

Diagrams using tikz

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1. Instructions and Information

To draw this diagrams, you need to use the following latex packages:

- `\usepackage{tikz}`
- `\usetikzlibrary{decorations.pathreplacing}`
- `\usepackage{forest}`
- **Note:** you may need additional packages. The file `./sty/basic-article.sty` contains all the packages you need and some extra ones.
- You also need to create `./sty/`, save the file `math-commands.sty` on that folder, and include `\usepackage{./sty/math-commands}` in your main file.

You can check the `.tex` file used to create this `.pdf` for details.

The diagrams created here uses the package `tikz`. See documentation [here](#). It extends that package using commands whose deetails you can find [here](#). The full code is in the appendix [A](#) below, which is also in the file `math-commands.sty`.

2. Nodes and Edges

2.1. Basic shapes

Some predefined nodes on `basic-math-commands.sty`



name:const; constant node; Snippet: dagn or dagnr



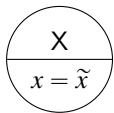
name:latent; latent node; Snippet: dagn or dagnr (for relative position)



name:latent2; latent node (notation 2); Snippet: dagn or dagnr (for relative position)



name:obs; observed node; Snippet: dagn or dagnr (for relative position)



name:potential; potential variable node (for single world graphs); Snippet: dagn or dagnr (for relative position)



name:factor; factor node ; Snippet: dagn or dagnr (for relative position)



name:manipulated; manipulated node ; Snippet: dagn or dagnr (for relative position)



name:det; deterministic node ; Snippet: dagn or dagnr (for relative position)



name:operation; operations node ; Snippet: dagn or dagnr (for relative position)

Figure 1: Some possible notation for types of nodes

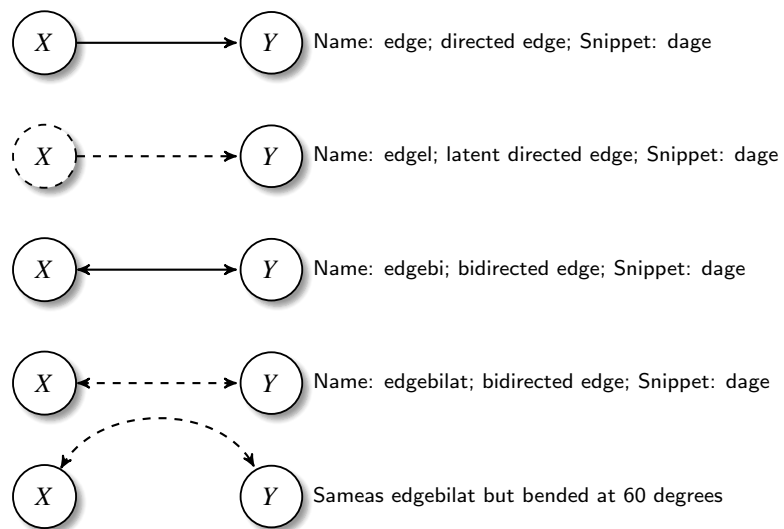


Figure 2: Some edge types

2.2. Template

```
\node at (<x>, <y>) [<properties>] (<node-id>) {<label>} ; %
```

<x> and **<y>** position of the nodes

<properties> **circle**, **retangle**, **diamond** shape (e.g., circle)

draw color of the border (default draw=black)

minimum size minimum size of the node

inner sep separation between label and node

font font size

colorfont font color (default=black)

fill color to fill the node (default color=white)

node distance distance between nodes

label={ [<color>]<position>:<text> } label next to node (e.g., label=right:"this node is about X"; <position> can be right, left, top, bottom, top right, etc.)

<node-id> label to identify the node

<label> text that appear inside the node

2.3. Examples

```
\begin{figure} [ht] \centering
\begin{tikzpicture}
\node at (0, 0) [
  circle,                % rectangle/diamond
  draw                    = black,    % border
  line width              = .5pt,     % border width
  minimum size            = 20pt,     % minimum size of node
  inner sep               = 1pt,      % sep b/w border and inner text
  font                    = \normalsize, %
  text                    = black,    % inner label color
  fill                    = white,
  node distance           = 1pt,
]
(beta1)
{ \ ( \beta_1 \ ) } ;
\end{tikzpicture}
\end{figure}
```



```
\begin{figure} [ht] \centering
\begin{tikzpicture}
\node at (0, 0) [
```

```

circle,                % rectangle/diamond
draw                   = black,    % border
line width            = .5pt,     % border width
minimum size          = 20pt,     % minimum size of node
inner sep             = 1pt,      % sep b/w border and inner text
font                  = \normalsize,%
text                  = black,    % inner label color
fill                  = white,
node distance         = 1pt,
]
(betal)
{\( \beta_{1} \)} ; %
\node at (1, 0) [
  circle,              % rectangle/diamond
  draw                 = black,    % border
]
()
{\( \Sigma \)} ;
\node at (3, 0) [latent ] (id) {<label>} ; %
\node at (5, 0) [obs   ] (mu) {\( \mu \)} ; %
\node at (7, 0) [const ] (id-x) {X} ; %
\end{tikzpicture}
\end{figure}

