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► **To cite this version:**

Bhargav Teja Nallapu, Frédéric Alexandre. A system-level computational model of decision-making and learning in the lateral and medial sub-regions of Orbitofrontal Cortex. OFC 2019: Fourth Quadrennial Meeting on OFC Function, Nov 2019, Paris, France. hal-02417618

HAL Id: hal-02417618

<https://inria.hal.science/hal-02417618v1>

Submitted on 18 Dec 2019

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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

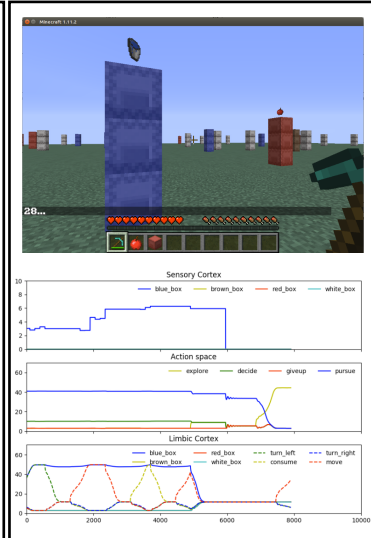
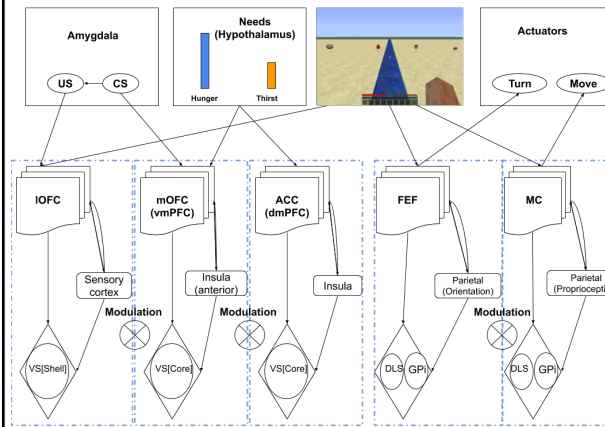
Flexible and adaptive animal behavior through value-based decision making and learning

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

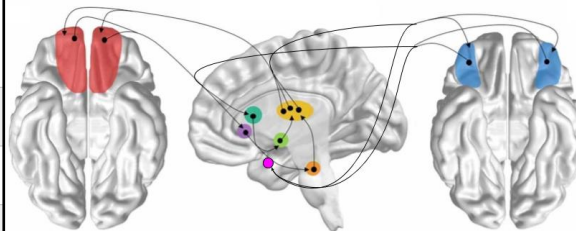
Limbic and sensori-motor loop interactions (Krack et al., 2010)



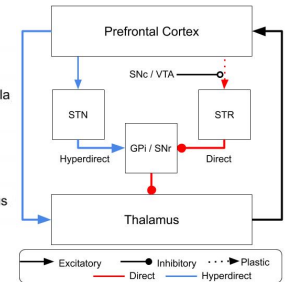
Lateral

Medial

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



CtxBG (Boraud et al., 2018)



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]

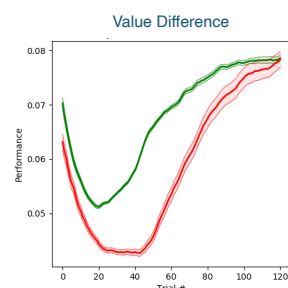
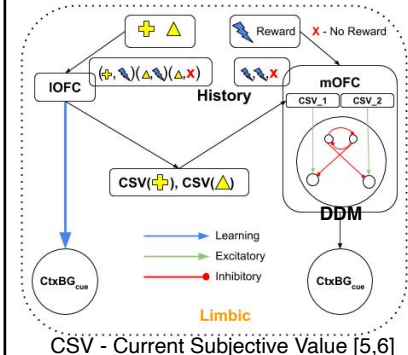
Before feedback[1]

Credit Assignment[3]

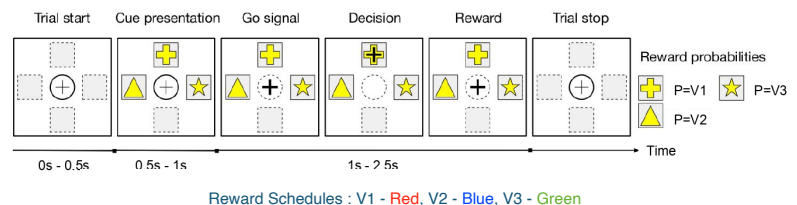
Value Comparison[4]

ImOFC Model

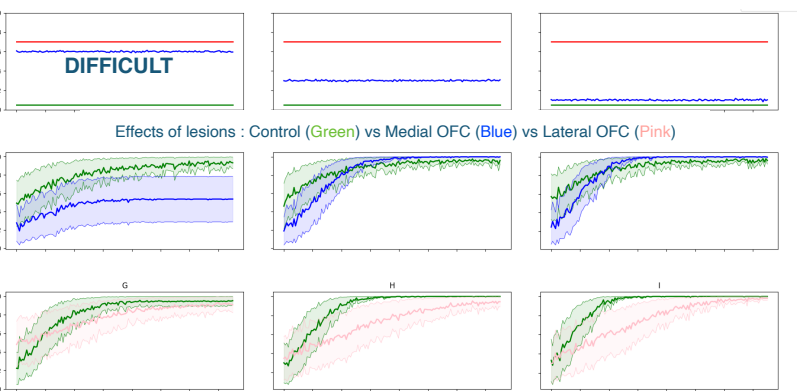
ImOFC Model
CtxBG Model



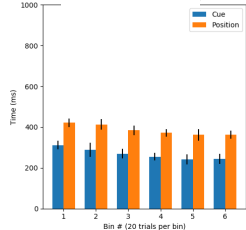
3-Arm Bandit Task



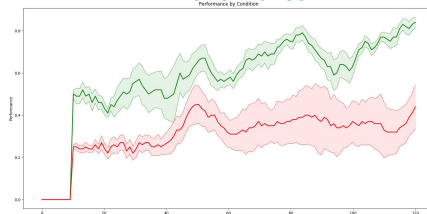
Reward Schedules : V1 - Red, V2 - Blue, V3 - Green



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] Boret 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

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