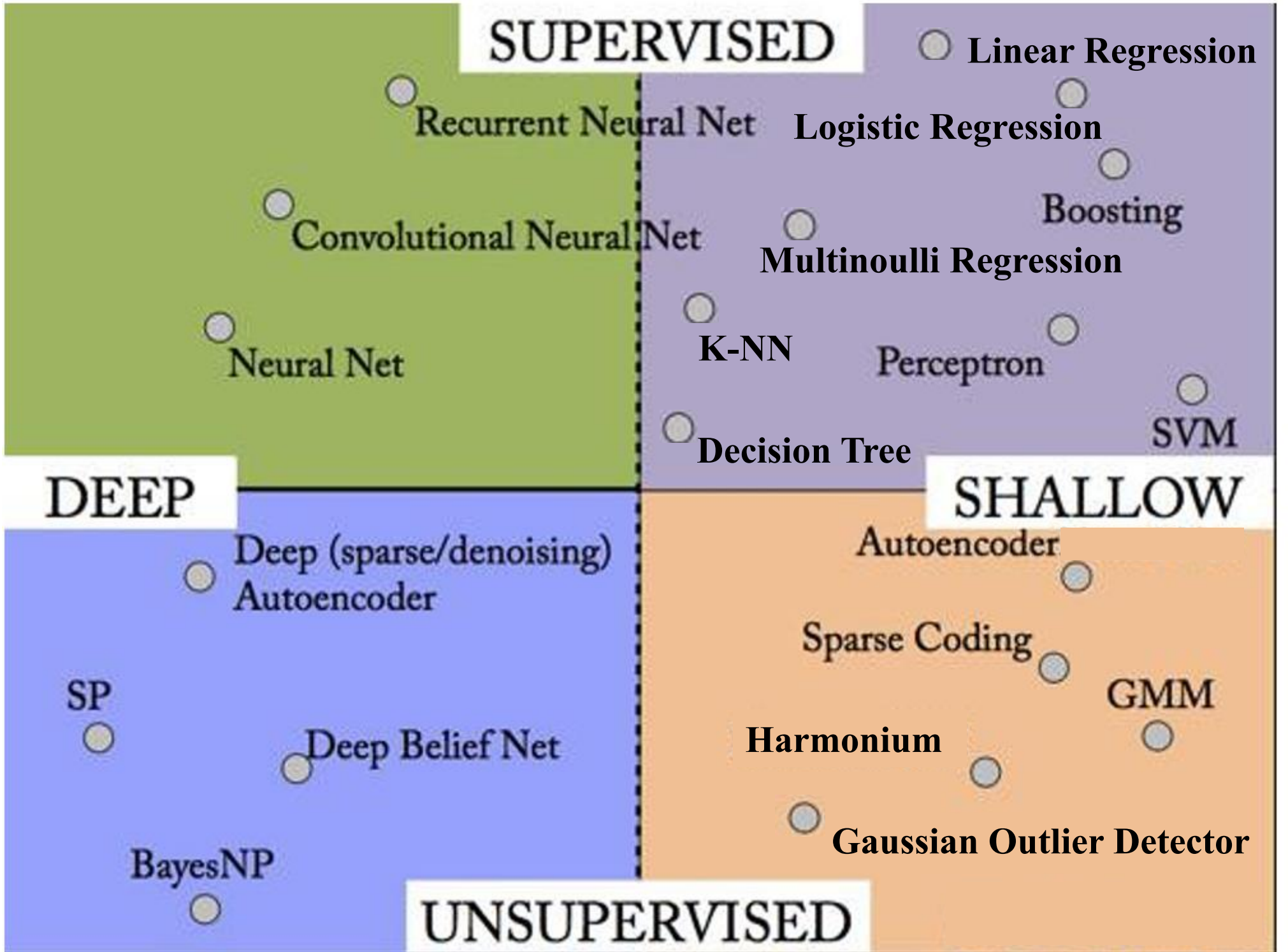




Generative Modeling and the Naïve Assumption

Alexander G. Ororbia II
Introduction to Machine Learning
CSCI-335
3/27/2026



Generation vs. Discrimination

Generative Models

- Represent both the data and the labels
- Often, makes use of conditional independence and priors
- Examples
 - Naïve Bayes classifier
 - Bayesian network
 - Single/Dual-wing harmonium
 - Variational autoencoder
- Models of data may apply to future prediction problems

Discriminative Models

- Learn to directly predict the labels from the data
- Often, assume a simple boundary (e.g., linear)
- Examples
 - Logistic regression
 - SVM, perceptron, discriminants
 - Decision tree / An ensemble
 - MLP
- Often easier to predict a label from the data than to model the data

