

Probabilistic Graphical Models

Lecture 1b - Problems

The Problems

Subject of PGM

- Multidimensional data
- High-dimensional data

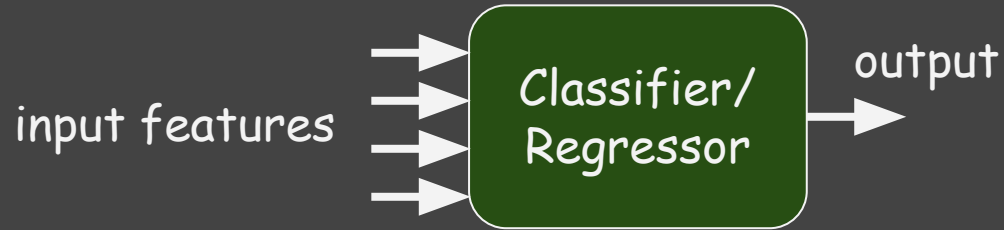


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Basic Machine Learning



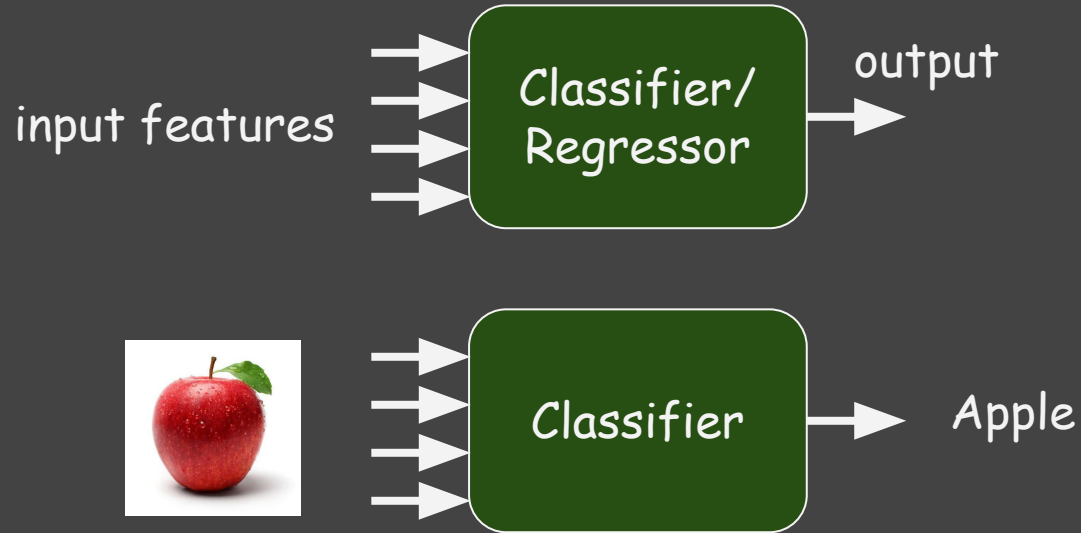
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Basic Machine Learning



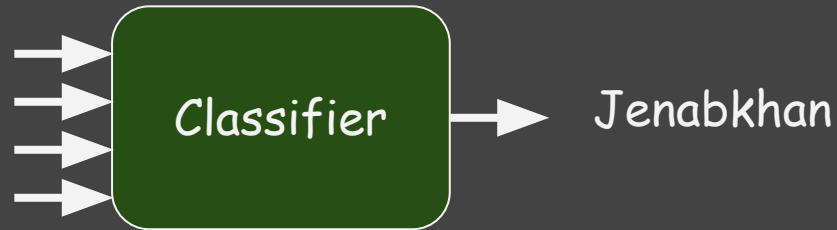
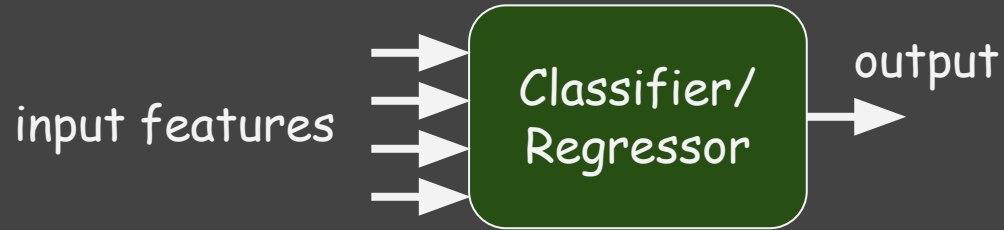
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Basic Machine Learning



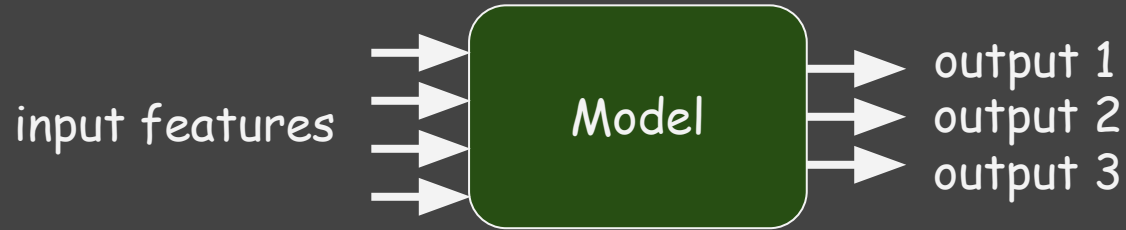
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Multiple Target Variables



