The nef TikZ library*

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Abstract

The nef TikZ library provides predefined styles and shapes to create
diagrams for neural networks constructed with the methods of the Neural
Engineering Framework (NEF) [1].

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1 Usage

To use the nef TikZ library load the tikz package and the library with:

\usepackage{tikz}
\usetikzlibrary{nef}

1.1 Global styles

nef This style provides basic general settings like minimum node sizes and arrow
tips for the diagrams. It also sets some layout options on for graphs. The style
can be applied to the tikzpicture environment or to more narrow scopes.

1.2 Node styles and shapes

ea Use this style for ensemble arrays.

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*This document corresponds to tikz-nef v0.1, dated 2017/03/29.
<table>
<thead>
<tr>
<th>Style/shape</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>ea</code></td>
<td>ensemble array</td>
</tr>
<tr>
<td><code>ens</code></td>
<td>ensemble</td>
</tr>
<tr>
<td><code>ext</code></td>
<td>external inputs and outputs</td>
</tr>
<tr>
<td><code>net</code></td>
<td>network</td>
</tr>
<tr>
<td><code>pnode</code></td>
<td>pass-through node</td>
</tr>
<tr>
<td><code>rect</code></td>
<td>rectification ensemble</td>
</tr>
</tbody>
</table>

Figure 1: Node styles and shapes.

<table>
<thead>
<tr>
<th>Style</th>
<th>Usage</th>
</tr>
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<tbody>
<tr>
<td><code>inhibit</code></td>
<td>inhibitory connection</td>
</tr>
<tr>
<td><code>modulatory</code></td>
<td>modulatory connection</td>
</tr>
<tr>
<td><code>recurrent</code></td>
<td>recurrent connection</td>
</tr>
</tbody>
</table>

Figure 2: Edge styles.

- **ens**: Use this style for single ensembles.
- **ext**: Use this style for inputs and outputs external to the displayed network.
- **net**: Use this style for networks.
- **pnode**: Use this style for pass-through nodes.
- **rect**: Use this style for rectification ensembles (i.e., all encoders are 1).

### 1.3 Edge styles

- **inhibit**: Use this style for inhibitory connections.
- **modulatory**: Use this style for modulatory connections.
- **recurrent**: Use this style for recurrent connections. It will add a loop above an ensemble or network.
2 Examples

2.1 Gated difference integrator (working memory)

\usepackage{tikz}
\usetikzlibrary{graphs}
\usetikzlibrary{nef}
\usetikzlibrary{quotes}

\begin{tikzpicture}[nef]
\graph {
  input [ext] -> gate [ens] -> integrator/$x$ [ens] -> output [ext];
  integrator -> [bend right, "$-1"] gate;
  integrator -> [recurrent] integrator;
  store -> [inhibit] gate;
};
\end{tikzpicture}

References