Generation vs. Discrimination

Generative Models

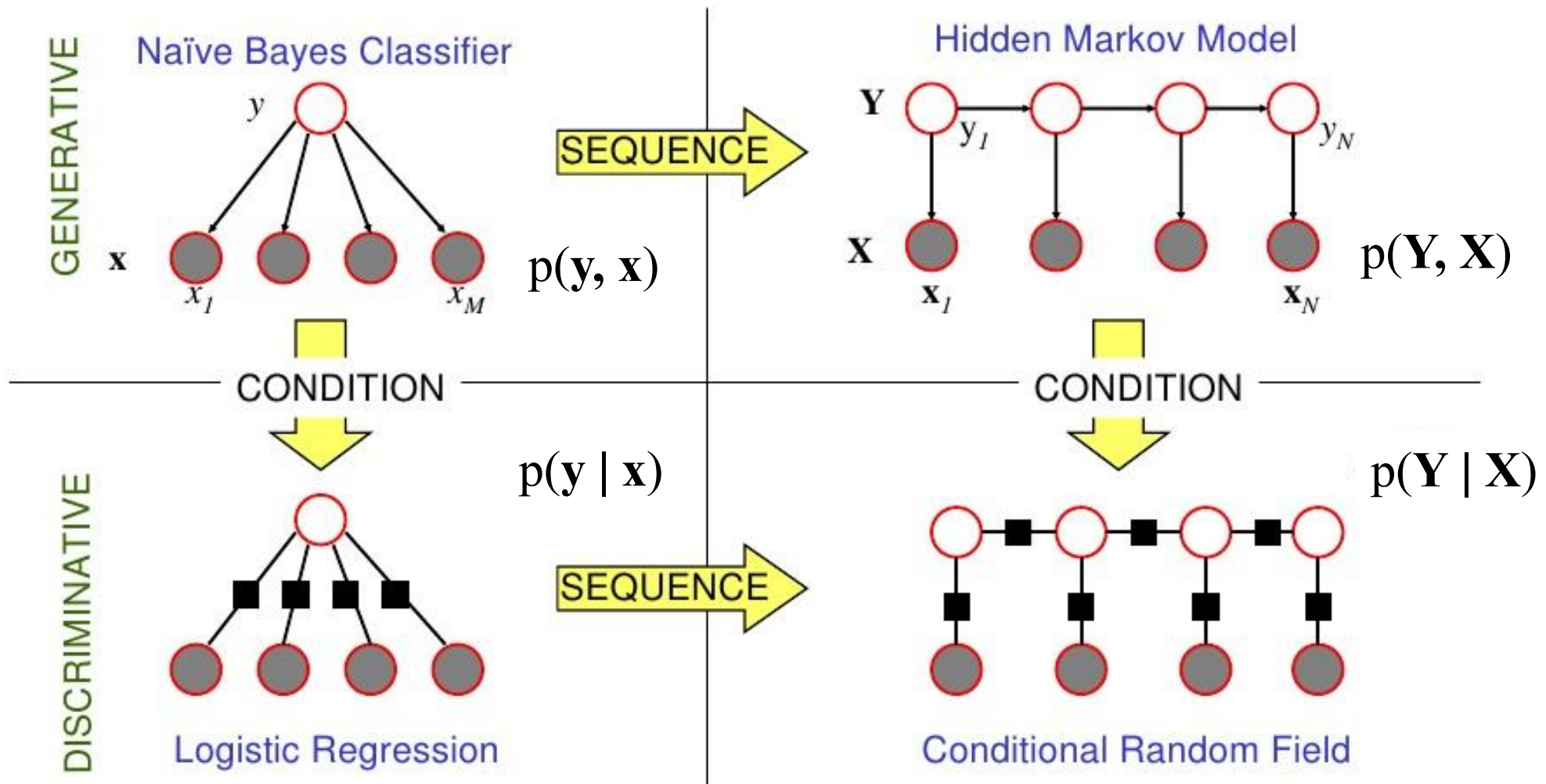
