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 $\mathrm{L}\sum_{i=1}^{k}\mathrm{E}$: `$\lse{i=1}{k}$`
- $\mathtt{poly}(N)$: `$\poly{N}$`
- Independent RVs $X_1 \perp\!\!\!\perp X_2, X_1 \perp\!\!\!\perp X_2$: `$X_1 \indepsym X_2, \indep{X_1}{X_2}$`
- Cond. independent RVs $(X_1 \perp\!\!\!\perp X_2 \,|\, X_3)$: `$(\cindep{X_1}{X_2}{X_3})$`

2 General graphs

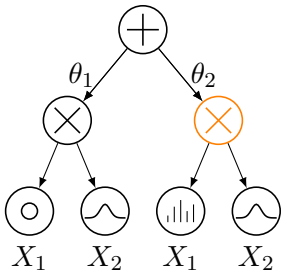
- Graph $\mathcal{G}$: `$\graph$`
- Walk $\mathcal{W}$: `$\walk$`
- Tree $\mathcal{T}$: `$\tree$`
- Vertex set $\mathrm{V}(\mathcal{G})$: `$\vset(\graph)$`
- Edge set $\mathrm{E}(\mathcal{G})$: `$\eset(\graph)$`
- Node/nodes $\mathsf{N}, \mathbf{N}$: `$\node$`
- Child/children: $\mathsf{C}, \mathbf{C}$: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

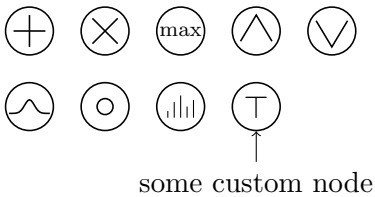
3 Probabilistic Circuits

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

4 Tikz / Plotting

Plotting is based on an adaptation of 'tikzlibraryspn.code.tex' by Nicola Di Mauro and Antonio Vergari.
Examples to illustrate how to use the plotting:





Code for the figures above:

Figure 1

```
\begin{tikzpicture}[
>=latex,
level/.style={sibling distance = 2cm/(#1),
level distance = 1.2cm},
```

```
edge from parent/.style={draw,-latex}
]
\node[sum] (s1) {}
    child {node[prod]  (p1) {}
     child {node[bern, label=below:{$X_1$}]  (s2) {}}
child {node[cont, label=below:{$X_2$}]  (s3) {}}
    }
    child {node[prod, draw=orange] (p2) {}
         child {node[cat, label=below:{$X_1$}]  (s2) {}}
child {node[cont, label=below:{$X_2$}]  (s3) {}}
    };

\draw[->] (s1) -- node[left] {$\theta_1$} (p1);
\draw[->] (s1) -- node[right] {$\theta_2$} (p2);
\end{tikzpicture}
```

Figure 2 / Reference

```
\begin{tikzpicture}

\node[sum]  at (0,1) {};
\node[prod] at (1,1) {};
\node[max] at (2,1) {};
\node[land] at (3,1) {};
\node[lor] at (4,1) {};

\node[cont] at (0,0) {};
\node[bern] at (1,0) {};
\node[cat] at (2,0) {};
\node[pcnode] (c) at (3,0) {\large$\top$};
\node (t) at (3,-1) {some custom node};

\draw[->] (t) -- (c);

\end{tikzpicture}
```