1 ExMISA Network

Two-gene network with Mutual Inhibition, Self-Activation, and exclusive transcription factor binding.

\[
\begin{align*}
A_{00} & + 2a \xrightarrow{h_x}{a} A_{10} \\
A_{00} & + 2b \xrightarrow{h_r}{a} A_{01} \\
B_{00} & + 2b \xrightarrow{h_s}{a} B_{10} \\
B_{00} & + 2a \xrightarrow{h_r}{a} B_{01} \\
A_{00} & \xrightarrow{g_0} A_{00} + a \\
B_{00} & \xrightarrow{g_0} B_{00} + b \\
A_{01} & \xrightarrow{g_0} A_{01} + a \\
B_{01} & \xrightarrow{g_0} B_{01} + b \\
A_{10} & \xrightarrow{g_1} A_{10} + a \\
B_{10} & \xrightarrow{g_1} B_{10} + b \\
a & \xrightarrow{k} 0 \\
b & \xrightarrow{k} 0
\end{align*}
\]

2 Pluripotency network

There are eight genes (encoding transcription factors) in the pluripotency network. Transcription factors bind as homodimers with the exception of the OCT4-SOX2 heterodimer. Only three transcription factors interact with their own gene, CDX2, NANOG, and GATA6. Transcription factors bind as dimers with the rate \( h \) and unbind with the rate \( f \). When a gene is bound by any activator and no repressors, it expresses at a rate \( g_{on} \), otherwise, it expresses at a rate \( g_{off} \). The only exception is NANOG, which must be bound by all three of its activators and no repressors to be activated.