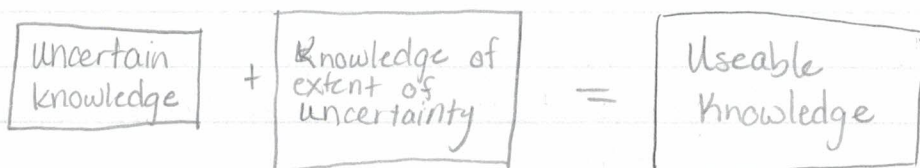


More on farming insurance:

- System to insure failure crops
 - ↳ sell insurance
 - if Temperature < cutoff
 - then farmer gets \$1000 to cover crop loss
 - Insurer has to estimate the probability of this weather condition occurring

• Same idea with insurance against hurricanes or with health insurance

- There's a lot of uncertainty in life
- Most cause and effect relationships are uncertain
- Most uncertainty stems from:
 - lack of information
 - lack of technology
 - inaccuracy of measurement (error)
 - ↳ Heisenberg Uncertainty principle says it's impossible to measure velocity & position of small particles at same time



2 kinds of statements

① It will rain tomorrow (not rain) → Less information

② There is X% chance of rain tomorrow → More refined information; includes uncertainty

#2 can help imply #1 but not vice versa

Common Terms

randomness

chance

variability

expectation

distribution

standard error

- All of these are related to uncertainty

- Probability is the tool used for inferential statistics

- Branches of statistics

· inferential statistics \rightarrow infer about population from sample

· descriptive statistics \rightarrow obtain summary of data (e.g. mean, variance)

Ex. Throw 10 coins

Results:	H	H	T	T	H	T	T	T	T	T
	1	2	3	4	5	6	7	8	9	10

- Look like probability of heads is $3/10$

\hookrightarrow But you can't conclude that coin is unfair. Sample size is too small for certainty

- Assumed a model for this data

\hookrightarrow Bernoulli distribution

\hookrightarrow says value 1 (H) with p

value 0 (T) with $1-p$ $0 < p < 1$

- Need to learn distributions and probabilistic models to apply the appropriate one to real data

- * Probability preliminaries
- * Discrete, continuous probabilistic models
- * Multivariate probabilistic model
- * Large sample methods

Preliminaries of Probability

- Topics: sample spaces
events (= sets)
operations on events (\cup, \cap)
- Experiments can be done in reality or by logic on paper
- Process counting, enumerating (listing all the possible outcomes)

Sample space: The set of all possible outcomes of an experiment
Will be denoted S

↳ For coin flip example $S = \{H, T\}$

↳ dice throw $\rightarrow S = \{1, 2, 3, 4, 5, 6\}$

↳ 2 dice throw $\rightarrow S = \{(1, 1), (1, 2), (1, 3) \dots (6, 6)\} \rightarrow 36$ results

↳ consider $(3, 1) \neq (1, 3)$ as different results

↳ Select 2 fuses & classify as either defective or non defective
 $S = \{ \overset{(D)}{DN}, \overset{(N)}{NN}, ND, DD \}$

↳ Sample space of how many are defective?
 $S = \{0, 1, 2\}$

↳ Sample space of the number of fuses inspected until two defective fuses are found

$S = \{2, \dots, 10, \dots, 20, \dots, 200, \dots, 3\}$