Project Diary

COSC326 Etude 7 For Sale

Team name: We Ballin', Wii Bowlin'
Group: Ethan Fraser 6338284, Jordan Kettles 2147684, Magdeline Huang 2824402, Tim Copland 2501633
GitHub repo: https://github.com/timcop/COSC326/tree/main/07-For_Sale

April 30 Friday

We devised two strategies, Strat 1 and Strat 2:

- Strat1
  - **bid:** Always bids by +1 up to half of it's pot before passing.
  - **chooseCard:** Chooses a card proportional to the standard deviation of the cards ie if the standard deviation is high, choose a high value card
- Strat2
  - **bid:** Bids +1 if the current bid is an odd number, else +2 up until half of it's pot before passing.
  - **chooseCard:** Chooses a card proportional to the std deviation of the cards.

We also discussed the potential importance of standard deviation in the game. The standard deviation is how spread out the card values are from the mean.

This shows a sample selling round with the standard deviation of the cheques calculated on the left. The bolded cheque numbers are the cheques we think the agent should be trying to win.

Ideas of hardcoded values:
If 1 < stddev <= 3.5, choose top 4
If 3.5 < stddev <= 5.5, choose top 3
If 5.5 < stddev, choose top 2

Stdev	Hand (**cards to choose**)
5.62	[0, 3, 5, **12, 15]**
5.88	[0, 2, 4, **12, 15**]
3.22	[4, 7, **9, 11, 13**]
3.97	[3, 5, **8, 11, 14**]
4.00	[2, 6, **8, 9, 14**]
2.49	[6, 7**, 10, 10, 13**]
4.24	[2, 9, **12, 13, 13**]
4.29	[3, 5, **8, 11, 15**]
1.41	[3, **5, 6, 6, 7**]
5.50	[0, 2, **9, 10, 15]**
4.67	[0, 4, **7, 8, 14**]
3.38	[4, **10, 11, 12, 14]**

May 4 Tuesday

We decided to play the For Sale game as a team again to see if we could find any additional ideas for the strategies. Jordan also decided to use Strat2 as his strategy to see how effective it would be in winning the game.

Here are our discoveries when playing the game:

- Strat2 wasn't particularly effective and it didn't win the game.
- The selling phase is a better determinant of how much money you will have at the end of the game than the bidding phase.
- The standard deviation is important in both phases of the game.

May 7 Friday

We discussed more strategies.

- For bidding phase
    - Make a pass if all properties are of low value
    - Don't be the first to pass because you will end up getting the lowest value card
    - The first person to pass is the person who receives the lowest value card for that round, so you want to avoid passing first.
- For selling phase
    - If all the cheques are of high values and there's a low standard deviation, choose a low value property.
    - Want to avoid getting a zero cheque.

We also considered refining existing strategies?

- Play around with the percentage? Currently it's 0.4

We came up with different actions we would take for the different game scenarios. This is so that we are not just considering the standard deviation, but also the actual values of the cards.

Phase	**Low standard deviation**	**High standard deviation**
Bidding	- If the cards are all of a high value, consider passing early - If the cards are all of a low value, consider passing	Because the cards are very spread out, it depends on how much money the player has left. If they have lots left, they may choose to bid, but if not, they might pass. Also, they should bid a high card to maximise their chances of getting the high value card.
Selling	- If the cards are all of a high value, play a low value card - If the cards are all of a medium value, - If the cards are all of a low value, play a low value card and avoid getting the 0 cheque if it exists	If the cards are all of high value, If the cards are of medium value If the cards are all of low value,

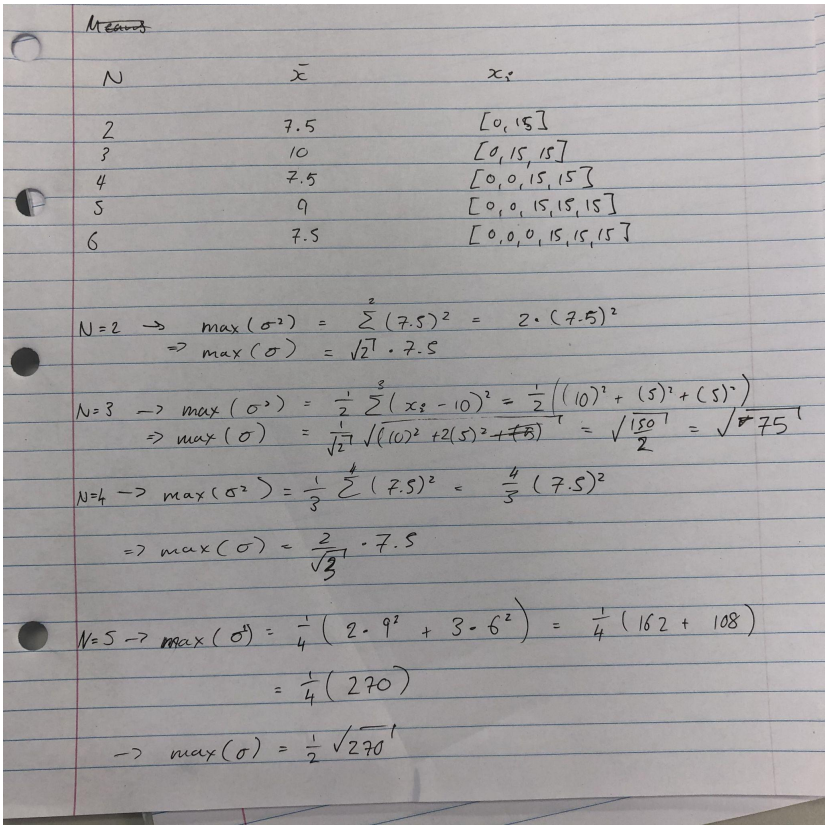
We also devised Strat3:

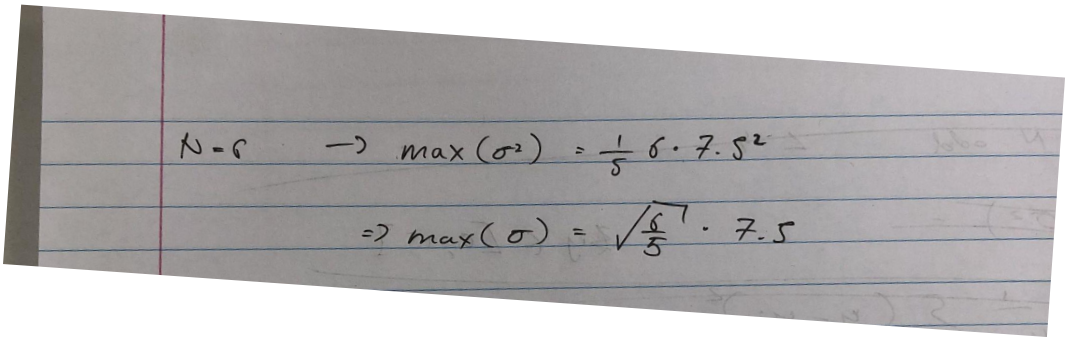
- **bid:** Use std deviation
- **chooseCard:** Use std deviation

