Agent for Bazar Blot

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► The Origin of the Game

Bidding

► General Rules

Playing

Card	Trump	Regular	No-Trumps
А	11	11	19
K	4	4	4
Q	3	3	3
J	20	2	2
10	10	10	10
9	14	0	0
8	0	0	0
7	0	0	0

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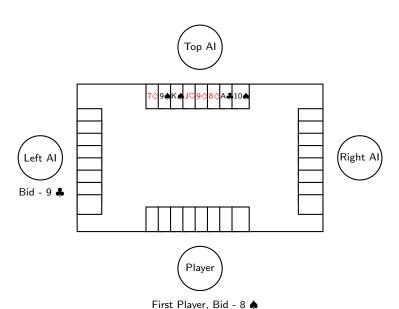
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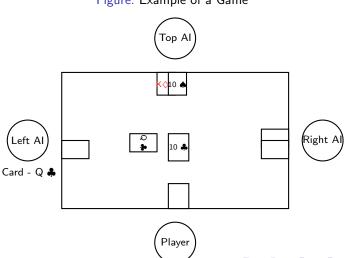
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Without resorting to cheating we will have $\binom{24}{8}$ nodes in our first depth!

Figure: Example of a Game



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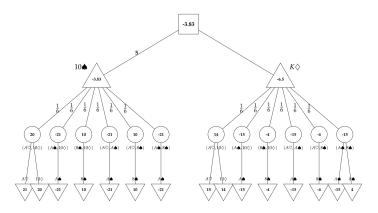
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Figure: Example of Expectimax tree



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Mini-Max

Assuming we know everyone's cards what's the approximate number of terminal states?

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Mini-Max

- ► Assuming we know everyone's cards what's the approximate number of terminal states?
- ► (8!)⁴
- We can't use normal Mini-Max either even with alpha-beta pruning.

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Depth-Limited Cheating Mini-Max

- ▶ Depth is limited to 12.
- Uses alpha-beta pruning.
- ▶ Heuristic is the current score / 10.
- lt plays slightly worse than a random bot.

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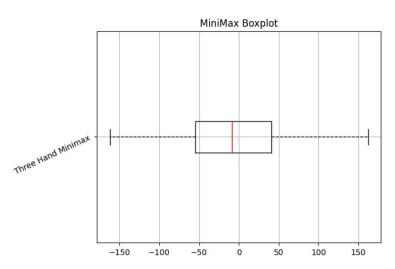
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Minimax vs Random Without Auction (Three hand version)



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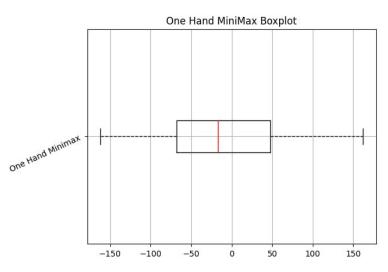
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Minimax vs Random Without Auction (One hand version)



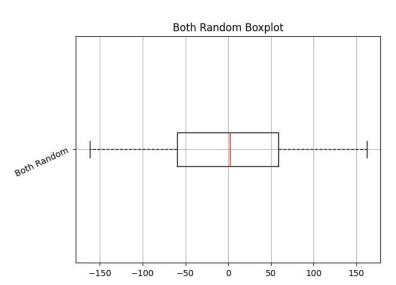
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Random vs Random Without Auction (Control)



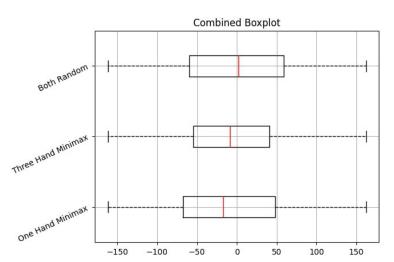
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Combined Plot of the Three Versions



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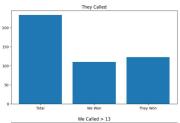
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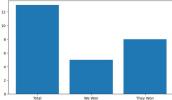
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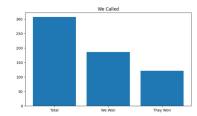
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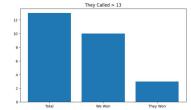
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Game Results With Auction (Control)









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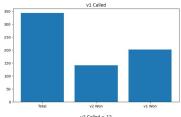
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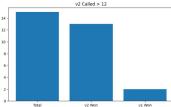
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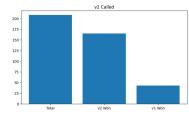
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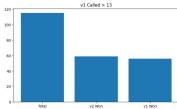
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Game Results With Auction (V1 vs V2)









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Numerical Solutions

- ► Euler's Method
- Backward Euler's Method

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By using the extension $y'(x) \approx \frac{y_{k+1}-y_k}{h}$ and having the y_0 , we can iteratively predict the $y_{k+1} = y(x+h)$, by using the system

$$\begin{cases} y_{k+1} = y_k + h \cdot f(x_k, y_k) \\ y(x_0) = y_0 \end{cases}$$

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4 D > 4 A P + 4 B > B + 9 Q P

In case of SIR, we are solving 3 ODE's, hence we are solving a system for s_{k+1} , i_{k+1} , and r_{k+1} , given the s_0 , i_0 , r_0

$$\begin{cases} s_{k+1} = s_k - \beta \cdot h \cdot s_k \cdot i_k \\ i_{k+1} = i_k + (\beta \cdot s_k \cdot i_k - \gamma \cdot i_k) \cdot h \\ r_{k+1} = r_k + \gamma \cdot h \cdot i_k \end{cases}$$

This time, the Method uses a different approach, namely

$$y'(x) \approx \frac{y_k - y_{k+1}}{h}$$

Plugging the SIR ODE's, we will get the system

$$\begin{cases} s_{t+1} = s_t - h \cdot \beta s_{t+1} i_{t+1} \\ i_{t+1} = i_t + h \cdot (\beta s_{t+1} i_{t+1} - \gamma i_{t+1}) \\ r_{t+1} = r_t + h \cdot \gamma i_{t+1} \end{cases}$$

By solving each one of these SLE's, we will get the next approximations for s_k , i_k , r_k

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Thank You For Attention! More Information is available at Our Github Repository

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