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Multiple Target Variables



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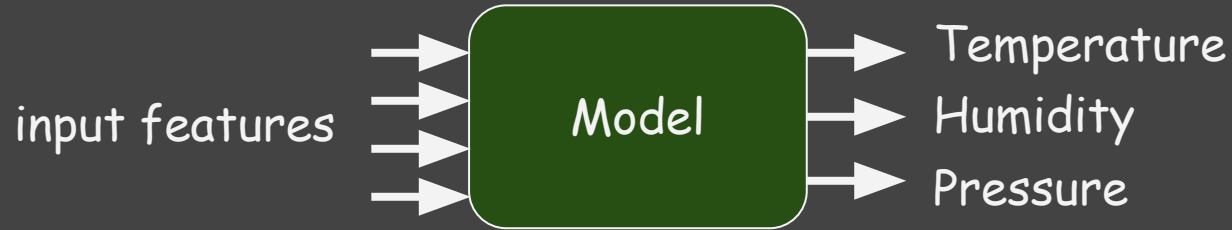
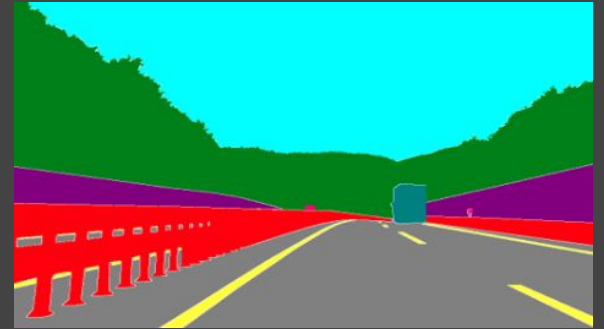
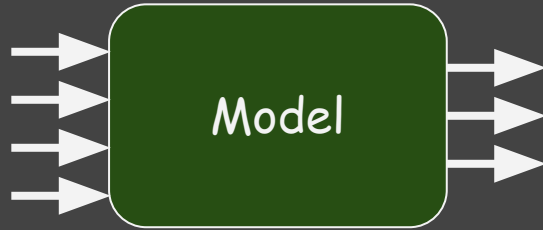


Image segmentation



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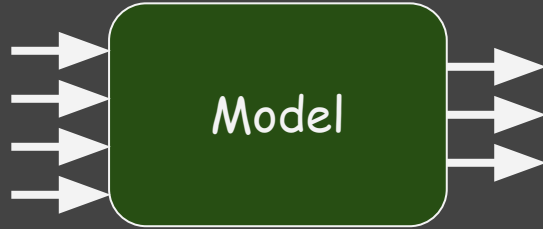
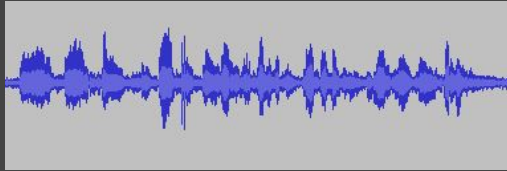


<https://sites.google.com/site/highwaydrivingdataset>

Speech recognition



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یکی بود یکی نبود.

Part-of-speech tagging



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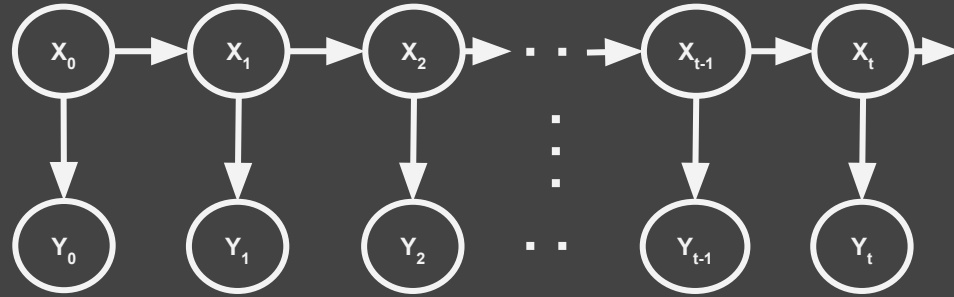
To err is human to forgive is divine

P V V Adj. P V V Adj.

Dynamical Systems



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$$d_{t+1} = d_t + \Delta t v_t + e_d$$

