



Mathematical Foundations

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JANUARY 13, 2018

Preface: Why make us do this?

- Probabilities (along with statistics) are the language we use to describe data
- A reasonable (but geeky) definition of data science is how to get probabilities we care about from data
- Later classes will be about how to do this for different probability models
- But first, we need key definitions of probability (and it makes more sense to do it all at once)

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- So pay attention!

By the end of today ...

- You'll be able to apply the concepts of distributions, independence, and conditional probabilities
- You'll be able to derive joint, marginal, and conditional probabilities from each other
- You'll be able to compute expectations and entropies

Engineering rationale behind probabilities

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- Encoding confidence
 - The flip side of uncertainty
 - Useful for decision making: should we trust our conclusion?
 - We can construct probabilistic models to boost our confidence
 - E.g., combining polls