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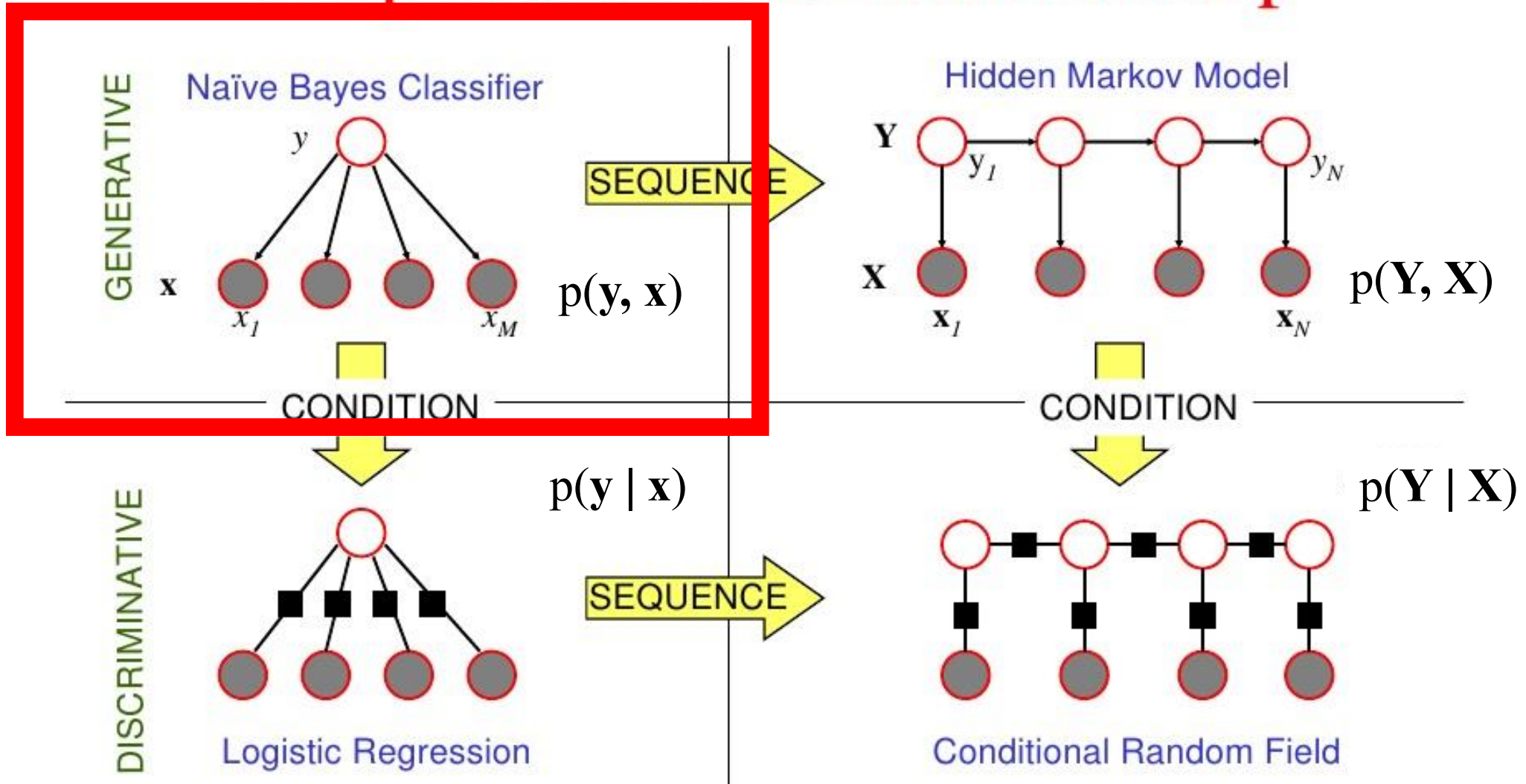
Graphical Models

