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Eriksen model: neural network dynamics analysis and simulations
YUAN LIU, Department of Physics, Princeton University, PHILIP HOLMES, Mechanical and Aerospace Engineering and Program in Applied and Computational Mathematics, Princeton University — We analyze a connectionist neural network model of the two-alternative forced choice Eriksen task, in which subjects must correctly identify a central stimulus and disregard flankers that may or may not be compatible with it. We have analyzed a linearized version of the connectionist model for the Eriksen two-alternative forced-choice task. We show that, provided solutions remain within the central domain of the logistic function in which it may be approximated by a linear function that matches its slope g at the bias point b, analytical solutions of a decoupled, linearized model modulated by a pre-determined attention signal provide reasonable estimates of critical times at which evidence in favor of the correct and incorrect alternatives cross over for incompatible trials. We then derive estimates of accuracy as a function of response time by interrogating a drift-diffusion (DD) process with variable drift rate, fitted to outputs from the perception layer of the fully nonlinear model. We compare our results with numerical simulations of the full nonlinear model and discuss the possibility to use information theory to optimize our network model.

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