```

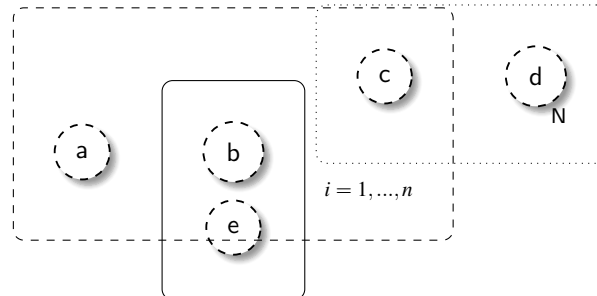


3. Edges

3.1. Basic Edges

4. Plate and Parametric Models

4.1. Basic shapes



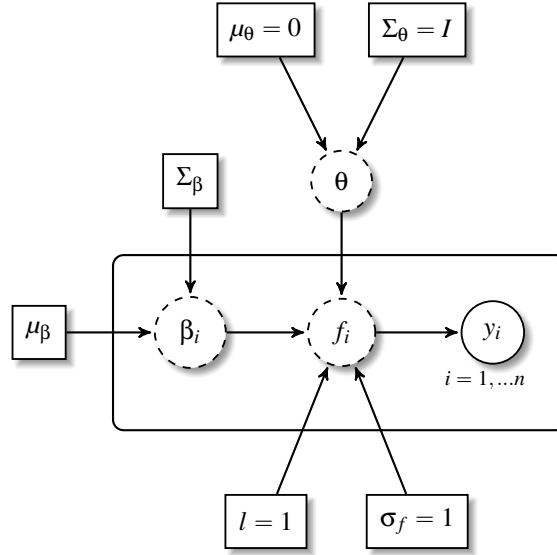
4.2. Examples

```
\begin{figure}[ht]\centering
\begin{tikzpicture}[thick,scale=1, every node/.style={transform shape}]
%% Nodes
\node at (2, 0) [obs      ] (yi)      {\( y_i \)} ; %
\node at (0, 0) [latent  ] (fi)      {\( f_i \)} ; %
\node at (-2, 0) [latent  ] (betai)   {\( \beta_{i} \)} ; %
\node at (-2, 2) [const   ] (Sigmabeta) {\( \Sigma_{\beta} \)} ; %
\node at (-4, 0) [const   ] (mubeta)   {\( \mu_{\beta} \)} ; %
\node at (0, 2) [latent  ] (theta)    {\( \theta \)} ; %
\node at (-1, 4) [const   ] (mutheta)  {\( \mu_{\theta} = 0 \)} ; %
\node at ( 1, 4) [const   ] (Sigmatheta) {\( \Sigma_{\theta} = I \)} ; %
\node at (-1, -2.5) [const ] (l)      {\( l=1 \)} ; %
\node at ( 1, -2.5) [const ] (sigmaf)  {\( \sigma_f = 1 \)} ; %

%% plate
\plate {plate1} {(betai) (fi) (yi)} {\( i=1, \dots, n \)};

%% arrows
\edgesimple {fi} {yi}
\edgesimple {betai} {fi}
\edgesimple {mubeta} {betai}
\edgesimple {l} {fi}
\edgesimple {sigmaf} {fi}
\edgesimple {Sigmabeta} {betai}
\edgesimple {mutheta} {theta}
\edgesimple {Sigmatheta} {theta}
\edgesimple {theta} {fi}
\end{tikzpicture}
\end{figure}
```

```
\begin{figure}[ht]\centering
\begin{tikzpicture}[thick,scale=1, every node/.style={transform shape}, on grid, auto]
%% Nodes
\node at (-6, 0) [const      ] (mubeta)      {\( \mu_{\beta} \)} ; %
\node at (-4, 2) [const      ] (Sigmabeta)    {\( \Sigma_{\beta} \)} ; %
```