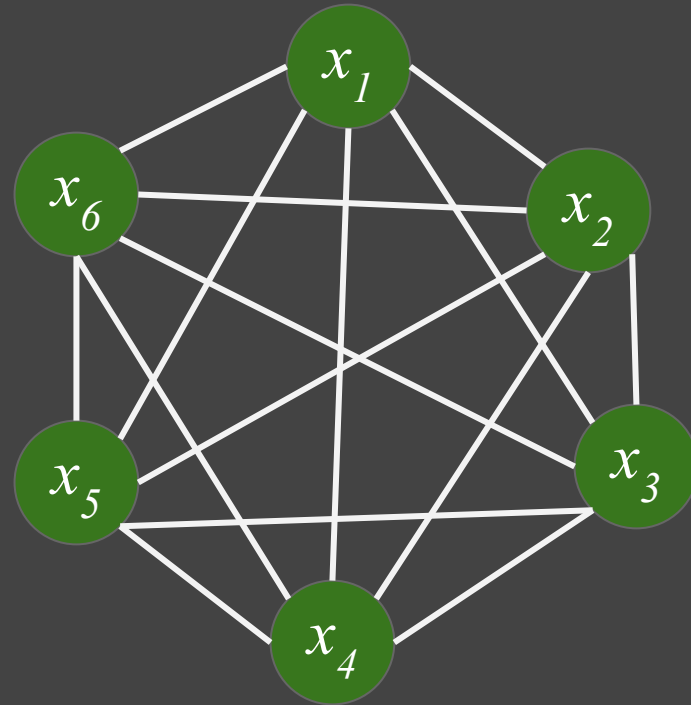
$$v_{t+1} = v_t + e_v$$

$$Y_t = d_t + e_o$$

Intercorrelated Variables



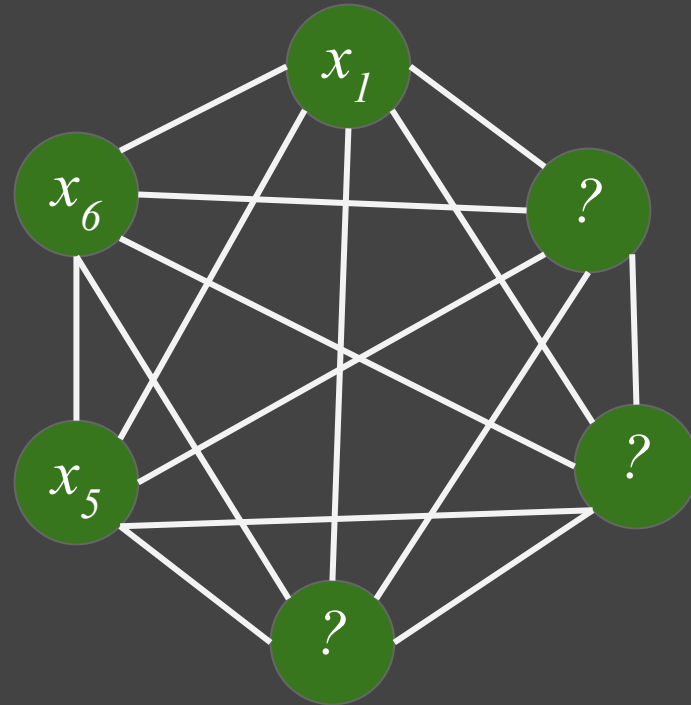
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Intercorrelated Variables



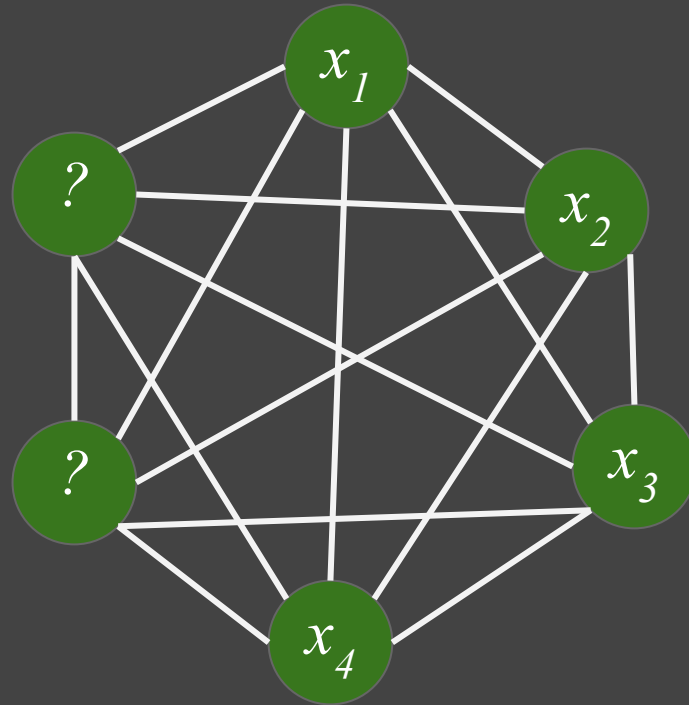
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Intercorrelated Variables



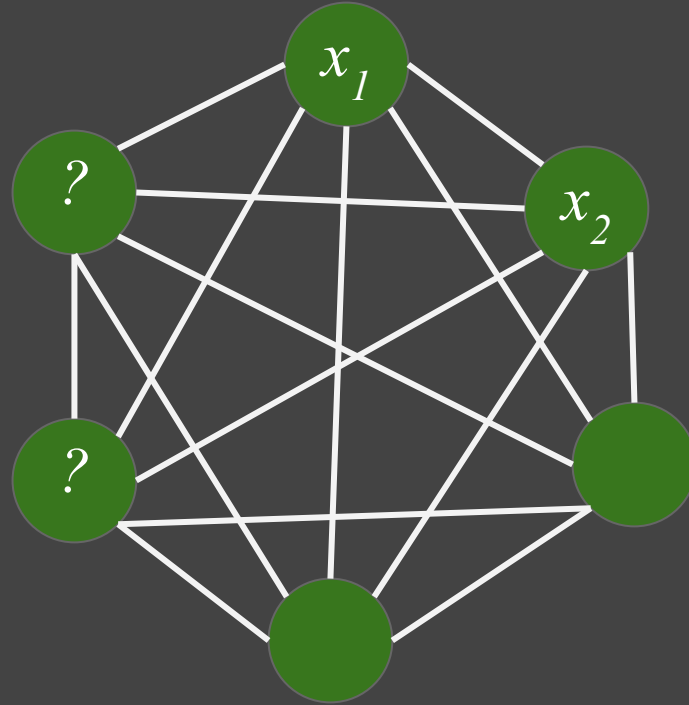
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Intercorrelated Variables



