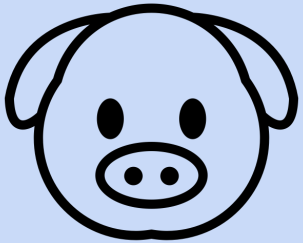
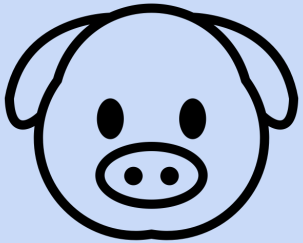
# The Game of Hog

Scott Lee

# The Game

100





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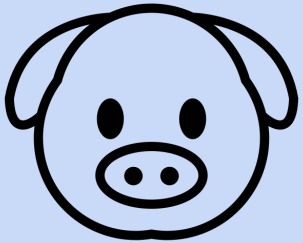

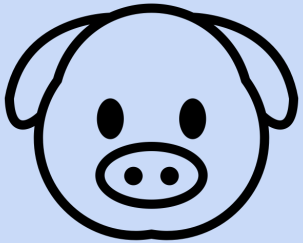

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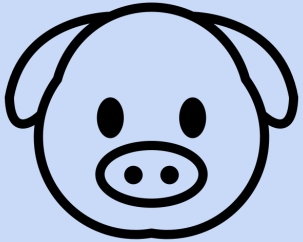

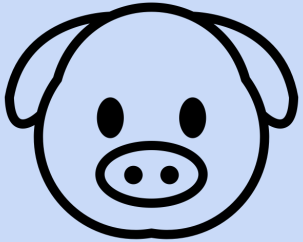

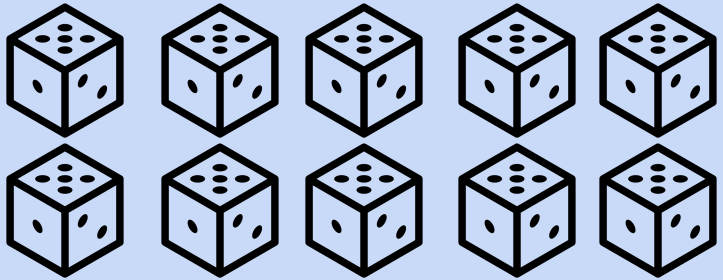

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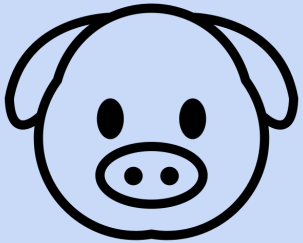
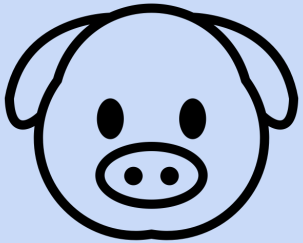




# The Game

**Pig Out:** If any of the dice outcomes is a 1, the current player's score for the turn is the number of 1's rolled.

**Free Bacon:** A player who chooses to roll zero dice scores one more than the largest digit in the opponent's total score.

**Hogtimus Prime:** If a player's score for the turn is a prime number, then the turn score is increased to the next larger prime number.

**When Pigs Fly:** The score for a turn is limited to 25 points minus the number of dice rolled.

# The Game

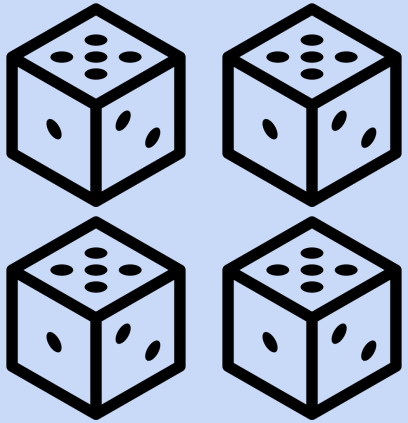
**Hog Wild:** If the sum of both players' total scores is a multiple of seven (e.g., 0, 7, 14, 21, 35), then the current player rolls special re-rolling dice. When re-rolling dice are rolled and the outcome is odd, they are rolled again exactly once.