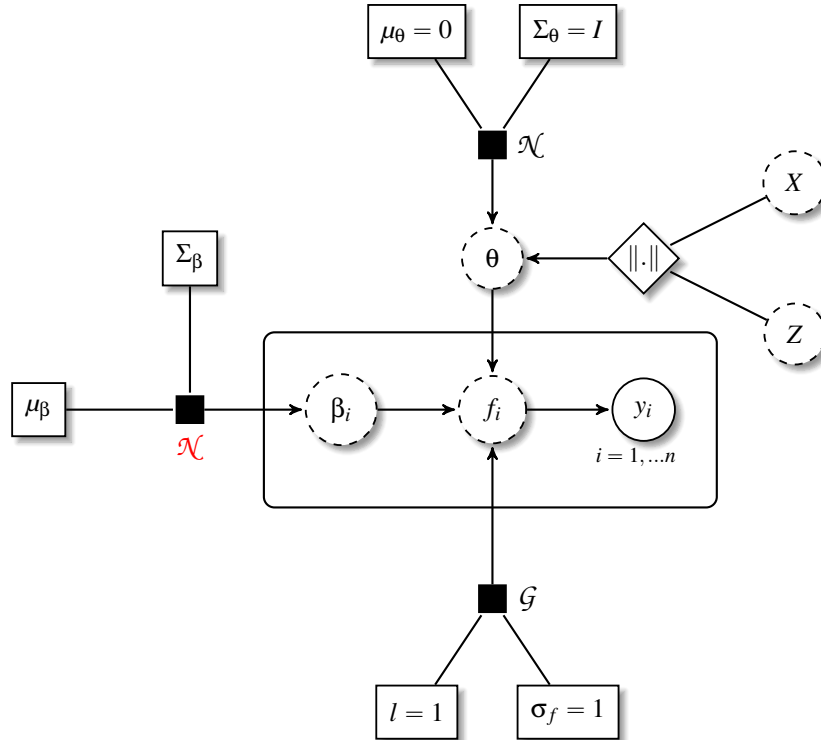
```

\node at (-4, 0) [dist, label={\red below:\normalsize\(\ \mu_\theta \)} ] (mutheta) {} ; %
\node at (2, 0) [obs ] (yi) {\(\ y_i \)} ; %
\node at (0, 0) [latent ] (fi) {\(\ f_i \)} ; %
\node at (-2, 0) [latent ] (betai) {\(\ \beta_i \)} ; %
\node at (0, 2) [latent ] (theta) {\(\ \theta \)} ; %
\node at (-1, 5) [const ] (mutheta) {\(\ \mu_\theta = 0 \)} ; %
\node at (1, 5) [const ] (Sigmatheta) {\(\ \Sigma_\theta = I \)} ; %
\node at (-1, -4) [const ] (l) {\(\ l = 1 \)} ; %
\node at (1, -4) [const ] (sigmaf) {\(\ \sigma_f = 1 \)} ; %
\node at (0, -2.5) [dist, label={\black right:\normalsize\(\ G \)} ] (g) {} ; %
\node at (2, 2) [operation ] (dot) {\(\ \cdot \)} ; %
\node at (4, 3) [latent ] (x) {\(\ X \)} ; %
\node at (4, 1) [latent ] (z) {\(\ Z \)} ; %
\node at (0, 3.5) [dist, label={\black right:\normalsize\(\ \theta \)} ] (normaltheta) {}
; %
%% arrows
\edgesimple [-] {mubeta} {normal}
\edgesimple [-] {Sigmabeta} {normal}
\edgesimple {normal} {betai} ;
\edgesimple {fi} {yi}
\edgesimple {betai} {fi}
\edgesimple [-] {l} {g}
\edgesimple [-] {sigmaf} {g}
\edgesimple {g} {fi} ;
\edgesimple [-] {mutheta} {normaltheta}
\edgesimple [-] {Sigmatheta} {normaltheta}
\edgesimple {normaltheta} {theta} ;
\edgesimple {theta} {fi}
\edgesimple [-] {x} {dot} ;
\edgesimple [-] {z} {dot} ;
\edgesimple {dot} {theta} ;

%% plate
\plate {plate1} {(betai) (fi) (yi)} {\(\ i=1, \dots, n \)};
\end{tikzpicture}