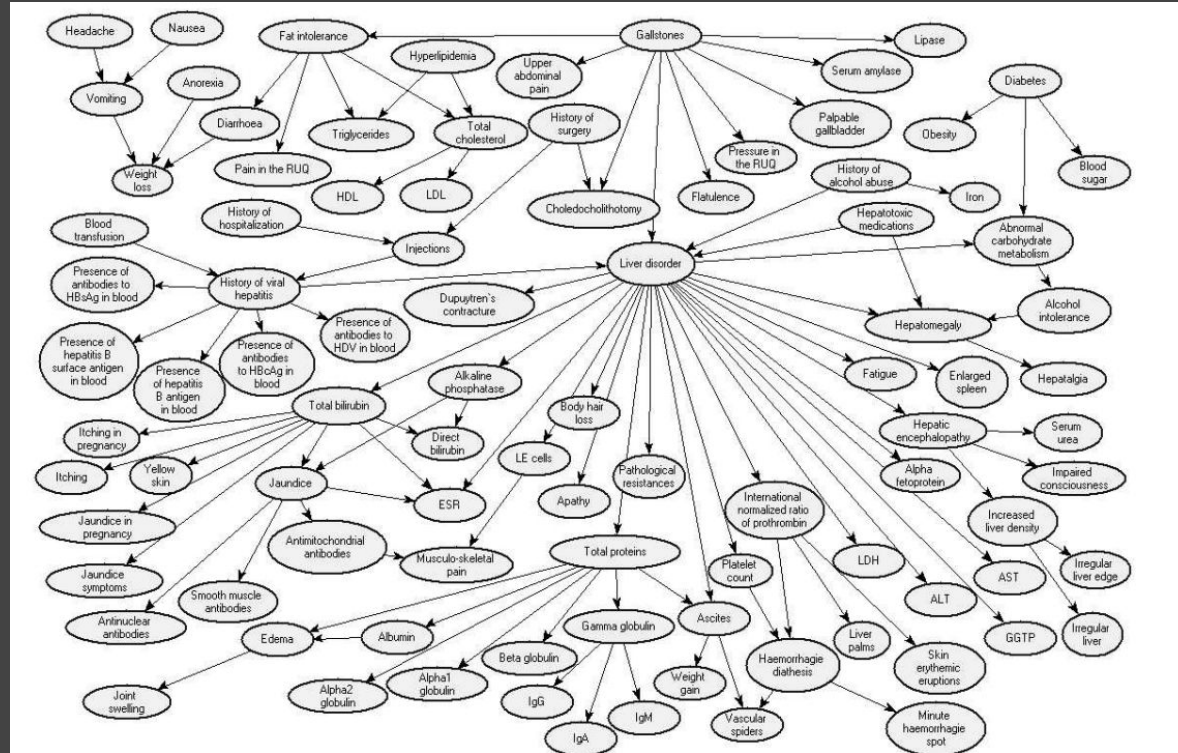
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Medical Diagnosis



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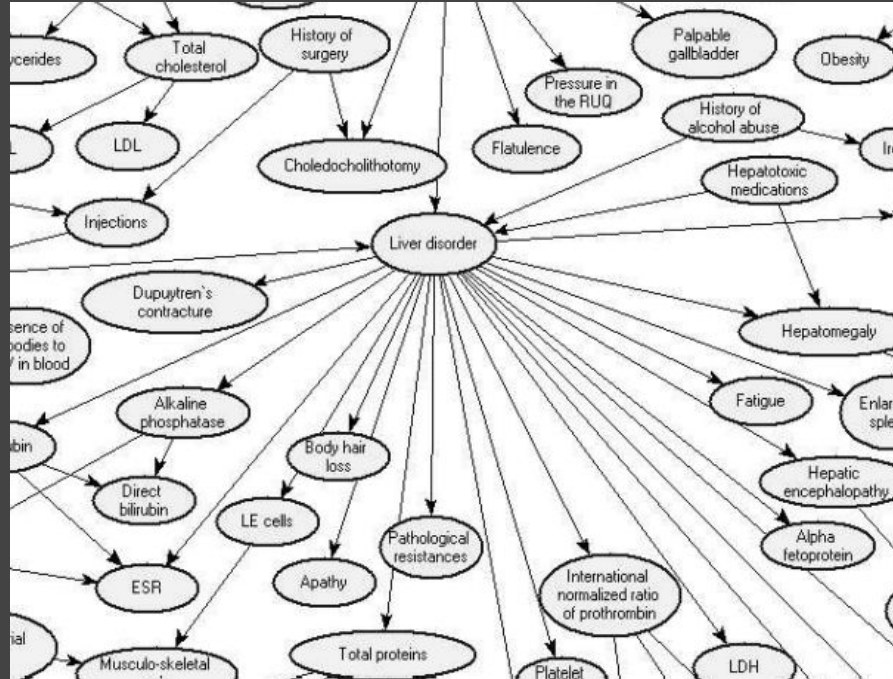


Onisko, Agnieszka, et al. "A Bayesian network model for diagnosis of liver disorders.", 1999.

Medical Diagnosis



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Onisko, Agnieszka, et al. "A Bayesian network model for diagnosis of liver disorders.", 1999.

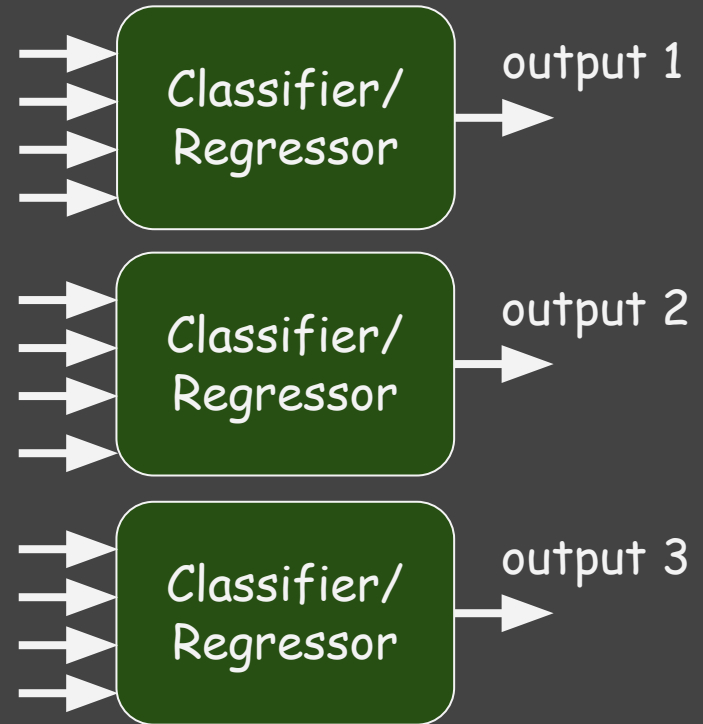
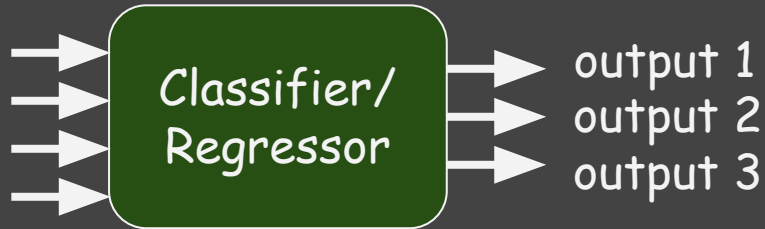
Image Inpainting



