Review probability and Bayer’s law from Statistics class

$A \succ B$ # a preferred over B
$A \sim B$ # about equal
$A \succcurlyeq B$ # A is at least as preferred as B

$U_{\perp}$ # lowest possible preference
$U_{\top}$ # highest possible preference

Calculating expected value: $\frac{1}{2}(2) + \frac{1}{2}(-1) = 0.5$
Lottery notation: $[0.5,\ 2;\ 0.5,\ \ -1]$

Axioms:
Orderability principle (can sort preferences)
Transitivity (A>B, B>C -> A>C)
Continuity: $A > B > C \Rightarrow \exists p\ s.t.\ [p, A;\ 1-p,\ C] \sim B$
Substitutability (if A~B, can replace A and B in the lottery)
Monotonicity (if A>B, then lottery that has higher chance of A is preferred)
Decomposability (compound lottery (multi stage) has an equivalent simple lottery (one stage))

Strict dominance (one lottery is always better than the other regardless of the outcome)
Stochastic dominance (plot probability of outcomes on a curve [0,1] and compare the area)

$\sum_{i=1}^{n} p_i U(S_i)$ # map outcomes though a utility function
Utility function preserves Orderability

$EU(a|e) = \sum_{s'} P(Result(a) = s'|a, e)U(s')$ # expected utility of a if e is sum of probabilities

$action = arg\ \max_{a}\ E(a|e)$ # utility maximizing action

$V^{\pi}: S \rightarrow R$ # value function
$V^{\pi^*}: S \rightarrow R$ # optimal value function (considers all futures)