```


`\end{figure}`

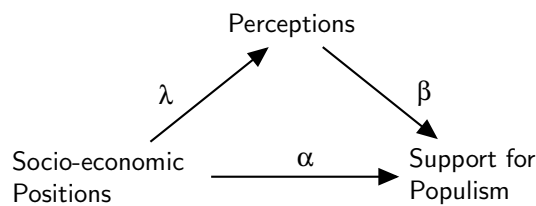


5. DAG

5.1. Nodes as Text and box

```
\begin{figure}[ht]\centering
\begin{tikzpicture}[thick,scale=1, every node/.style={transform shape}, on grid, auto]
\node at (0, 0) [textnode, text width=2.5cm ] (ind) {Socio-economic Positions} ; %
\node at (2.5, 2) [textnode, text width=1.8cm ] (med) {Perceptions} ; %
\node at (5, 0) [textnode, text width=2cm ] (out) {Support for Populism} ; %

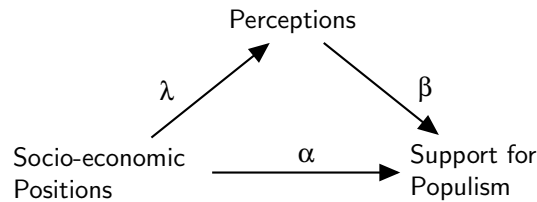
%% edges
\path[->] (ind) edge node[el,left,rotate=0] {\(\lambda\quad\)} (med);
\path[->] (med) edge node[el,right,rotate=0] {\(\quad\beta\quad\)} (out);
\path[->] (ind) edge node[el,above,rotate=0] {\(\alpha\quad\)} (out);
\end{tikzpicture}
\end{figure}
```



5.2. Nodes as text

```
\begin{figure}[ht]\centering
\begin{tikzpicture}[thick,scale=1, every node/.style={transform shape}, on grid, auto]
\node at (0, 0) [text width=2.5cm] (ind) {Socio-economic Positions} ; %
\node at (2.5, 2) [text width=1.8cm] (med) {Perceptions} ; %
\node at (5, 0) [text width=2cm] (out) {Support for Populism} ; %

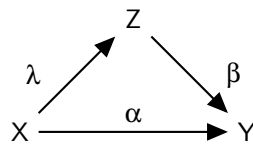
%% edges
\path[->] (ind) edge node[el,left,rotate=0] {\(\lambda\quad\)} (med);
\path[->] (med) edge node[el,right,rotate=0] {\(\beta\quad\)} (out);
\path[->] (ind) edge node[el,above,rotate=0] {\(\alpha\quad\)} (out);
\end{tikzpicture}
\end{figure}
```



5.3. Nodes as variables (relative position)

```
\begin{figure}[ht]\centering
\begin{tikzpicture}[thick,scale=1, every node/.style={transform shape}, on grid, auto]
\node at (0, 0) [ ] (ind) {X} ; %
\node (med) [above right = 1.5cm and 1.5cm of ind] {Z};
\node (out) [right = 3cm and 3cm of ind] {Y} ; %

%% edges
\path[->] (ind) edge node[el,left,rotate=0] {\(\lambda\quad\)} (med);
\path[->] (med) edge node[el,right,rotate=0] {\(\beta\quad\)} (out);
\path[->] (ind) edge node[el,above,rotate=0] {\(\alpha\quad\)} (out);
\end{tikzpicture}
\end{figure}
```



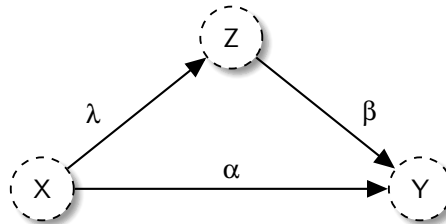
5.4. Nodes as variables and circles

```
\begin{figure}[ht]\centering
\begin{tikzpicture}[thick,scale=1, every node/.style={transform shape}, on grid, auto]
\node at (0, 0) [latent] (ind) {X} ; %
\node at (2.5, 2) [latent, ] (med) {Z} ; %
```

```

\node at (5, 0) [latent, ] (out) {Y} ; %
%% edges
\path[->] (ind) edge node[el,left,rotate=0] {\(\ \lambda \quad \)} (med);
\path[->] (med) edge node[el,right,rotate=0] {\(\ \quad \beta \quad \)} (out);
\path[->] (ind) edge node[el,above,rotate=0] {\(\ \alpha \quad \)} (out);
\end{tikzpicture}
\end{figure}

