Exercise 9  Separation Criteria: d-Separation

Consider the following directed graph:

Which of the following propositions hold true in the graph??

\( \text{\textasciitilde} X \perp \perp Y \mid Z \) denotes \( \text{\textasciitilde} X \text{ and } Y \text{ are d-separated (in } G \text{) by } Z \text{.} \)

\begin{align*}
\text{i) } & F \perp \perp H \mid G \\
\text{ii) } & C \perp \perp G \mid F \\
\text{iii) } & F \perp \perp E \mid C \\
\text{iv) } & A \perp \perp B \mid \emptyset \\
\text{v) } & A \perp \perp B \mid D \\
\text{vi) } & D \perp \perp F \mid \{C, G\} \\
\text{vii) } & E \perp \perp F \mid \{A, B\} \\
\text{viii) } & C \perp \perp E \mid \{D, F, H\}
\end{align*}

Exercise 10  Separation Criteria: u-Separation

Consider the undirected graph that is obtained if all arrow heads from the directed graph in exercise 9 are dropped. Check again the propositions i)–viii) of exercise 9, now with the u-separation criterion! Which differences can be observed?

Exercise 11  Separation Criteria: d/u-Separation

Remember the alternative way of checking for d-separation that was presented in the lecture (slides 51–53): \( X \text{ and } Y \text{ are d-separated by } Z \text{ if } X \text{ and } Y \text{ are u-separated by } Z \text{ in the moralised minimal ancestral subgraph induced by } X \cup Y \cup Z \). With this approach, verify again the results from exercise 9!