HW8_Andrew_Goldberg

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We have engaged in a business venture. Assume the probability of success is P(s) = 2/5; further assume that if we are successful we make $55,000, and if we are unsuccessful we lose $1750. Find the expected value of the business venture.

```
probSucc <- 2/5
expVent <- (55000*(probSucc)) - (1750*(1-probSucc))
expVent
```

```
## [1] 20950
```

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Consider a firm handling concessions for a sporting event. The firm's manager needs to know whether to stock up with coffee or cola and is formulating policies for specific weather predictions. A local agreement restricts the firm to selling only one type of beverage. The firm estimates a $1500 profit selling cola if the weather is cold and a $5000 profit selling cola if the weather is warm. The firm also estimates a $4000 profit selling coffee if it is cold and a $1000 profit selling coffee if the weather is warm. The weather forecast says that there is a 30% of a cold front; otherwise, the weather will be warm. Build a decision tree to assist with the decision. What should the firm handling concessions do?

```
                    ----cold--- (30%, E(coff|cold) = .3*4000 = 1200)
          ----coffee--(1200+700 = $1900)
                    ----warm--- (70%, E(coff|warm) = .7*1000 = 700)
----decision--- (cola)
                    ----cold--- (30%, E(cola|cold) = .3*1500 = 450)
          ----cola--(1200+700 = $3900)
                    ----warm--- (70%, E(cola|warm) = .7*5000 = 3500)
```

So cola is far more profitable

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The financial success of a ski resort in Squaw Valley is dependent on the amount of early snowfall in the fall and winter months. If the snowfall is greater than 40 inches, the resort always has a successful ski season. If the snow is between 30 and 40 inches, the resort has a moderate season, and if the snowfall is less than 30 inches, the season is poor, and the resort will lose money. The seasonal snow probabilities from the weather service are displayed in the following table with the expected revenue for the previous 10 seasons. A hotel chain has offered to lease the resort during the winter for $100,000. You must decide whether to operate yourself or lease the resort. Build a decision tree to assist in the decision.

```
                    ----snow >=40"----- (40%, E(high|operate) = .4*280000 = 112000)
                    ----snow 30"-40"--- (20%, E(med|operate)  = .2*100000 = 20000)
                    ----snow >=30"----- (40%, E(low|operate) = .4*-40000 = -16000)
          ----operate--(112000+20000-16000 = 116000)
----decision---(operate gives expectation of 16k more)
          ----lease--(100000)
```

1

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A big private oil company must decide whether to drill in the Gulf of Mexico. It costs $1 million to drill, and if oil is found its value is estimated at $6 million. At present, the oil company believes that there is a 45% chance that oil is present. Before drilling begins, the big private oil company can hire a geologist for $100,000 to obtain samples and test for oil. There is only about a 60% chance that the geologist will issue a favorable report. Given that the geologist does issue a favorable report, there is an 85% chance that there is oil. Given an unfavorable report, there is a 22% chance that there is oil. Determine what the big private oil company should do.

```
                          ----oil found--- (45%, E(oil found)  = .45*(6000000 - 1000000) = 2250000)
                          ----no oil------ (55%, E(no oil)      = .55*-1000000 = -550000)
              ----no geologist--(2250000-550000=1700000)
----decision---(hiring geologist has higher expectation (2488000-1700000)=788000)
              ----geologist----(2400000+88000=2488000)
                          ----favorable report--- (60%, E(oil found)  = .6*(4165000 -165000) = 2400000)
                                  ----oil found--- (85%, E(oil found|fav)  = .85*(6000000 - 1000000 - 100(
                                  ----no oil------ (15%, E(no oil|fav)  = .15*(-1000000 - 100000) = -16500
                          ----unfavorable report- (55%, E(no oil)      = .4*(1078000-858000)=88000)
                                  ----oil found--- (22%, E(oil found|unfav)  = .22*(6000000 - 1000000 - 1(
                                  ----no oil------ (78%, E(no oil|unfav)  = .78*(-1000000 - 100000) = -858
```

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    a. Which alternative do we choose if our criterion is to maximize the expected value?

```r
altA <- c(1100, 900, 400, 300)
altB <- c(850, 1500, 1000, 500)
altC <- c(700, 1200, 500, 900)

statesNat <- c(.35, .3, .25, .1)

expA <- sum(altA*statesNat)
expB <- sum(altB*statesNat)
expC <- sum(altC*statesNat)

max(c(expA, expB, expC))
```

```
## [1] 1047.5
```

```r
#altC has highest expected value
```

    b. Find the opportunity loss (regret) table and compute the expected opportunity loss (regret) for each alternative. What decision do you make if your criterion is to minimize expected regret?

```r
natTab <- rbind(altA, altB, altC) #create table

#subtract max of each alternative to create columns of regret table
Cond1 <- max(natTab[,1]) - natTab[,1]
Cond2 <- max(natTab[,2]) - natTab[,2]
Cond3 <- max(natTab[,3]) - natTab[,3]
Cond4 <- max(natTab[,4]) - natTab[,4]

RegNatTab <- cbind(Cond1, Cond2, Cond3, Cond4)
RegNatTab #regret table
```

```
##      Cond1 Cond2 Cond3 Cond4
## altA     0   600   600   600
## altB   250     0     0   400
## altC   400   300   500     0
```

```r
#Calculate expected opportunity loss
expRegA <- sum(RegNatTab[1,]*statesNat)
expRegB <- sum(RegNatTab[2,]*statesNat)
expRegC <- sum(RegNatTab[3,]*statesNat)
min(c(expRegA, expRegB, expRegC))
```

```
## [1] 127.5
```

```r
#alternative B has the lowest expected regret of 127.5
```