```

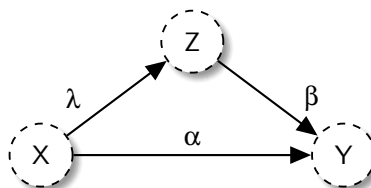


5.5. Nodes as variables and circles (closer)

```

\begin{figure}[ht]\centering
\begin{tikzpicture}[thick,scale=1, every node/.style={transform shape}, on grid, auto]
\node at (0, 0) [latent ] (ind) {X} ; %
\node at (2, 1.5) [latent, ] (med) {Z} ; %
\node at (4, 0) [latent, ] (out) {Y} ; %
%% edges
\path[->] (ind) edge node[el,left,rotate=0] {\(\ \lambda \quad \)} (med);
\path[->] (med) edge node[el,right,rotate=0] {\(\ \quad \beta \quad \)} (out);
\path[->] (ind) edge node[el,above,rotate=0] {\(\ \alpha \quad \)} (out);
\end{tikzpicture}
\end{figure}

```



5.6. Nodes as variables and circles (closer, no edge labels)

```

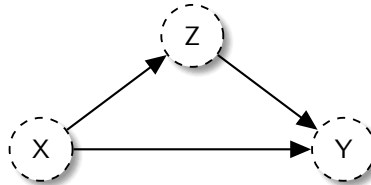
\begin{figure}[ht]\centering
\begin{tikzpicture}[thick,scale=1, every node/.style={transform shape}, on grid, auto]
\node at (0, 0) [latent ] (ind) {X} ; %
\node at (2, 1.5) [latent, ] (med) {Z} ; %
\node at (4, 0) [latent, ] (out) {Y} ; %
%% edges
\path[->] (ind) edge node[el,left,rotate=0] {} (med);
\path[->] (med) edge node[el,right,rotate=0] {} (out);

```

```

\path[->] (ind) edge node[el,above,rotate=0] {} (out);
\end{tikzpicture}
\end{figure}

```



5.7. Nodes as variables and circles (closer, no edge labels, and subfigures)

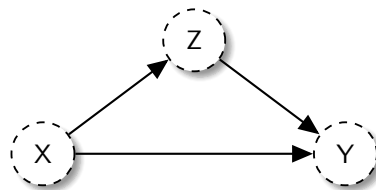
```

\begin{figure}[ht]
\begin{subfigure}{.5\textwidth}
% -----
\centering
\begin{tikzpicture}[thick,scale=1, every node/.style={transform shape}, on grid, auto]
\node at (0, 0) [latent ] (ind) {X} ; %
\node at (2, 1.5) [latent, ] (med) {Z} ; %
\node at (4, 0) [latent, ] (out) {Y} ; %

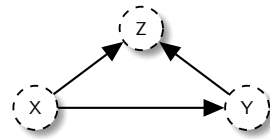
%% edges
\path[->] (ind) edge node[el,left,rotate=0] {} (med);
\path[->] (med) edge node[el,right,rotate=0] {} (out);
\path[->] (ind) edge node[el,above,rotate=0] {} (out);
\end{tikzpicture}
\caption{Put your sub-caption here}
\label{fig:sub-first}
% -----
\end{subfigure}
\begin{subfigure}{.5\textwidth}
% -----
\centering
\begin{tikzpicture}[thick,scale=.7, every node/.style={transform shape}, on grid,
auto]
\node at (0, 0) [latent ] (ind) {X} ; %
\node at (2, 1.5) [latent, ] (med) {Z} ; %
\node at (4, 0) [latent, ] (out) {Y} ; %

%% edges
\path[->] (ind) edge node[el,left,rotate=0] {} (med);
\path[->] (med) edge node[el,right,rotate=0] {} (out);
\path[->] (ind) edge node[el,above,rotate=0] {} (out);
\end{tikzpicture}
\caption{Put your sub-caption here}
\label{fig:sub-second}
% -----
\end{subfigure}
\caption{Put your caption here}
\label{fig:fig}
\end{figure}

