The Role of Inhibitory Neuronal Heterogeneity in Phase Relations Between Cortical Networks

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Neuronal heterogeneity, the presence of diverse types of neurons, is a widespread phenomenon throughout the nervous system, with the brain exhibiting a notable abundance of inhibitory neurons. While one might intuitively assume that increased diversity in the spiking patterns of neurons would hinder their ability to synchronize [1], it is intriguing that many cortical areas demonstrate synchronized oscillations and coherent activity during various cognitive tasks, despite this heterogeneity [2]. The functional significance of neuronal heterogeneity remains a subject of active investigation [3]. In this study, we delve into the role of inhibitory heterogeneity specifically, exploring how different types of inhibitory neurons contribute to the diversity of phase relations between two populations of neurons that are unidirectionally coupled. Our findings reveal that altering the type of inhibitory neurons influences the phase relationship between populations, while the balance between excitatory and inhibitory elements remains relatively stable. This research sheds light on the potential impact of neuronal variability on communication between distant regions of the brain, offering valuable insights into the intricate dynamics of neural networks.

References

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