Graphical Model Relationship



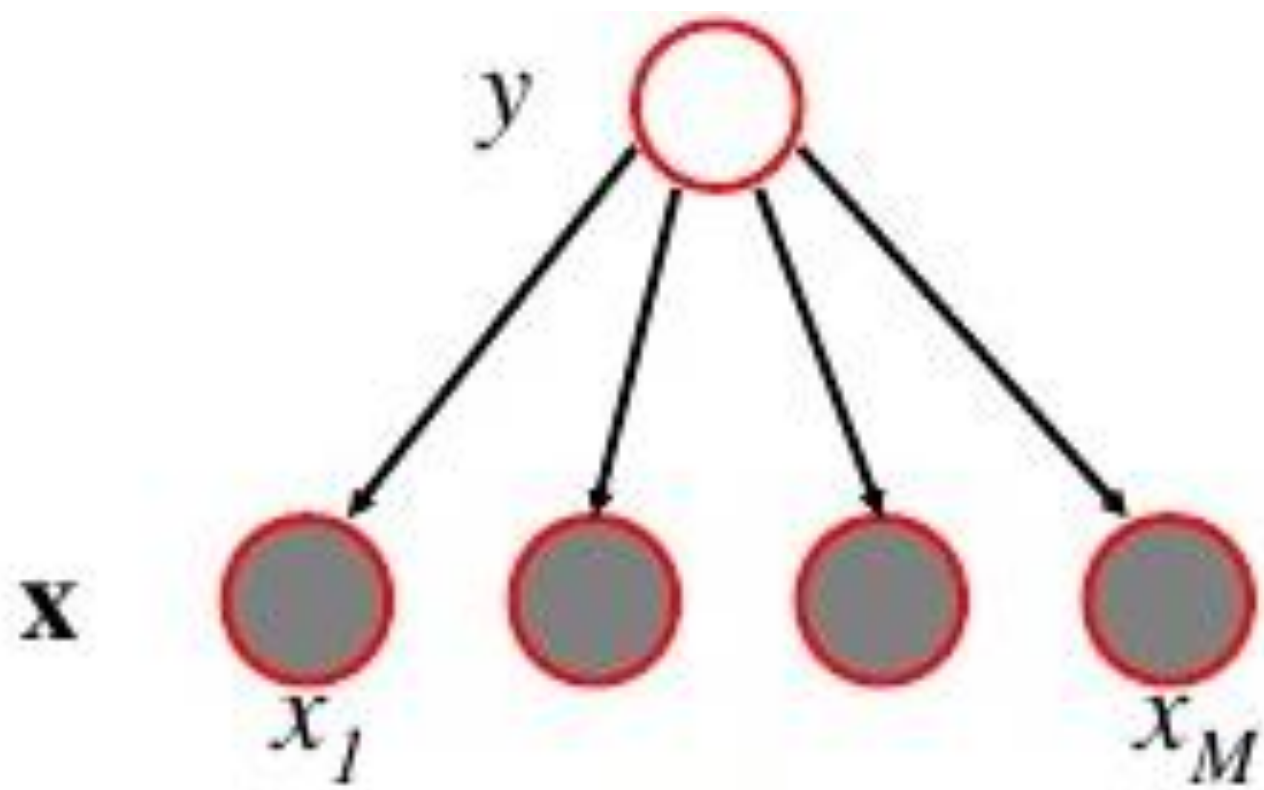
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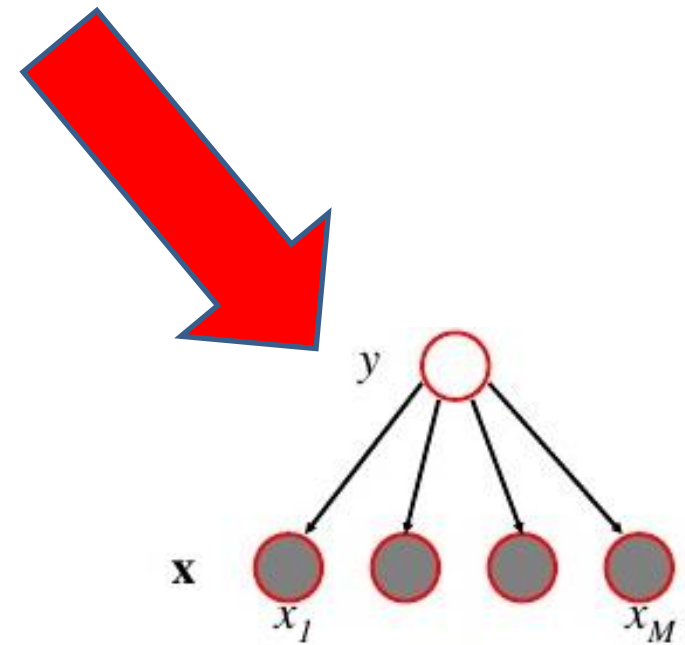


Construction: Crafting a Naïve Bayes graphical model!



Class-Labeled Training Tuples from the *AllElectronics* Customer Database

<i>RID</i>	<i>age</i>	<i>income</i>	<i>student</i>	<i>credit_rating</i>	<i>Class: buys_computer</i>
1	youth	high	no	fair	no
2	youth	high	no	excellent	no
3	middle_aged	high	no	fair	yes
4	senior	medium	no	fair	yes
5	senior	low	yes	fair	yes
6	senior	low	yes	excellent	no
7	middle_aged	low	yes	excellent	yes
8	youth	medium	no	fair	no
9	youth	low	yes	fair	yes
10	senior	medium	yes	fair	yes
11	youth	medium	yes	excellent	yes
12	middle_aged	medium	no	excellent	yes
13	middle_aged	high	yes	fair	yes
14	senior	medium	no	excellent	no



QUESTIONS?