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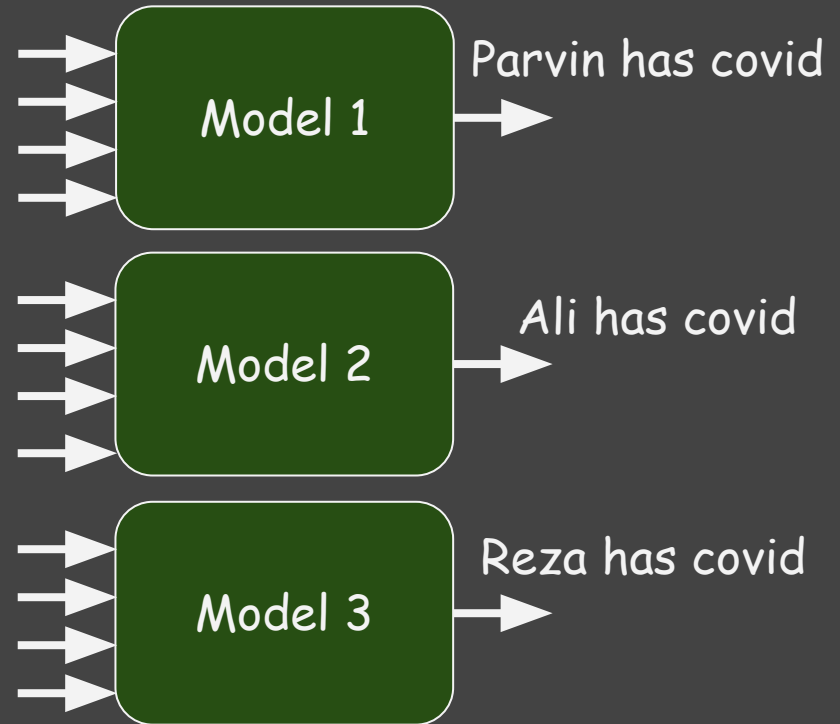
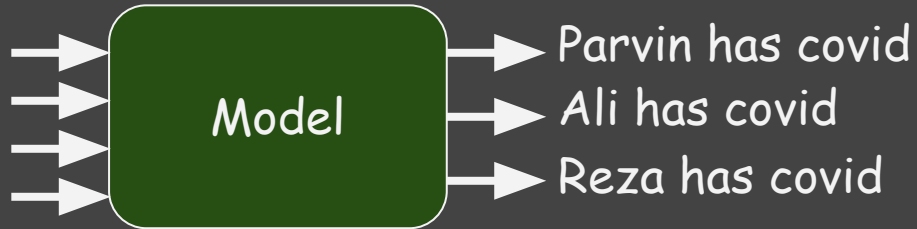
How to handle multiple outputs?



Challenges?



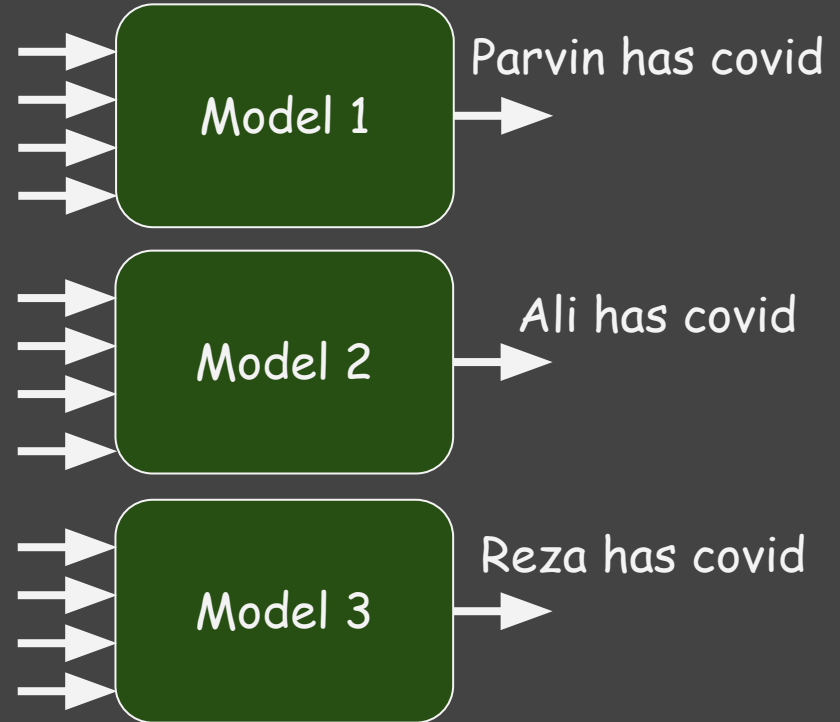
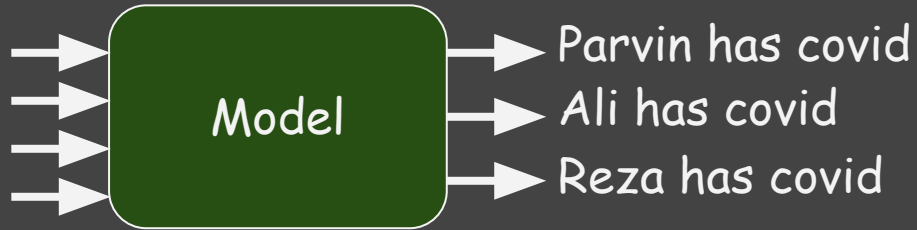
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Challenges?