**Swine Swap:** After the turn score is added, if one of the scores is double the other, then the two scores are swapped.

**Pork Chop:** A player may choose to roll -1 dice, which scores 1 point for the turn, but swaps the normal six-sided dice with four-sided dice for all subsequent turns. Subsequent rolls of -1 dice will continue swapping the dice back and forth.

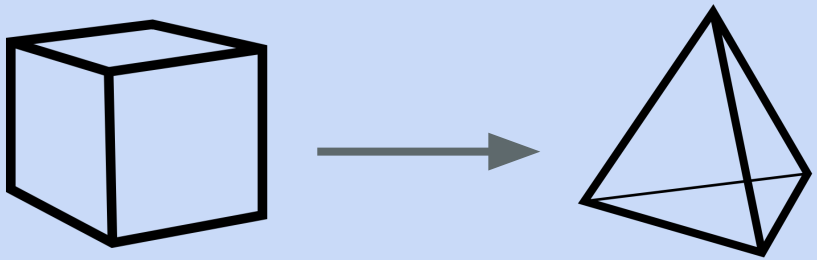
# Strategies vs. AI

**Base Strategy:** Always roll 4 dice



# Strategies vs. AI

**Improvement 1:** Invoke Pork Chop



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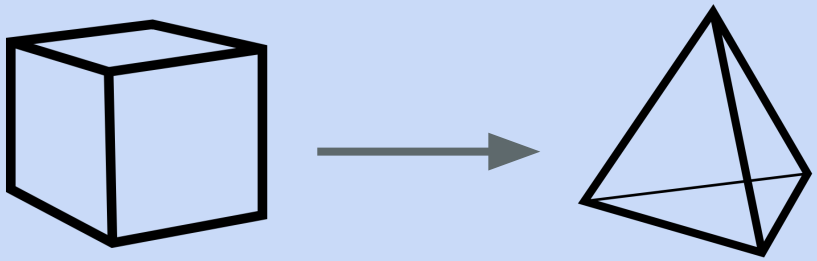

0.21

# Strategies vs. AI

**Improvement 2:** Force a Swine Swap.

- Free Bacon (Roll 0)
- Pork Chop (Guaranteed 1 point)

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**Improvement 3:** Prevent a Swine Swap.

- Free Bacon (Roll 0)
- Roll extra dice

# Strategies vs. AI

**Improvement 2:** Force a Swine Swap.

- Free Bacon (Roll 0)
- Pork Chop (Guaranteed 1 point)

**0.07**

**Improvement 3:** Prevent a Swine Swap.

- Free Bacon (Roll 0)
- Roll extra dice

**0.047**

# Strategies vs. AI

0.8873

vs. always rolling 4 dice

# Strategies vs. Humans

???

vs. unknown strategy

# Strategies vs. Humans

**Issue 1:** Unpredictable Pork Chop

- Turns into a mind game

# Strategies vs. Humans

**Issue 1:** Unpredictable Pork Chop

- Turns into a mind game

**Issue 2:** Cannot predict opponent rolls

- Harder to trigger/prevent Swine Swaps
- Harder to trigger/prevent Hog Wild

# Hog Contest

"A submission scores a match point each time it has an **expected win rate above 50.0001%**... Ties count as losses."

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# Strategies vs. Humans

some hardcoded strategy

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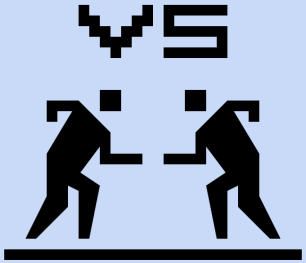


