Event-driven implementation of eligibility propagation

Agnes Korcsak-Gorzo\textsuperscript{1,2}, Jonas Stapmanns\textsuperscript{1,2}, Sacha van Albada\textsuperscript{1,3}, David Dahmen\textsuperscript{1}, Markus Diesmann\textsuperscript{1,4}

\textsuperscript{1} Institute of Neuroscience and Medicine (INM-6) and Institute for Advanced Simulation (IAS-6) and JARA-Institute Brain Structure-Function Relationships (INM-10), Jülich Research Centre, Jülich, Germany
\textsuperscript{2} Department of Physics, Faculty 1, RWTH Aachen University, Aachen, Germany
\textsuperscript{3} Institute of Zoology University of Cologne, Cologne, Germany
\textsuperscript{4} Department of Psychiatry, Psychotherapy, and Psychosomatics, Medical School, RWTH Aachen University, Aachen, Germany

Email: a.korcsak-gorzo@fz-juelich.de

We port eligibility propagation (eprop) \cite{1}, a biologically plausible approximation of backpropagation through time for recurrent spiking neural networks, to NEST. Eprop is local in space and time and employs broadcast alignment, i.e., random feedback weights from output neurons to the recurrent network. In contrast to the original fully time-driven implementation inTensorflow, we show here an implementation that is consistent with the event-driven update of synapses in NEST. Three factors enter this learning rule: the filtered presynaptic spike-trains, the postsynaptic membrane potential, and instructive learning signals emitted by the output neurons. To accumulate the factors until the weight update, we use the NEST archiving infrastructure \cite{2}. As a proof of concept, we demonstrate efficient learning of a regression and a classification task in fully connected networks of a few hundred neurons. We currently study the learning behavior in sparsely connected, Brunel-type \cite{3} networks and larger, more structured networks, like a cortical microcircuit \cite{4}.

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References


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