Data 605 - Assignment 10

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Markov Chain

Smith is in jail and has 1 dollar; he can get out on bail if he has 8 dollars. A guard agrees to make a series of bets with him. If smith bets A dollars, he wins A dollars with probability .4 and loses A dollars with probability .6.

Find the probability that he wins 8 dollars before losing all of his money if

  (a) he bets 1 dollar each time (timid strategy)
  (b) he bets, each time, as much as possible but not more than necessary to bring his fortune up to 8 dollars (bold strategy)
  (c) which strategy gives smith the better chance of getting out of jail?

Solution:

With the Markov Chain $(X_n n = 0, 1, ...)$ will represent the evolution of Smith's money

```
# Probability Smith wins
w <- .4

# Probability Smith loses
l <- .6

# Bail amount needed in $
n <- 8

# Current amount in Smith's possession
i <- 1
```

Parameters:

```
timid <- (1 - ((l / w)^ i)) / (1 - ((l / w)^ n))
timid
```

Timid Strategy

```
## [1] 0.02030135
```

```
# This strategy means that Smith has a probability of winning 3 times in a row
bold <- w ^ 3
bold
```

Bold Strategy

```
## [1] 0.064
```

Better Chance?

Based on this, although risky, the bold strategy would give Smith a higher outcome to post bail with a **6.4%** chance as opposed to **2.03%** chance with the timid strategy.