

# Examples for pctex

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‘pctex’ provides some useful commands for working with probabilistic circuits. The main purpose of this is reusability and harmonization of notation.

## 1 General/Misc

- Log-sum-exp  $L \sum_{i=1}^k E$ : `\lse{i=1}{k}`
- $\text{poly}(N)$ : `\poly{N}`
- Independent RVs  $X_1 \perp\!\!\!\perp X_2, X_1 \perp\!\!\!\perp X_2$ : `X_1 \indep X_2, \indep{X_1}{X_2}`
- Cond. independent RVs  $(X_1 \perp\!\!\!\perp X_2 \mid X_3)$ : `(\cindep{X_1}{X_2}{X_3})`

## 2 General graphs

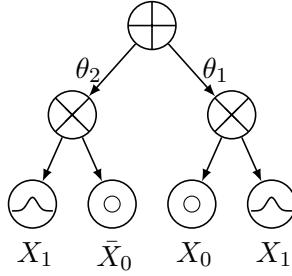
- Graph  $\mathcal{G}$ : `\graph`
- Walk  $\mathcal{W}$ : `\walk`
- Tree  $\mathcal{T}$ : `\tree`
- Vertex set  $V(\mathcal{G})$ : `\vset(\graph)`
- Edge set  $E(\mathcal{G})$ : `\eset(\graph)`
- Node/nodes  $N, \mathbf{N}$ : `\node`
- Child/children:  $C, \mathbf{C}$ : `\child`
- Children of a node:  $\text{ch}(N)$ : `\ch{\node}`
- Parents of a node:  $\text{par}(N)$ : `\pa{\node}`
- Neighbours:  $\text{neigh}(N)$ : `\neigh{\node}`

### 3 Probabilistic Circuits

- Probabilistic circuit:  $\mathcal{C}$ :  $\backslash\text{pc}$
- Scope function:  $\psi, \psi(\mathbf{N})$ :  $\backslash\text{scopesym}, \backslash\text{scope}\{\backslash\text{node}\}$
- v-tree:  $\mathcal{V}$ :  $\backslash\text{vtree}$
- Sum node/nodes:  $S, \mathbf{S}$ :  $\backslash\text{snode}, \backslash\text{snodes}$
- Product node/nodes:  $P, \mathbf{P}$ :  $\backslash\text{pnode}, \backslash\text{pnodes}$
- Leaf node/nodes:  $L, \mathbf{L}$ :  $\backslash\text{lnode}, \backslash\text{lnodes}$
- Region/regions:  $A, \mathbf{A}$ :  $\backslash\text{region}, \backslash\text{regions}$
- Partition/partitions:  $S, \mathbf{S}$ :  $\backslash\text{partition}, \backslash\text{partitions}$
- Region-graph:  $\mathcal{R}$ :  $\backslash\text{rg}$

### 4 Tikz / Plotting

Plotting is based on an adaptation of ‘tikzlibraryspn.code.tex’ by Nicola Di Mauro and Antonio Vergari.



Code for the figure above:

```
\begin{tikzpicture}

\sumnode{s1};
\prodnode[below=15pt of s1, xshift=30pt]{p1};
\prodnode[below=15pt of s1, xshift=-30pt]{p2};

\bernoded[below=15pt of p1, xshift=-15pt]{v1}{X_0};
```

```

\bernode[below=15pt of p2, xshift=15pt]{v2}{\bar{X}_0$};

\contnode[below=15pt of p1, xshift=15pt]{v3}{X_1$};
\contnode[below=15pt of p2, xshift=-15pt]{v4}{X_1$};

\weigedge[right] {s1} {p1} {\theta_1$};
\weigedge[left] {s1} {p2} {\theta_2$};

\edge {p1} {v1};
\edge {p2} {v2};
\edge {p1} {v3};
\edge {p2} {v4};

\end{tikzpicture}

```