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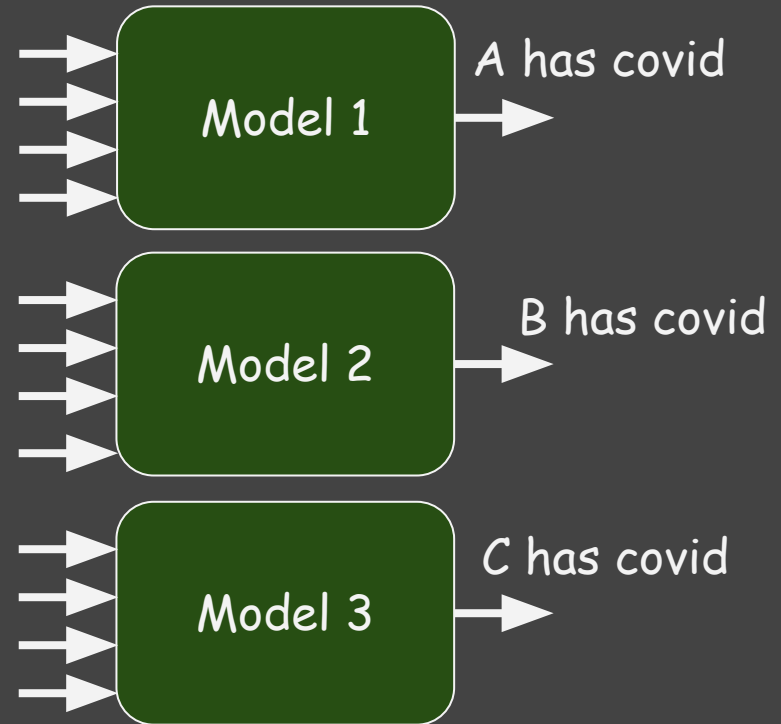
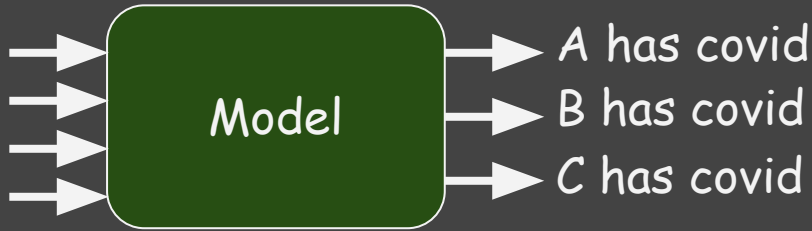


What if they live in the same house?

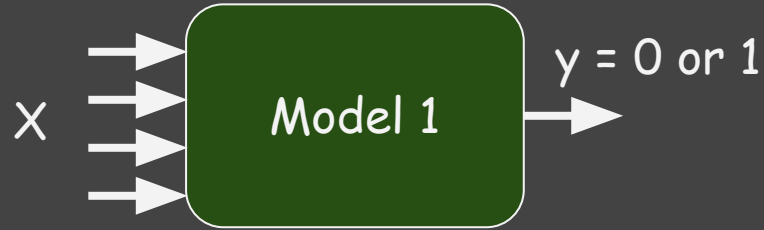
Challenges?



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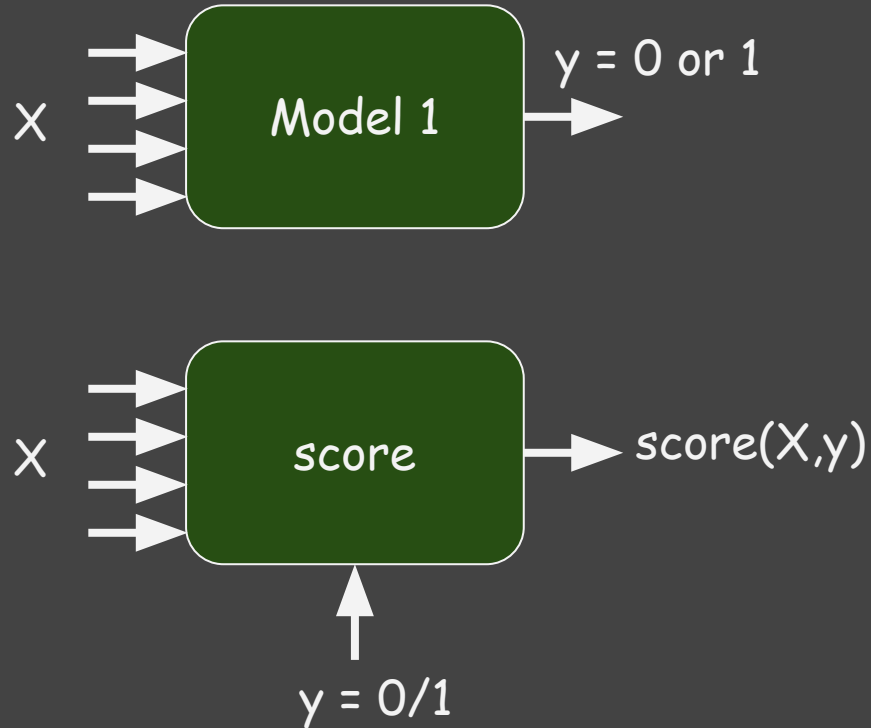
Challenges?



Challenges?



