Where do the probabilities come from?

- Probabilities come from:
  - Experts
  - Data

Learning probabilities — the simplest case

Observe tosses of thumbtack:
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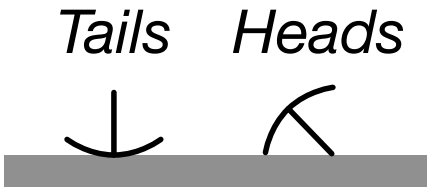
what should we use as $P(heads)$?



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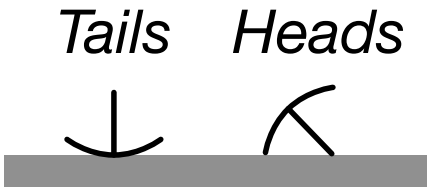

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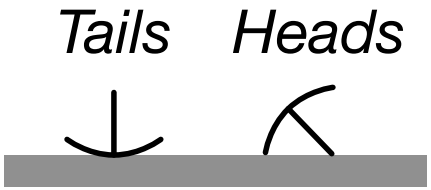

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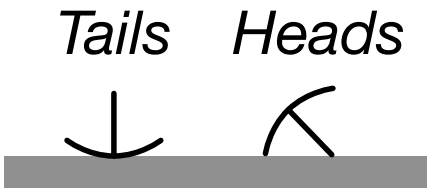

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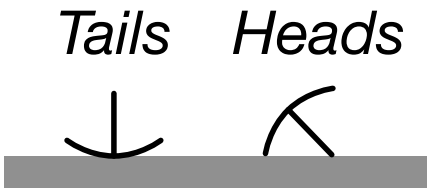

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— empirical frequency overfits to the data.

Example of Overfitting

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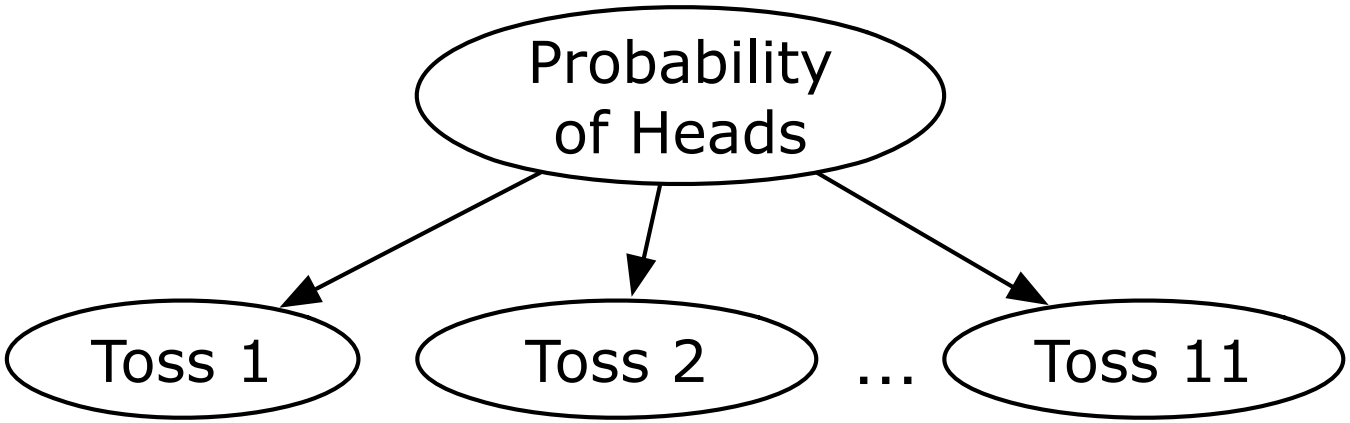
- Solution: add some "average" ratings for each restaurant!

