Representing Uncertainty in Visual Perception Using Pre-Synaptic Gaussian Noise and Sampling

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Submitter Patrick McClure

Affiliation University of Cambridge

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Presentation Abstract Summary Representing uncertainty in the world is essential for humans. This had lead to the hypothesis that neural representations code for a distribution of interpretations. Since the ideal method for integrating probabilistic information is to use Bayesian decision theory, Bayesian models of human visual perception and behavior have become prominent. For visual perception, there is growing evidence for a sampling-based probabilistic representation, although most implementations do not scale to large convolutional neural networks (CNNs) currently used to perform high-level vision. We evaluated how using Gaussian pre-synaptic noise and sampling affects the predictions of CNNs for object recognition in natural scenes. We find that Monte Carlo (MC) sampling using Gaussian pre-synaptic noise increases task performance and leads to networks that better represent their own uncertainty.

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Co-author Information

* Presenting Author

First Name	Last Name	Affiliation	E-mail
Patrick *	McClure *	University of Cambridge	patrick.mcclure@mrc-cbu.cam.ac.uk
Nikolaus	Kriegeskorte	MRC Cognition and Brain Sciences Unit	nikokriegeskorte@gmail.com

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