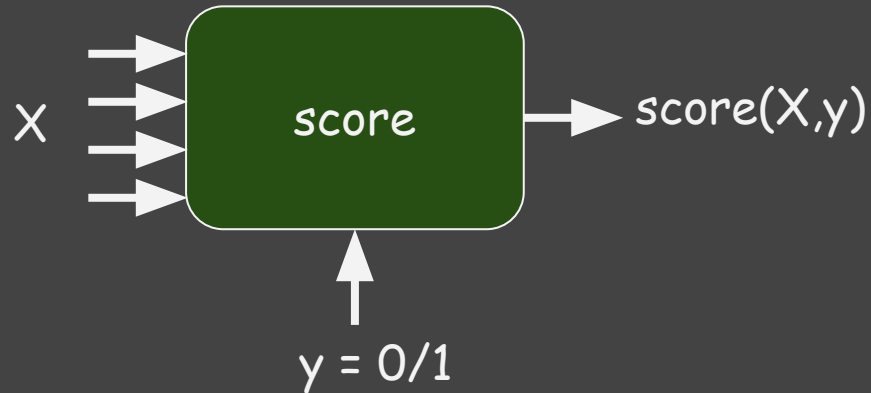
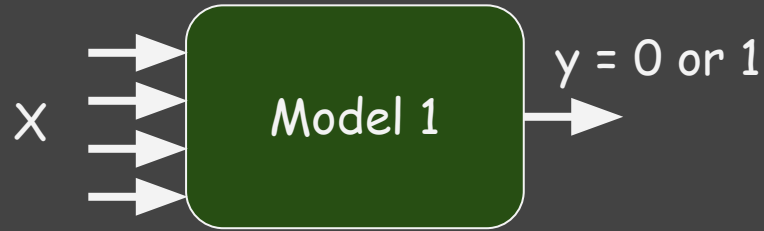
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Challenges?



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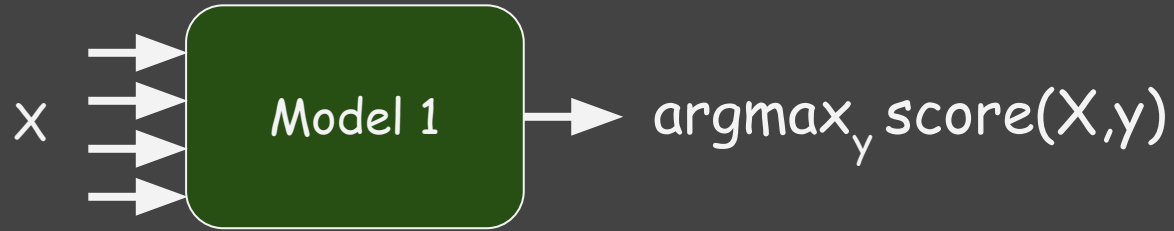


$$\max(\text{score}(X,0), \text{score}(X,1))$$

Challenges?



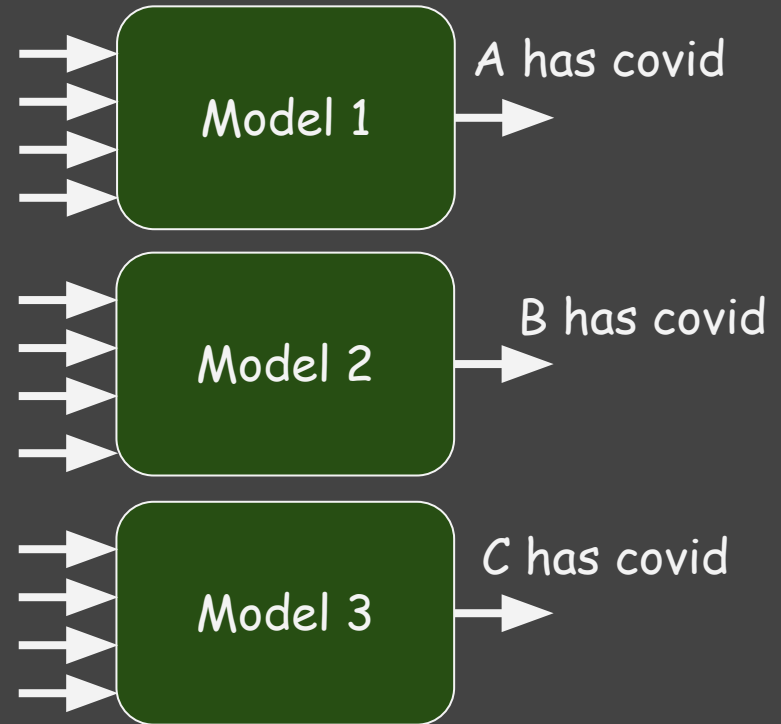
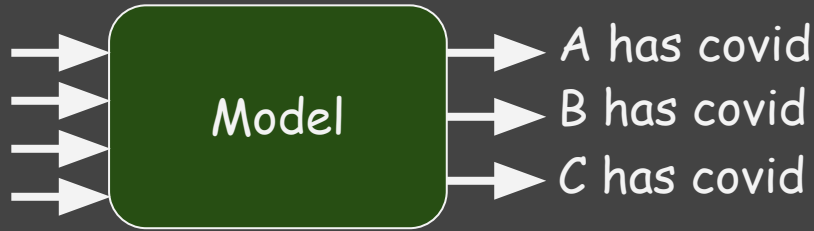
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Challenges?



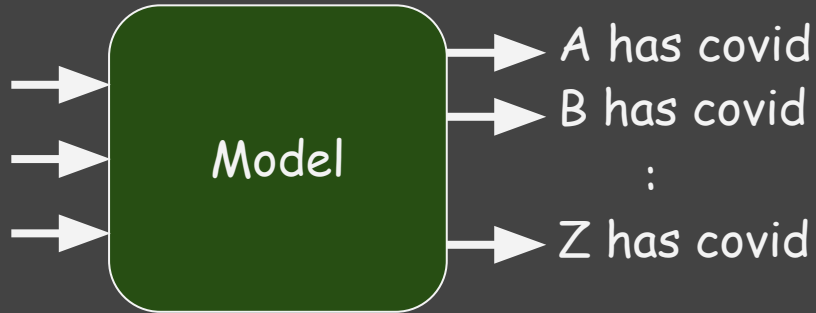
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Challenges?