Bayesian Learning



aispace: `http://artint.info/code/aispace/beta.xml`

- *Probablity_of_Heads* is a random variable representing the probability of heads.
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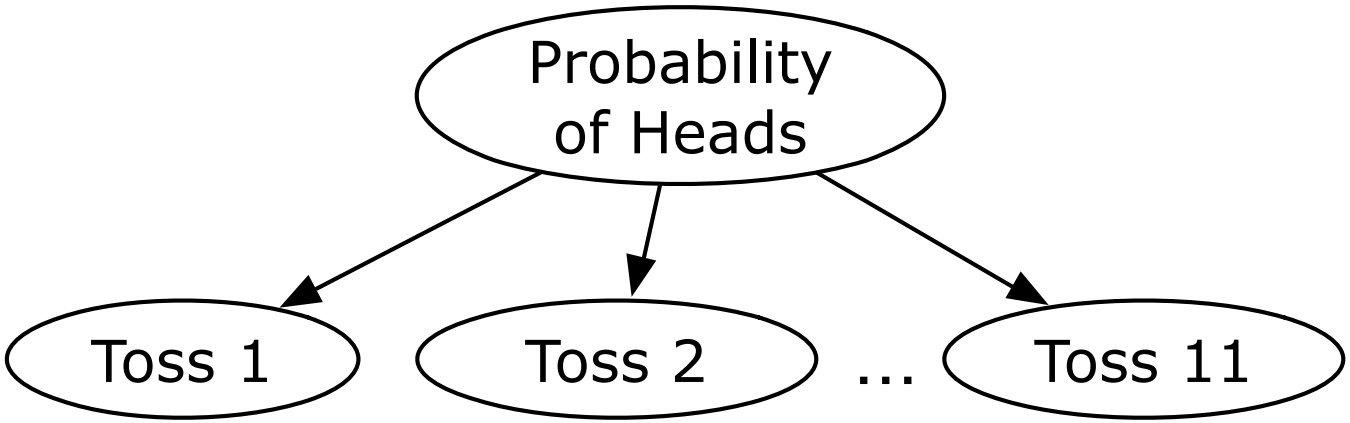

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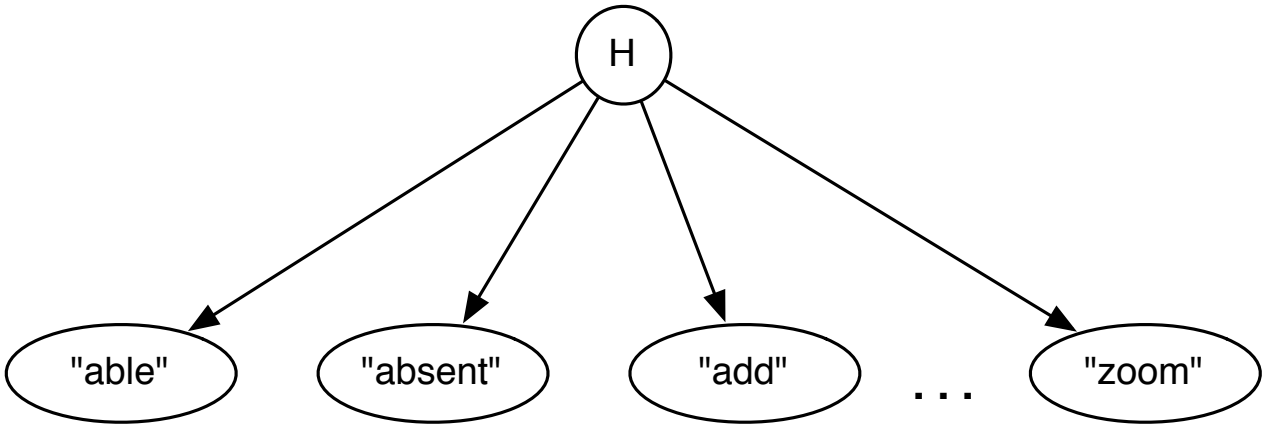
- $\mathit{Toss\#}i$ is independent of $\mathit{Toss\#}j$ (for $i \neq j$) given *Probablity_of_Heads*
- i.i.d. or independent and identically distributed.

Naive Bayes Classifier: User's request for help



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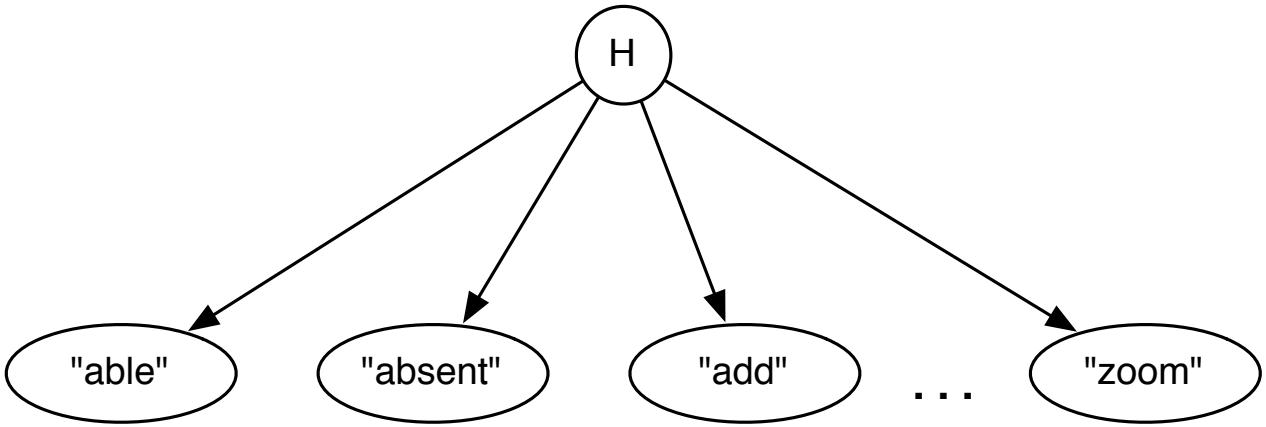

