

CSCI 378 HW9

Our generative story for regression is:

- choose weight vector w

- for $n=1$ to N :

 - let $z^{(n)} = x^{(n)} w$

 - draw $\epsilon^{(n)}$ from distribution ψ

 - let $y^{(n)} = \rho(z^{(n)}, \epsilon^{(n)})$

(a) Adapt the causal diagram from REGRESSION PROBLEMS (3) such that $U \cup V = \{w, \epsilon^{(1)}, x^{(1)}, y^{(1)}, z^{(1)}, \dots, \epsilon^{(N)}, x^{(N)}, y^{(N)}, z^{(N)}\}$ (no need to specify F ; just draw the diagram)

(b) If we view the causal diagram from (a) as a Bayesian network, which of the following d-separation properties hold? Place a checkmark beside the correct d-separation assertions.

$$W \perp X^{(1)} \mid \{\emptyset\} \quad \underline{\hspace{1cm}}$$

$$W \perp X^{(1)} \mid \{Y^{(1)}\} \quad \underline{\hspace{1cm}}$$

$$W \perp X^{(1)} \mid \{Y^{(2)}\} \quad \underline{\hspace{1cm}}$$

$$W \perp X^{(1)} \mid \{Y^{(2)}, Y^{(1)}\} \quad \underline{\hspace{1cm}}$$

$$X^{(1)} \perp Y^{(1)} \mid \{\emptyset\} \quad \underline{\hspace{1cm}}$$

$$X^{(1)} \perp W \mid \{Y^{(1)}\} \quad \underline{\hspace{1cm}}$$

$$X^{(1)} \perp E^{(1)} \mid \{\emptyset\} \quad \underline{\hspace{1cm}}$$

$$X^{(1)} \perp E^{(1)} \mid \{Y^{(1)}\} \quad \underline{\hspace{1cm}}$$

$$X^{(1)} \perp E^{(1)} \mid \{Y^{(1)}, Z^{(1)}\} \quad \underline{\hspace{1cm}}$$

$$Y^{(1)} \perp Y^{(2)} \mid \{\emptyset\} \quad \underline{\hspace{1cm}}$$

$$Y^{(1)} \perp Y^{(2)} \mid \{W\} \quad \underline{\hspace{1cm}}$$