BRIGHAM AND WOMEN'S HOSPITAL
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Department of Medicine
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Channing Network Science Seminar

July 23rd (Monday), 2018, 3pm @ 3rd-floor conference room

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Tailoring Dynamics in Recurrent Neural Network for Optimal Learning

Abstract: Recurrent neural networks (RNNs) are promising algorithms for processing time series. Despite their potential applications and numerous research efforts, they remain difficult to design and train. As a contribution to this effort, we propose to encode task-specific knowledge into the dynamics of the network so that the features extracted by the recurrent structure are pre-adapted to each time series. In particular, we focus on the short-term memory of the RNN and its frequency responses. We use Echo State Networks as an example of RNN, where we show that both features are relevant from a machine learning perspective and then demonstrate how to design networks whose dynamics are adapted to a specific task. Our analytical results are validated in three benchmark tasks and reveal interesting connections between random matrices, control theory and machine learning.

BIO: Pau Vilimelis Aceituno is a Ph.D. candidate at the Max Planck Institute for Mathematics in the Sciences. His research interests lie at the interface between graph theory, machine learning and theoretical neuroscience. Currently, he is studying how biological learning rules observed in biological networks adapt the dynamics of large populations of neurons and how those adaptation can be explained in terms of information processing. Before starting his Ph.D., Pau worked as a trainee at the Channing Division of Network Medicine at Harvard Medical School, as a software developer at Amadeus IT Group and as a satellite engineer at Airbus Space & Defence.

Hosted by Yang-Yu Liu