INTRO SLIDE/CONTENTS

Our group chose to study Markov Chains and we thought it would be interesting to apply this mathematical process to something that most everyone has played, the board game Monopoly. Can everyone who has played this game before raise their hands? Now only keep your hands up if you have actually won the game. Well, congratulations to you guys. I won’t be playing with you since you’re good. Hopefully, over the next few minutes, our group can give everyone else some insights today that you can take home over break and use to dominate your unsuspecting friends and family in Monopoly.

SLIDE 1

First, I wanted to go over a brief explanation on how to play the game. Each player is given $1500 and is represented by a token and the start, which is GO. On your turn, you roll 2 dice and advance the corresponding number of spots. If you roll doubles (2&2 or 3&3 etc) you advance and roll again. Once you are on your square, if it is a property, you may want to purchase it. As you go around the board, the prices of the properties will generally increase. From $60 on the first spot to $400 on Boardwalk.

Every time you go around the board and pass Go, you collect $200. You will also get to charge other players rent if they land on one of your properties. The rents are small at the beginning, but increase if one player has a monopoly of that color group, as well as if the owner has improved the property with houses or hotels.

Jail is a spot on the board that you can get to a few different ways, this affected our calculations for the Matrix and Gordon will explain that, but briefly if you land on the square “Go to Jail” you are sent directly to jail. There are also “Go to Jail” cards in the stack of Chance and Community Chest Cards.

So, to recap, players move around the board by rolling dice, you buy property, develop the property with houses or hotels, and collect rent from your opponent. The final objective is to force your opponents into bankruptcy.

SLIDE 2

Now for our Problem today, the strategy will lie in making decisions on which properties are worth purchasing, which ones to develop and which ones to sell or trade to other players. A valuation system is created by combining the probabilities of players landing on each property and the potential rents received. Markov chain will allow us to get the steady state probabilities that an opponent will land on any given property. We can then calculate the expected income for each property

SLIDE 3

Here is a larger view of the same board. Now that we have refreshed the rules and flow of the game, which spot on the board is the most valuable? Why is that?

Today, this is the problem we are going to solve using Markov Chains. Let me bring up Jack who will introduce and explain this process to you.