

## Optimal coding of offer values in orbitofrontal cortex: Theoretical predictions and experimental tests

*Thursday, July 6, 2023 10:00 AM (50 minutes)*

A binary economic choice entails the computation and comparison of two offer values. When monkeys chose between different goods, two groups of neurons in orbitofrontal cortex (OFC) encode the two offer values. Importantly, experiments using electrical stimulation demonstrated a causal relationship between the activity of offer value cells and choices. Given a value range, the tuning curves of offer value cells are quasi-linear and independent of the distribution of the offers. The gain of the tuning curves (i.e., the slope of the encoding) is inversely proportional to the value range (range adaptation). In previous work, we developed a theory of optimal coding for offer values (Rustichini et al, 2017). The central concept is that the encoding of offer values is optimal if tuning curves ensure maximal expected payoff (i.e., maximum chosen value). The theory is based on a linear decision model, where choices are determined by the difference between the activity of the two groups of offer value cells. The theory indicates that quasi-linear tuning curves are optimal only if the two value ranges are equal and the joint distribution of offer values is uniform within the relevant domain of offers. (Since this condition is not satisfied in our experiments, quasi-linearity can be viewed as an inflexible trait of the tuning functions, presumably advantageous in an evolutionary perspective.) The theory also demonstrates that, for linear tuning curves, range adaptation ensures maximal expected payoff. Finally, indicating with A and B the two offered goods, with  $\Delta VA$  and  $\Delta VB$  the two value ranges, and with JA and JB the efficacy of synapses for which offer value A and offer value B cells are pre-synaptic, the theory predicts the relation  $JA/JB = \Delta VA/\Delta VB$ . We have now generalized this prediction for a decision model that (a) includes the other groups of neurons identified in OFC (encoding the chosen good and the chosen value) and (b) is fully connected. We have also tested the prediction using estimates for the synaptic efficacies derived from network inference analysis (Ising model) applied to populations of 20-120 neurons recorded simultaneously. Preliminary results based on a limited data set support the theoretical prediction. This finding validates the theory and supports the understanding that offer value cells in OFC are optimally tuned for economic choices.

**Presenter:** PADOA-SCHIOPPA, Camillo

**Session Classification:** Invited talk