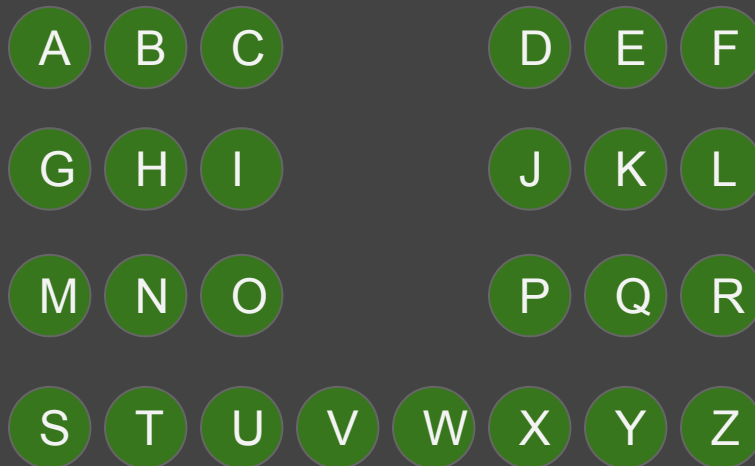
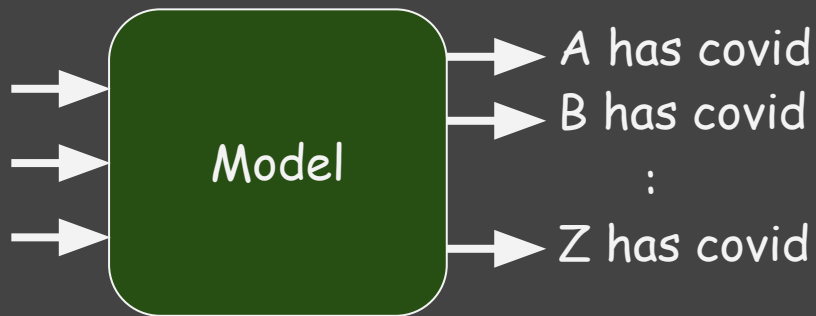
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Using structure



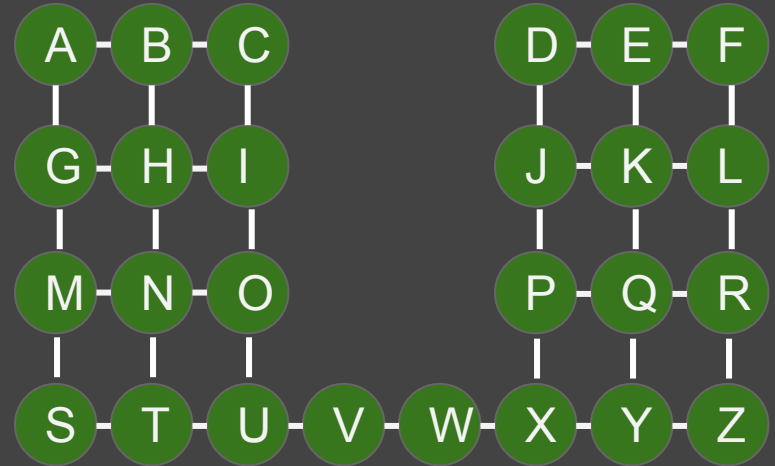
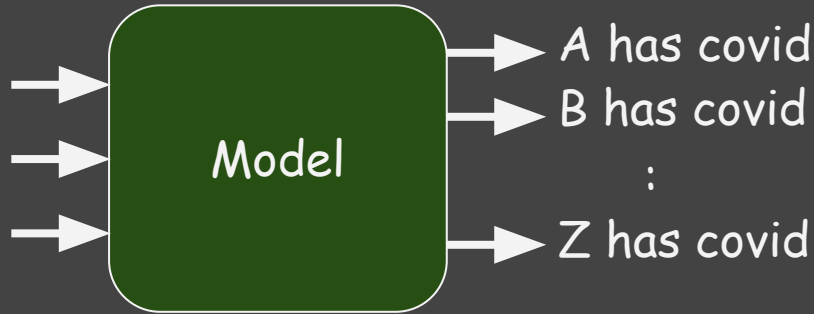
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Using structure



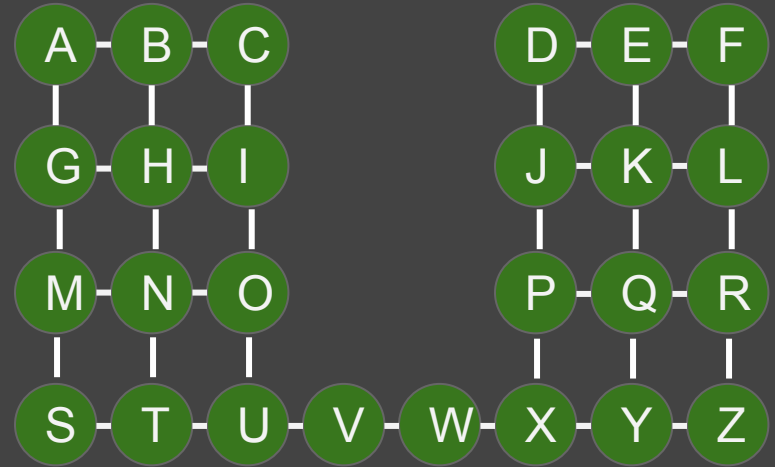
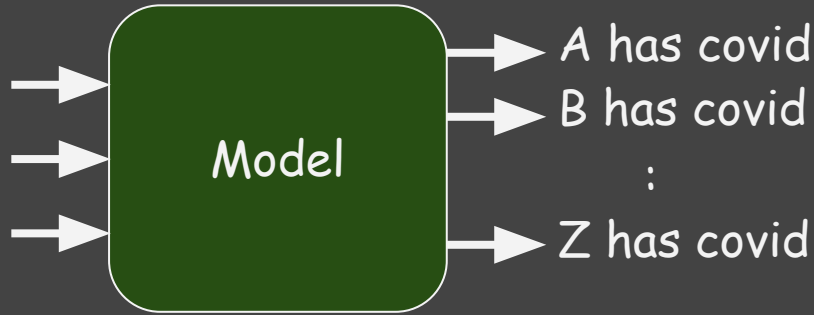
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Using structure



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Conditional Independence

Using structure



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