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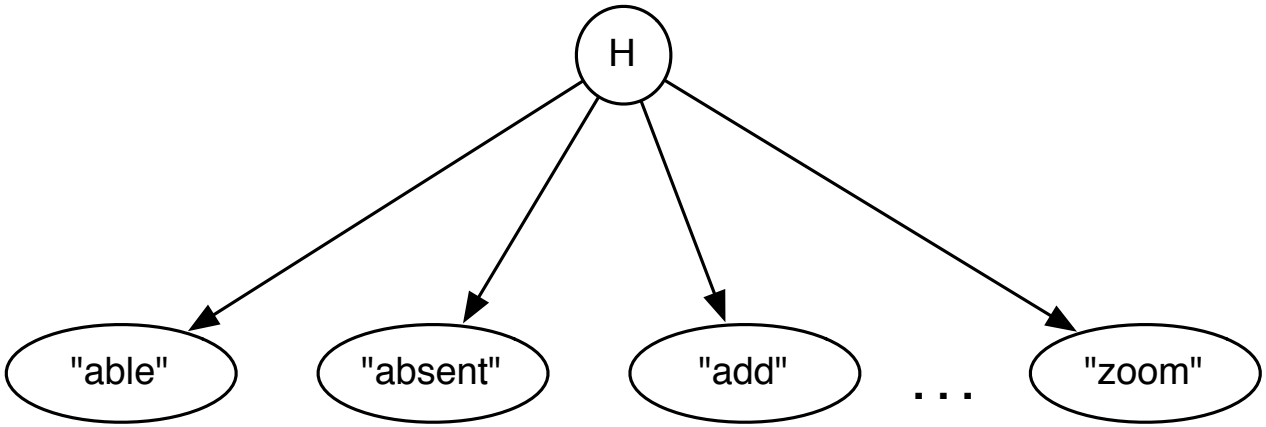

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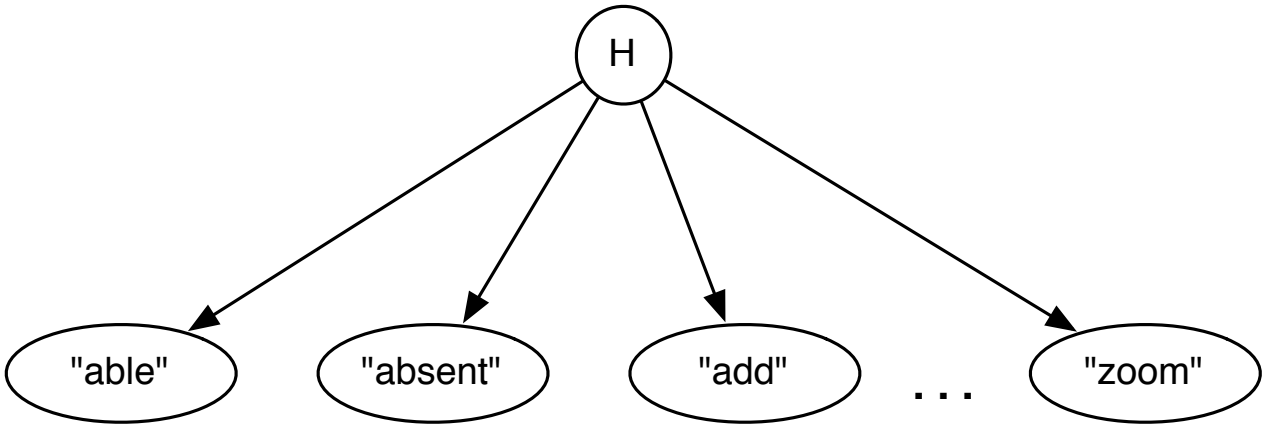

