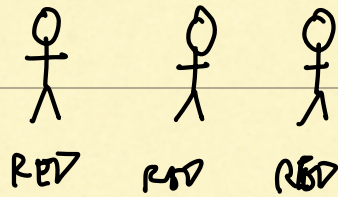
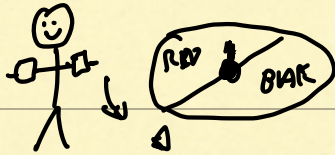


Q1

CASINO

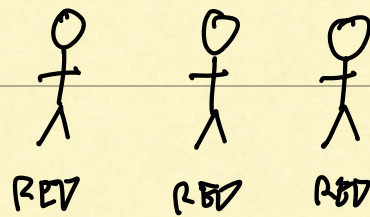
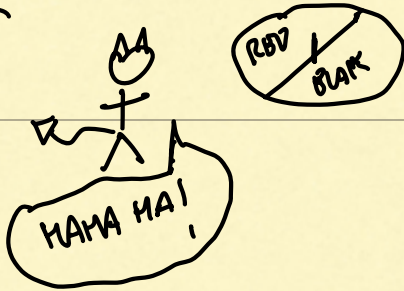


YOU



Q2

PROFESSOR



YOU



FORWARD MODELING
GENERATIVE MODELING PROBABILITY

MODEL

BEHAVIOR

OBSERVATIONS

INTERMEDIATE
REPRESENTATION
?

INFERENCE
CLASSIFICATION
LEARNING
"BACKWARD" MODELING

PREDICTION

STATISTICS

AXIOMS OF PROBABILITY

X - RANDOM VARIABLE

$X \in S$ SAMPLE SPACE OR STATE SPACE

EX. $\{H, T\}$, $\{0, 1, 2, \dots\}$

\mathbb{R} (REAL NUMBERS)

ELEMENTS AND SUBSETS ARE CALLED EVENTS

EVENTS CAN BE COMBINED

$e_1 \cup e_2$

UNION

"OR"

$e_1 \cap e_2$

INTERSECT

"AND"

$S \setminus e$ - COMPLEMENT EVENT "NOT"

X HAS A PROBABILITY FUNCTION \mathbb{P}

$\mathbb{P}(e)$

\nwarrow SUBSETS

- $0 \leq \mathbb{P}(e)$ FOR ANY e

- $\mathbb{P}(S) = \underline{1}$

- IF $e_1 \cap e_2 = \emptyset$ THEN

NOTHING

$$\mathbb{P}(e_1 \cup e_2) = \mathbb{P}(e_1) + \mathbb{P}(e_2)$$

CONSEQUENCES

$$\mathbb{P}(e) \leq 1$$

$$\mathbb{P}(\text{NOTHING}) = 0$$

EX FAIR DIE



$$S = \{1, 2, 3, \dots, 6\}$$

$$e_A = \text{EVEN} \quad \{2, 4, 6\}$$

$$e_B = \text{LESS THAN } 3 \quad \{1, 2\}$$

$$\mathbb{P}(e_A \cup e_B) = \mathbb{P}(\{1, 2, 4, 6\})$$

IF IT IS FAIR, $\mathbb{P} = \frac{4}{6}$

$$P(e_A \cap e_B) = P(\{e_2\}) = \frac{1}{6}$$

CONDITIONAL PROBABILITY

"GIVEN"

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

EX

$$P(e_A | e_B) = \frac{P(e_A \cap e_B)}{P(e_B)} = \frac{\frac{1}{6}}{\frac{2}{6}} = \frac{1}{2}$$

INDEPENDENCE

A AND B ARE INDEPENDENT IF

$$P(A \cap B) = P(A) \cdot P(B)$$

NOTE

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{\underline{P}(A) \cdot \cancel{P(B)}}{\cancel{P(B)}}$$

$$= \underline{P}(A)$$