```



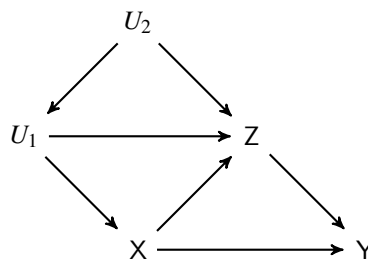
(a) Put your sub-caption here



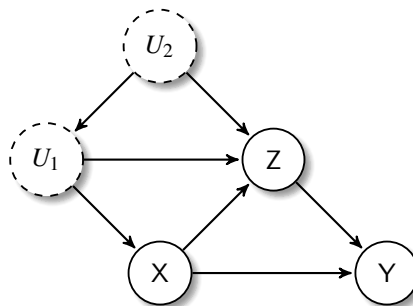
(b) Put your sub-caption here

Figure 3: Put your caption here

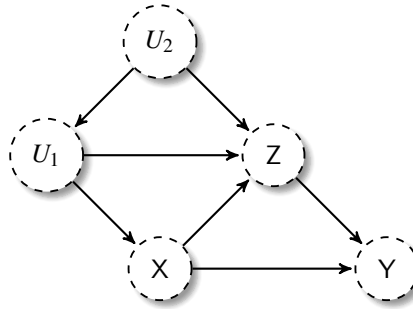
5.8. Large DAG



5.9. Large DAG (using latent var notation)



5.10. Large DAG (using latent var notation alternative)



6. Undirected Graphs

```

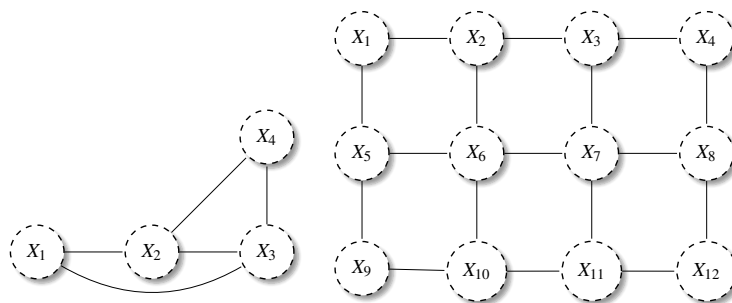
\begin{figure}[ht]
\scalebox{.75}{ % to reduce the size of the figure (package graphix)
% nodes: latent, obs, det, const, factor, plate, gate
\centering
\tikz{ %
\node[latent] (x1) {\(\ X_1 \)} ; %
\node[latent, right=of x1] (x2) {\(\ X_2 \)} ; %
\node[latent, right=of x2] (x3) {\(\ X_3 \)} ; %
\node[latent, above=of x3] (x4) {\(\ X_4 \)} ; %
\edgesimple [-] {x1} {x2} ; %
\edgesimple [-] {x2} {x3} ; %
\edgesimple [-] {x3} {x4} ; %
\edgesimple [-] {x2} {x4} ; %
\edgesimple[bend right, -] {x1} {x3} ; %
}
~~~~~
\tikz{ %
\node[latent] (x1) {\(\ X_1 \)} ; %
\node[latent, right=of x1] (x2) {\(\ X_2 \)} ; %
\node[latent, right=of x2] (x3) {\(\ X_3 \)} ; %
\node[latent, right=of x3] (x4) {\(\ X_4 \)} ; %
% second row
\node[latent, below=of x1] (x5) {\(\ X_5 \)} ; %
\node[latent, below=of x2] (x6) {\(\ X_6 \)} ; %
\node[latent, below=of x3] (x7) {\(\ X_7 \)} ; %
\node[latent, below=of x4] (x8) {\(\ X_8 \)} ; %
% third row
\node[latent, below=of x5] (x9) {\(\ X_9 \)} ; %
\node[latent, below=of x6] (x10) {\(\ X_{10} \)} ; %
\node[latent, below=of x7] (x11) {\(\ X_{11} \)} ; %
\node[latent, below=of x8] (x12) {\(\ X_{12} \)} ; %
\edgesimple [-] {x1} {x2} ; %
\edgesimple [-] {x2} {x3} ; %
\edgesimple [-] {x3} {x4} ; %
\edgesimple [-] {x1} {x5} ; %
\edgesimple [-] {x2} {x6} ; %
\edgesimple [-] {x3} {x7} ; %
\edgesimple [-] {x4} {x8} ; %
\edgesimple [-] {x5} {x6} ; %
\edgesimple [-] {x6} {x7} ; %
\edgesimple [-] {x7} {x8} ; %
}

```

```

\edgesimple [-] {x5} {x9} ; %
\edgesimple [-] {x6} {x10} ; %
\edgesimple [-] {x7} {x11} ; %
\edgesimple [-] {x8} {x12} ; %
\edgesimple [-] {x9} {x10} ; %
\edgesimple [-] {x10} {x11} ; %
\edgesimple [-] {x11} {x12} ; %
}
}
\end{figure}

```



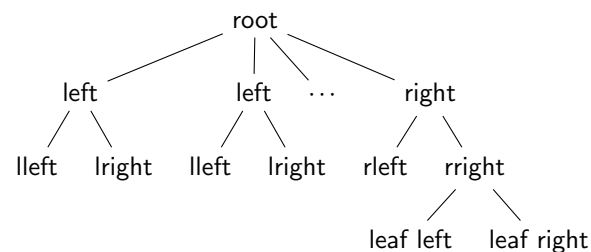
7. Tree

It uses the package `forest`, so you need to include `\usepackage{forest}` in the latex header.
Snippet: `dagtree`