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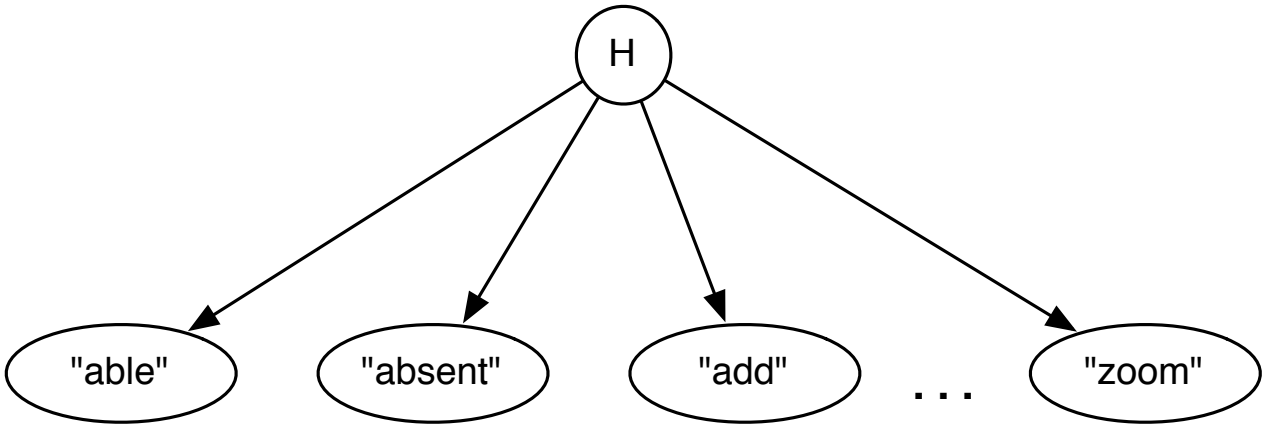

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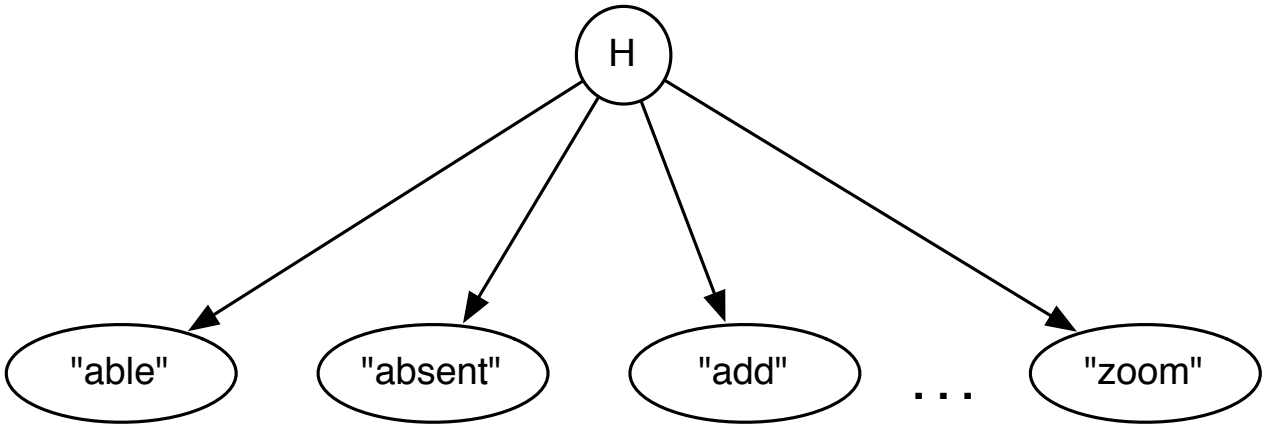

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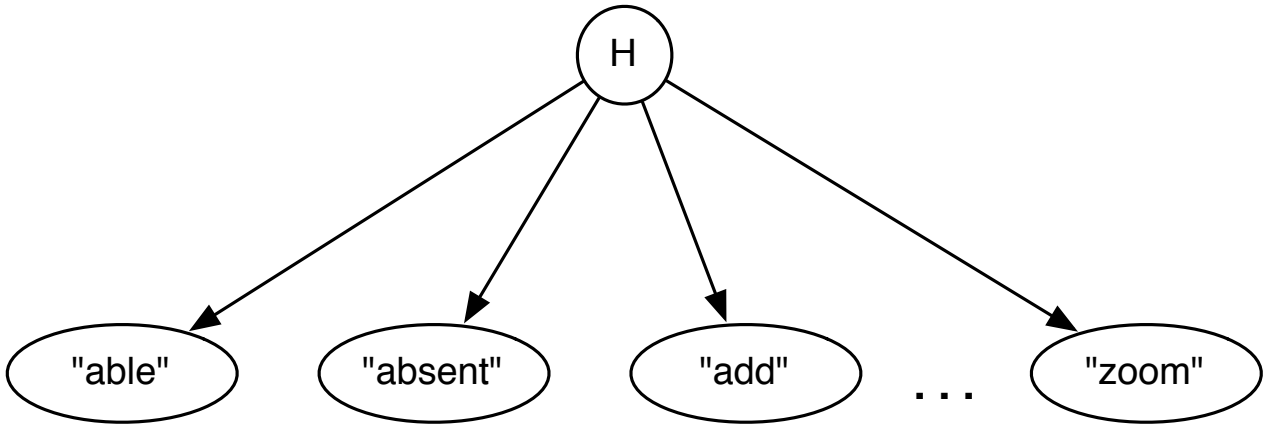

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