Emergent Computations in Artificial Neural Networks and the Brain

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Currently, a symbiosis is emerging among neuroscience, artificial intelligence (AI), and cognitive sciences. Leveraging AI techniques, researchers can train neural networks inspired by the brain's functioning to analyze its cognitive functions.

In this master's thesis, we will follow the following steps. Firstly, we will use cognitive tasks such as categorization and perception-based decision-making as examples. Next, we will employ supervised learning algorithms typical of AI to train neural networks to perform these tasks. The trained networks will serve as tools to explore how the brain could tackle them. Once trained, we will conduct a detailed analysis of how these networks have learned to categorize and make decisions. Finally, we will compare the results of our analysis with the experimental findings obtained from electrophysiological recordings in animals trained to perform the same tasks (1, 2, 3).

This work aims to shed light on the similarities between artificial neural networks and the brain in handling cognitive functions. The Computational Neuroscience group at UAM has significant experience in these problems (4, 5), including expertise in various learning algorithms (6).

**References**

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