```

\begin{figure} [ht] \centering
\begin{forest}
  % for tree={l+=1cm} % increase level distance
  [root
    [left[lleft][lright]]
    [left[lleft][lright]]
    [\(\cdots\)]
    [right[rleft][rright[leaf left][leaf right]]]
  ]
\end{forest}
\end{figure}

```



```

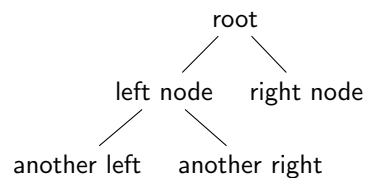
\begin{figure} [ht] \centering
\begin{forest}
  % for tree={l+=1cm} % increase level distance

```

```

[ root
  [ left node[ another left][ another right]]
  [ right node]
]
\end{forest}
\end{figure}

```



A. Settings to draw diagrams

```

%% =====
%% For graphs
%% =====
% tikzlibrary.code.tex
% Modified from https://github.com/jluttine/tikz-bayesnet
%
% Copyright 2010–2011 by Laura Dietz
% Copyright 2012 by Jaakko Luttinen
%
% This file may be distributed and/or modified
%
% 1. under the LaTeX Project Public License and/or
% 2. under the GNU General Public License.
%
% See the files LICENSE_LPPL and LICENSE_GPL for more details.

% Load other libraries
\usetikzlibrary{shapes}
\usetikzlibrary{fit}
\usetikzlibrary{chains}
\usetikzlibrary{arrows}

% Nodes
% -----
\usetikzlibrary{shadows.blur}
\usetikzlibrary{shapes.symbols}
\newcommand{\DAGnodedistance}{30pt}
\newcommand{\DAGinnersep}{5pt}
\newcommand{\DAGminsize}{20pt}
\newcommand{\DAGfont}{\fontsize{10}{10}\selectfont}
\newcommand{\DAGcolorfont}{black}
\newcommand{\DAGcolorborder}{black}
\newcommand{\DAGcolorfill}{white}
\newcommand{\DAGlinewidth}{.7pt}
\tikzstyle{basic} = [

```



```

shape          =circle,
draw           =\DAGcolorborder,
line width    =\DAGlinewidth,
minimum size  =\DAGminsize,
inner sep     =\DAGinnersep,
font          =\DAGfont,
text          =\DAGcolorfont,
fill          =\DAGcolorfill,
node distance =\DAGnodedistance,          % for relative positions
blur shadow={shadow blur steps=5}
]
\tikzstyle{latent}      = [basic]          % Latent node
\tikzstyle{obs}         = [basic, fill=gray!25] % Observed node
%% \tikzstyle{factor}    = [basic, fill=black, text=white]% Factor node
\tikzstyle{factor}     = [rectangle, fill=black,minimum size=5pt, inner sep=0pt,
node distance=0.4]
\tikzstyle{factor caption} = [caption] %
\tikzstyle{const}      = [basic, rectangle,] % Constant node
\tikzstyle{det}        = [basic, inner sep =1pt, diamond] %
Deterministic node
\tikzstyle{dist}       = [rectangle, draw, fill=black,minimum size=10pt, inner
sep=0pt, node distance=0.4]
\tikzstyle{operation}  = [basic, inner sep =1pt, diamond] %
Deterministic node
\tikzstyle{textnode}   = [basic, rectangle, inner sep=5pt] %
Deterministic node

% Plate node
% -----
\tikzset{
plate/.style={
draw = black,
shape=rectangle,
rounded corners=0.5ex,
thick,
minimum width=3.1cm,
text width=3.1cm,
align=right,
inner sep=10pt,
inner ysep=10pt,
}
}
\newcommand{\DAGplateinnersep}{15pt}
\newcommand{\DAGplatecolorborder}{black}
\tikzstyle{plate caption} = [
caption,
node distance=0,
inner sep=0pt,
below left=0pt and 0pt of #1.south east] %
\tikzstyle{plate} = [
draw=black,
text width=3.1cm,
shape=rectangle,

```

