Stress at work → Exercise → Improved mood
Season is independent of age given we know this person has flu.

\[ P(\text{season} = \text{winter} | \text{flu} = 1) \]

\[ P(\text{season} = \text{winter} | \text{flu} = 1, \text{age} = 80) \]

\[ P(\text{season} = \text{winter} | \text{flu} = 1, \text{health condition} = \text{poor}) \]

\[ P(\text{season} = \text{winter} | \text{flu} = 1, \text{health condition} = \text{poor}, \text{age} = 80) \]
\[ K(x, x) \geq 0 \]

\[ K(x, z) = \phi(x) \phi(z) \]

\[ \mathbf{p}(x) = \int \mathbf{1}_{\|x\| \leq \theta} \frac{1}{\sqrt{2\pi\theta}} e^{-\frac{x^2}{2\theta}} \, dx \quad \text{if } \|x\| \leq \theta \]

\[ \text{otherwise} \]

\[ \Theta \rightarrow \text{small} \]

\[ \mathbf{p}(x_1, \ldots, x_n) = \prod_{i=1}^{n} \int \mathbf{1}_{\|x_i\| \leq \theta} \frac{1}{\sqrt{2\pi\theta}} e^{-\frac{x_i^2}{2\theta}} \, dx_i \]

\[ \Theta = \max_{\|x\| \leq \theta} \text{sign} \]

\[ \text{every } \|x\| \leq \theta \]

\[ \text{any } \|x\| > \theta \]
Exercise at work

Exercise causes stress.

Exercise <--- Bad mood

Correlated?

Learning rate small

Batch size large

Accuracy high

P(y|x)
P(x|y)
\[ P(x_1, x_2, \ldots, x_8) = P(x_1) \cdot P(x_2 | x_1) \cdot P(x_3 | x_1, x_2) \ldots \]
\[ P(x_8 | x_1, x_2, \ldots, x_7) \]

\( x_i \) are discrete

\( x_i \in \{1, \ldots, k\} \)
\[ P(x_1) \leq \Theta \]
\[ P(x_2) \leq \Theta \]
\[ P(x_3 | x_1) \leq K^2 \]
\[ P(x_3 | x_5, x_6) \leq K^3 \]
\[ 1 + K + 4K^2 + 2K^3 \]
\[ \mathcal{O}(K^3) \rightarrow \mathcal{O}(K^8) \]
\[ 16 \rightarrow \mathcal{O}(K^3) \]
\[ \mathcal{O}(K^{16}) \]
\( P(x_1, \ldots, x_8) \)

\[ = P(x_1, P(x_2), \ldots, P(x_8)) \]

\[ 8 \ll \mathcal{O}(K^3) \]

\( x_2, x_7 \) given \( x_3 \)
congestion is conditionally independent of season given flu burden
\[ P(z) \]

\[ P(z, x) = P(z) \cdot P(x | z) \]
\[ P(x, y) = P(x|y) \ P(y) \]
\[ = P(y|x) \ P(x) \]

excercise  bad mood
stress at work
$E(x_1, x_2) = x_1 x_2$

$X_2$ is conditionally independent of the other RVs given $X_1$. $X_1$ is conditionally independent of the green observations of the green RVs.
common cause

stress

exercise

bad mood

age

health

flu

season

health

P(season | flu)

P(season | flu, health)

flu