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# Synthetic brain imaging on a spiking neural model of parieto-frontal interactions in reaching

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## Introduction

We developed a model of arm-reaching that uses spiking neural model arranged in dynamic neural fields to encode sensory input and perform reach target selection. The output of the model was used to control a simulated three-dimensional arm and hand in a reciprocal reaching task based on one used in monkey neurophysiological literature. To perform synthetic brain imaging on our model, we have implemented the extended balloon model [1] with a capillary model extension [2]. This simulates blood flow in response to a flow-inducing signal, as well as blood volume, deoxyhemoglobin concentration, oxygen extraction rate and the BOLD response. To facilitate both region- and voxel-based analysis of simulated PET and fMRI responses, simulated neurons in each region are grouped into virtual voxels. Each virtual voxel contains an instantiation of the extended balloon model. The sum of the synaptic activity and transmembrane current magnitudes over all of the neurons in a voxel is used to generate the flow-inducing signal for the rCBF component. This system allows synthetic PET and fMRI signals to be generated simultaneously by sampling the rCBF or BOLD signals, respectively, according to the repetition time (TR) of the scan. The overall model is thus able to address behavioral, electrophysiological and neuroimaging data in both monkeys and humans.

## References

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