```

solid,          % dashed, dotted
rounded corners,
fit=#1,
color           = \DAGplatecolorborder,
inner sep      = \DAGplateinnersep,
xshift=0cm,    % displacement to x direcation
yshift=0cm,    % displacement to y direcation
node distance=5pt,
]
\tikzstyle{wrap} = [inner sep=0pt, fit=#1] % Invisible wrapper node
\tikzstyle{gate} = [draw, rectangle, dashed, fit=#1] % Gate

% Caption node
% -----
\tikzstyle{caption} = [font=\footnotesize, node distance=0] %
\tikzstyle{every label} += [caption] %

\tikzset{>={triangle 45}}

%\pgfdeclarelayer{b}
%\pgfdeclarelayer{f}
%\pgfsetlayers{b,main,f}

% \factoredge [options] {inputs} {factors} {outputs}
\newcommand{\factoredge}[4][[]]{ %
  % Connect all nodes #2 to all nodes #4 via all factors #3.
  \foreach \f in {#3} { %
    \foreach \x in {#2} { %
      \path (\x) edge[-,#1] (\f) ; %
      %\draw[-,#1] (\x) edge[-] (\f) ; %
    } ;
    \foreach \y in {#4} { %
      \path (\f) edge[->,#1] (\y) ; %
      %\draw[->,#1] (\f) -- (\y) ; %
    } ;
  } ;
}

% \edge [options] {inputs} {outputs}
\newcommand{\edge}[3][[]]{ %
  % Connect all nodes #2 to all nodes #3.
  \foreach \x in {#2} { %
    \foreach \y in {#3} { %
      \path (\x) edge [->,#1 ] (\y) ; %
      %\draw[->,#1] (\x) -- (\y) ; %
    } ;
  } ;
}

% \factor [options] {name} {caption} {inputs} {outputs}
\newcommand{\factor}[5][[]]{ %
  % Draw the factor node. Use alias to allow empty names.
  \node[factor, label={[name=#2-caption]#3}, name=#2, #1,
  alias=#2-alias] {} ; %

```

```

% Connect all inputs to outputs via this factor
\factoredge {#4} {#2-alias} {#5} ; %
}

% \plate [options] {name} {fitlist} {caption}
\newcommand{\plate}[4][{}]{ %
  \node[wrap=#3] (#2-wrap) {}; %
  \node[plate caption=#2-wrap] (#2-caption) {#4}; %
  \node[plate=(#2-wrap)(#2-caption), #1] (#2) {}; %
}

% \gate [options] {name} {fitlist} {inputs}
\newcommand{\gate}[4][{}]{ %
  \node[gate=#3, name=#2, #1, alias=#2-alias] {}; %
  \foreach \x in {#4} { %
    \draw [-*,thick] (\x) -- (#2-alias); %
  } ;%
}

% \vgate {name} {fitlist-left} {caption-left} {fitlist-right}
% {caption-right} {inputs}
\newcommand{\vgate}[6]{ %
  % Wrap the left and right parts
  \node[wrap=#2] (#1-left) {}; %
  \node[wrap=#4] (#1-right) {}; %
  % Draw the gate
  \node[gate=(#1-left)(#1-right)] (#1) {}; %
  % Add captions
  \node[caption, below left=of #1.north ] (#1-left-caption)
  {#3}; %
  \node[caption, below right=of #1.north ] (#1-right-caption)
  {#5}; %
  % Draw middle separation
  \draw [-, dashed] (#1.north) -- (#1.south); %
  % Draw inputs
  \foreach \x in {#6} { %
    \draw [-*,thick] (\x) -- (#1); %
  } ;%
}

% \hgate {name} {fitlist-top} {caption-top} {fitlist-bottom}
% {caption-bottom} {inputs}
\newcommand{\hgate}[6]{ %
  % Wrap the left and right parts
  \node[wrap=#2] (#1-top) {}; %
  \node[wrap=#4] (#1-bottom) {}; %
  % Draw the gate
  \node[gate=(#1-top)(#1-bottom)] (#1) {}; %
  % Add captions
  \node[caption, above right=of #1.west ] (#1-top-caption)
  {#3}; %
  \node[caption, below right=of #1.west ] (#1-bottom-caption)
  {#5}; %
  % Draw middle separation

```

```

\draw [-, dashed] (#1.west) -- (#1.east); %
% Draw inputs
\foreach \x in {#6} { %
  \draw [-*,thick] (\x) -- (#1); %
} ;%
}

% End graphs
%=====

```