May 11 Tuesday

- Discuss standard deviation strategy.
- Create strategy based on the table

- Test strategy



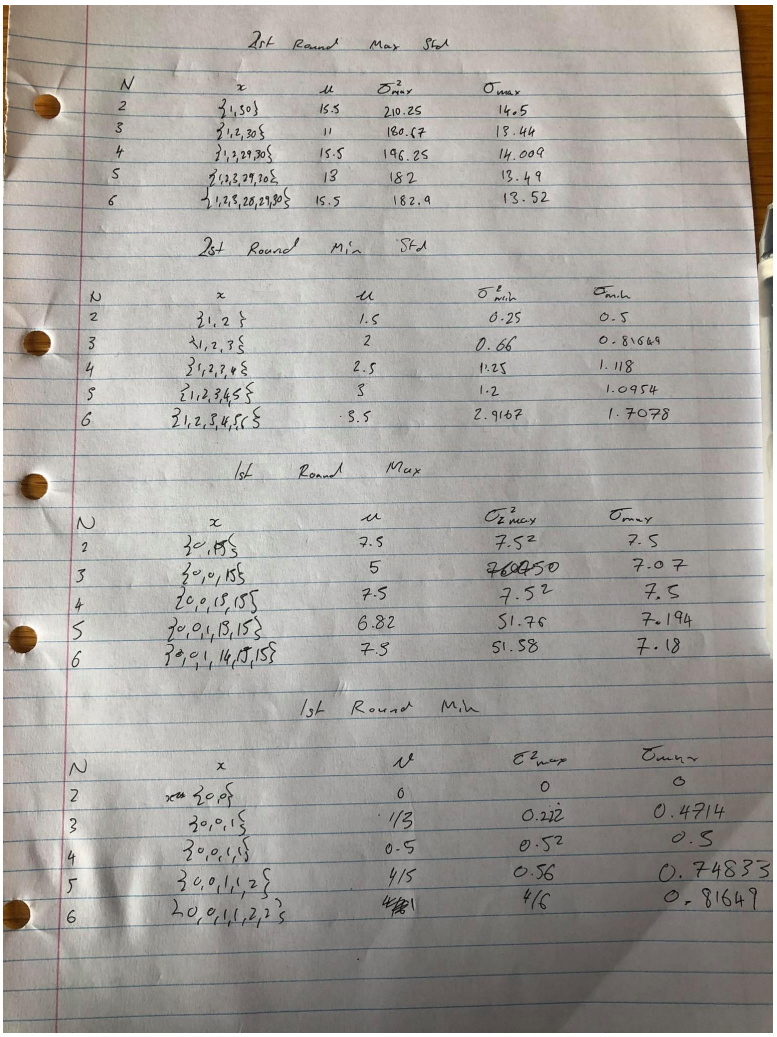


May 18 Tuesday

- Improving our chooseCard strat
- Creating a new chooseCard strat
- Calculated min and max std deviation
- **Strat 4:**
    - **bid:** Always bids while the median card is still in play before passing.
    - **chooseCard:** Chooses a card proportional to the standard deviation of the cards ie if the standard deviation is high, choose a high value card

Ethan is writing a median card strat. It will keep betting if the median card is still in play.
The max deviation calculations need to be redone since they are calculated using impossible hands.

Max and Minimum std deviation for Round 1 and Round 2



1st Round Max Std

N	x	μ	σ^2_{max}	σ_{max}
2	{1,30}	15.5	210.25	14.5
3	{1,2,30}	11	180.67	13.44
4	{1,3,29,30}	15.5	196.25	14.009
5	{1,3,29,30,2}	13	182	13.49
6	{1,2,5,28,29,30}	15.5	182.9	13.52

2st Round Min Std

N	x	μ	σ^2_{min}	σ_{min}
2	{1,2}	1.5	0.25	0.5
3	{1,2,3}	2	0.66	0.81669
4	{1,2,3,4}	2.5	1.25	1.118
5	{1,2,3,4,5}	3	1.2	1.0954
6	{1,2,3,4,5,5}	3.5	2.9167	1.7078

1st Round Max

N	x	μ	σ^2_{max}	σ_{max}
2	{7.5,15}	7.5	7.5^2	7.5
3	{0,0,15}	5	7600250	7.07
4	{0,0,15,15}	7.5	7.5^2	7.5
5	{0,0,1,13,15}	6.82	51.76	7.194
6	{0,0,1,14,15,15}	7.5	51.58	7.18

1st Round Min

N	x	μ	σ^2_{max}	σ_{max}
2	{0,0}	0	0	0
3	{0,0,1}	1/3	0.222	0.4714
4	{0,0,1,1}	0.5	0.52	0.5
5	{0,0,1,1,2}	4/5	0.56	0.74833
6	{0,0,1,1,2,2}	4/6	4/6	0.81649

Improving the chooseCard function:

If max_std - std <= some_number:

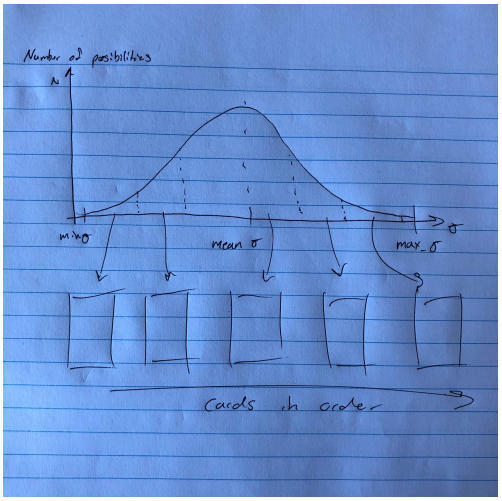
bet your highest card

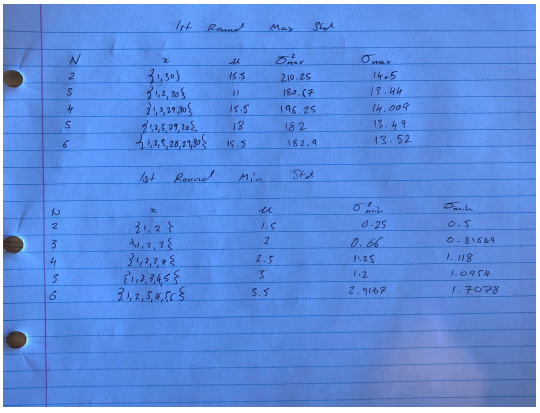
elif std - min_std <= some_number:

bet your lowest card

if |std - (max_std - min_std)/2| <= some number

bet middle card





May 21 Friday

- Tidied up the code, added the correct names to the strategies.

May 24 Monday

- Created Strat 6:
    - **Bid:** Compares the standard deviation of the cards in auction to a range of standard deviations of all cards remaining (including on the table). We then set a max bid which is proportional to how large the standard deviation is, so higher will give a higher max bid.
    - **chooseCard:** Similar to the bidding strat, we compare the standard deviation of the cards on the table to all the cards remaining and make a range of standard deviations for which card to play.
- Tested every strategy and decided to submit Strategy 5