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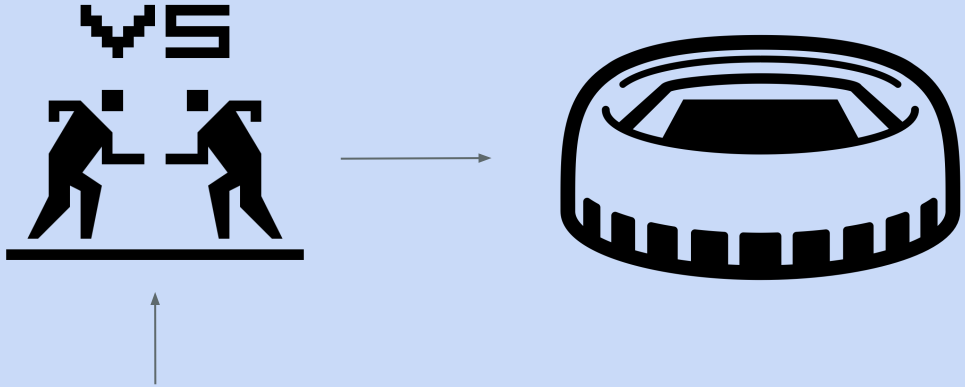

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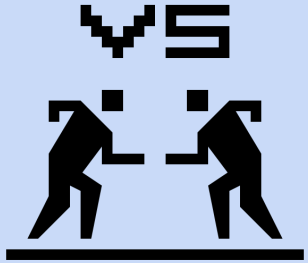
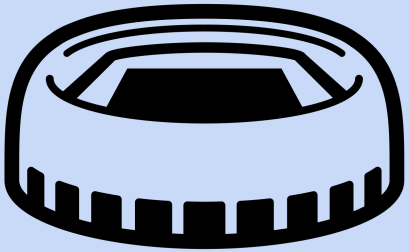
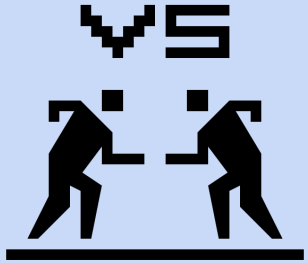


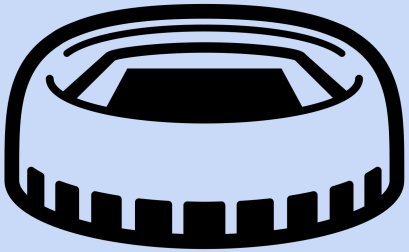



winning strategy

some hardcoded strategy

# Strategies vs. Humans



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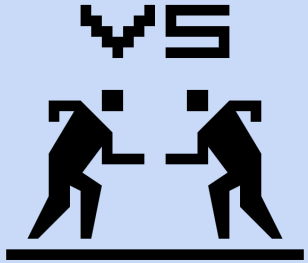


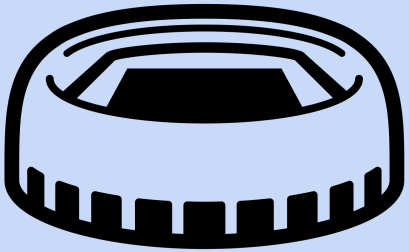

winning strategy

some hardcoded strategy

final strategy

# Strategies vs. Humans

Moves = [[5, 5, -1, 5, 0, 6, 5, 5, 5, 0, 8, 6, 5, 4, 0, 4, 0, 0, 0, 0, 3, 5, 2, -1, 4, 5, 0, 4, 4, 4, 10, 5, 9, -1, 8, 7, 7, 7, 6, 5, 5, 5, 4, 0, 0, 0, 0, 0, 4, 5, 5, 2, 0, 4, 0, 4, 0, 4, -1, 3, 0, 4, 0, 4, 0, 0, 4, 6, 3, 5, 5, 7, 4, 5, 4, 5, 6, 5, -1, 4, 5, 4, -1, 4, 5, 4, 4, 2, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, ],
[6, 4, 4, 4, 4, 5, 6, 6, 6, 0, 3, 5, 0, 5, 6, 4, 5, 5, 5, 4, 5, 6, 3, 0, 2, 5, 3...], ...]

# Strategies vs. Humans

117 teams

114 wins

2 losses

0.9828 win rate

# More About Hog

http://cs61a.org/proj/hog/