\documentclass{article}

\usepackage{tikz}

\begin{document}

\begin{tikzpicture}

\usetikzlibrary {quotes}

\usetikzlibrary {shapes,positioning}

\node[minimum size=1.5cm,fill=green!20!white,draw,circle] (b) at (0,0){ $\mathbf{B\_1}$};

\node[minimum size=1.5cm,fill=green!20!white,draw,circle] (b1) at (7,0){ $\mathbf{B\_2}$};

` \node at (0,1.5) {Bias Nodes};

\node[minimum size=1.5cm,fill=blue!20!white,draw,circle] (i) at (-2,-3){ $\mathbf{I\_1}$};

\node[minimum size=1.5cm,fill=blue!20!white,draw,circle] (i1) at (-2,-6){ $\mathbf{I\_2}$};

\node[minimum height=1cm,,minimum width=4cm,rectangle split,rectangle split

horizontal,

rectangle split parts=2,text width=0.7cm,text centered,

rectangle split part fill={black!20,black!40},

rounded corners=0.3cm, draw] (h) at (4,-3) {$\mathbf{H\_1}$ \nodepart{two} $\mathbf{HA\_1}$ };

\node[minimum height=1cm,,minimum width=4cm,rectangle split,rectangle split

horizontal,

rectangle split parts=2,text width=0.7cm,text centered,

rectangle split part fill={yellow!30,yellow!50},

rounded corners=0.3cm, draw] (o) at (10.5,-3) {$\mathbf{O\_1}$ \nodepart{two} $\mathbf{OA\_1}$ };

\node[minimum height=1cm,,minimum width=4cm,rectangle split,rectangle split

horizontal,

rectangle split parts=2,text width=0.7cm,text centered,

rectangle split part fill={black!20,black!40},

rounded corners=0.3cm, draw] (h1) at (4,-6) {$\mathbf{H\_2}$ \nodepart{two} $\mathbf{HA\_2}$ };

\node[minimum height=1cm,,minimum width=4cm,rectangle split,rectangle split

horizontal,

rectangle split parts=2,text width=0.7cm,text centered,

rectangle split part fill={yellow!30,yellow!50},

rounded corners=0.3cm,draw] (o1) at (10.5,-6) {$\mathbf{O\_2}$ \nodepart{two} $\mathbf{OA\_2}$ };

\node at (-2,-7.5) {Input Nodes};

\node at (4,-7.5) {Hidden Nodes};

\node at (9,-7.5) {Output Nodes};

\draw[ ->] (i) -> (h) node[midway, above] {$\mathbf{w\_1}$};

\draw[->] (i) -> (h1) node[midway, above right] {$\mathbf{w\_2}$};

\draw[->] (i1) -> (h) node[midway, above left] {$\mathbf{w\_3}$};

\draw[->] (i1) -> (h1) node[midway, above] {$\mathbf{w\_4}$};

\draw[->] (b) -- (h) node[midway, left] {$\mathbf{w\_5}$};

\draw[->] (b) -- (h1) node[midway, below left] {$\mathbf{w\_6}$};

\draw[->] (h) -- (o) node[midway, above] {$\mathbf{w\_7}$};

\draw[->] (h) -- (o1) node[midway, above right] {$\mathbf{w\_8}$};

\draw[->] (h1) -- (o) node[midway, above left] {$\mathbf{w\_9}$};

\draw[->] (h1) -- (o1) node[midway, above] {$\mathbf{w\_{10}}$};

\draw[->] (b1) -- (o) node[midway, right] {$\mathbf{w\_{11}}$};

\draw[->] (b1) -- (o1) node[midway, below left] {$\mathbf{w\_{12}}$};

\end{tikzpicture}

\end{document}