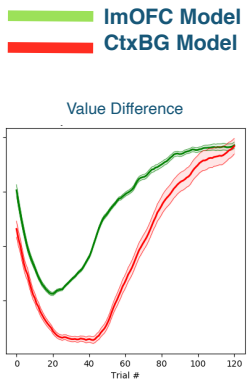
CtxBG (Boraud et al., 2018)



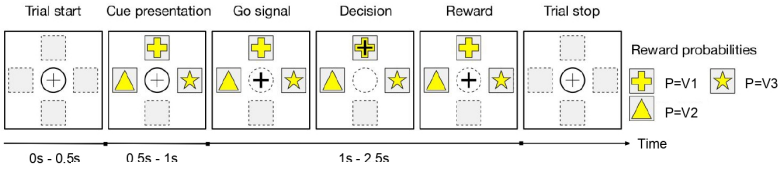
lmOFC Model



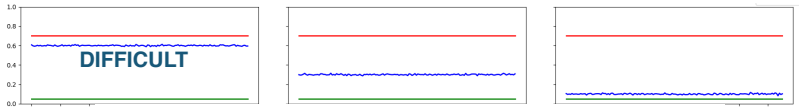
CSV - Current Subjective Value [5,6]



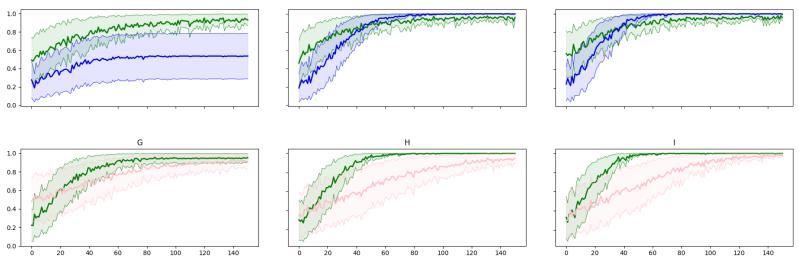
3-Arm Bandit Task



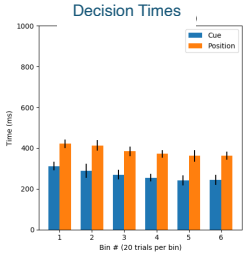
Reward Schedules : V1 - Red, V2 - Blue, V3 - Green



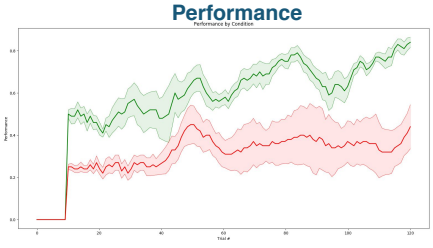
Effects of lesions : Control (Green) vs Medial OFC (Blue) vs Lateral OFC (Pink)



Decision Times



Performance



Hypotheses : Medial vs Lateral OFC

- Value prediction vs State prediction
- Task beginning vs Task ending
- Model-Free vs Model-Based

References

[1] Bouret et al., 2010
[2] Walton et al., 2010
[3] Noonan et al., 2010
[4] Hunt et al., 2012
[5] Bissonette et al., 2013, [6] Grossberg 2018