



APRIL 28, 2025

REAL LIFE GAMES:  
HOW GAME THEORY SHAPES HUMAN  
DECISIONS

CAN YOU GUESS  $\frac{2}{3}$   
OF THE AVERAGE?

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Let's play a game!

# **GUESS $\frac{2}{3}$ OF THE AVERAGE**

Everyone chooses a number between 0 and 100.

The goal is to choose a number that is as close as possible to the target.

The target is  $\frac{2}{3}$  of the average guess (across everyone).

The top three guesses get a prize!

How'd you do?

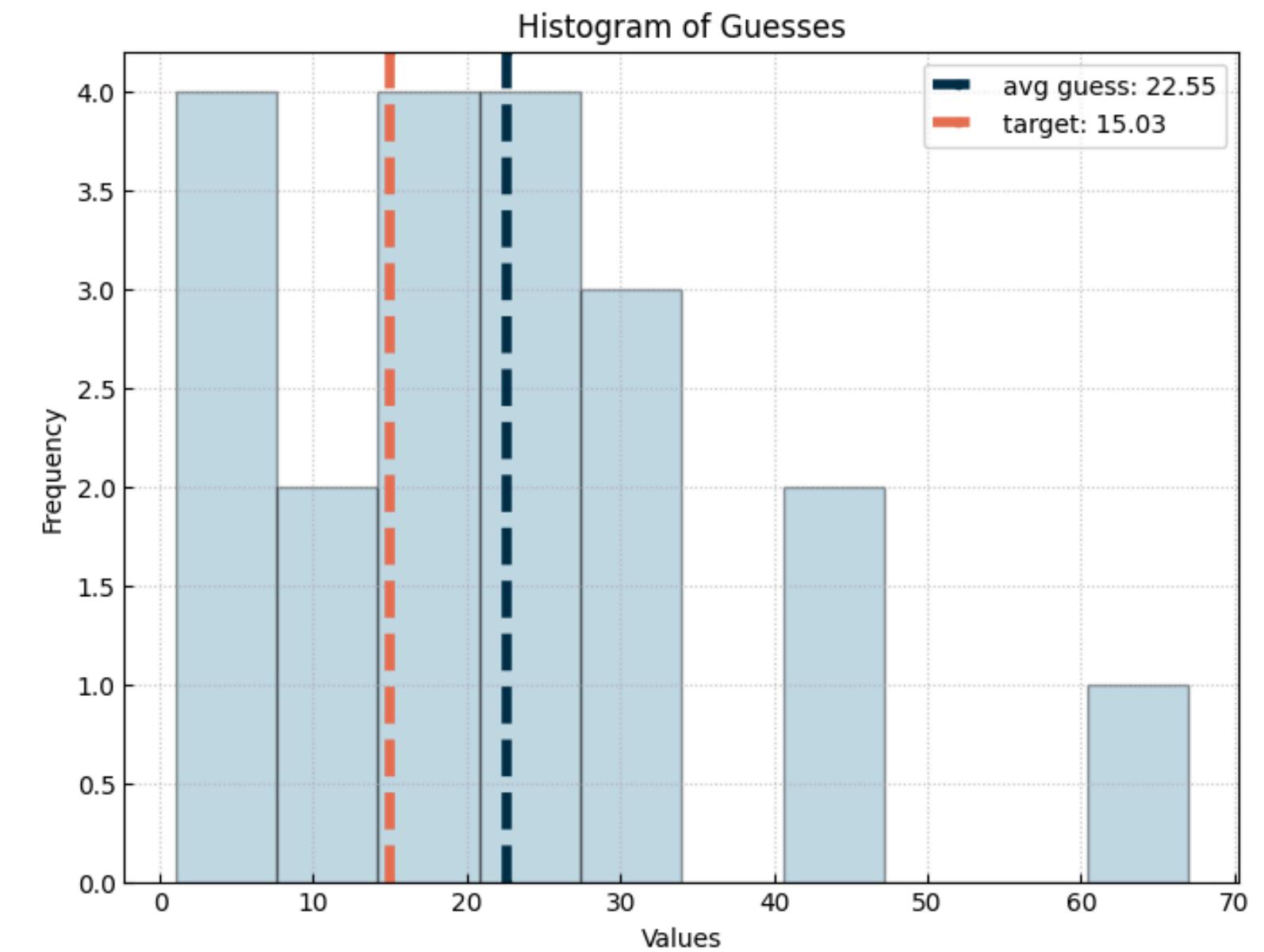
# **GUESS $\frac{2}{3}$ OF THE AVERAGE: RESULTS**

There were 20 guesses.

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The target value was 15.03!

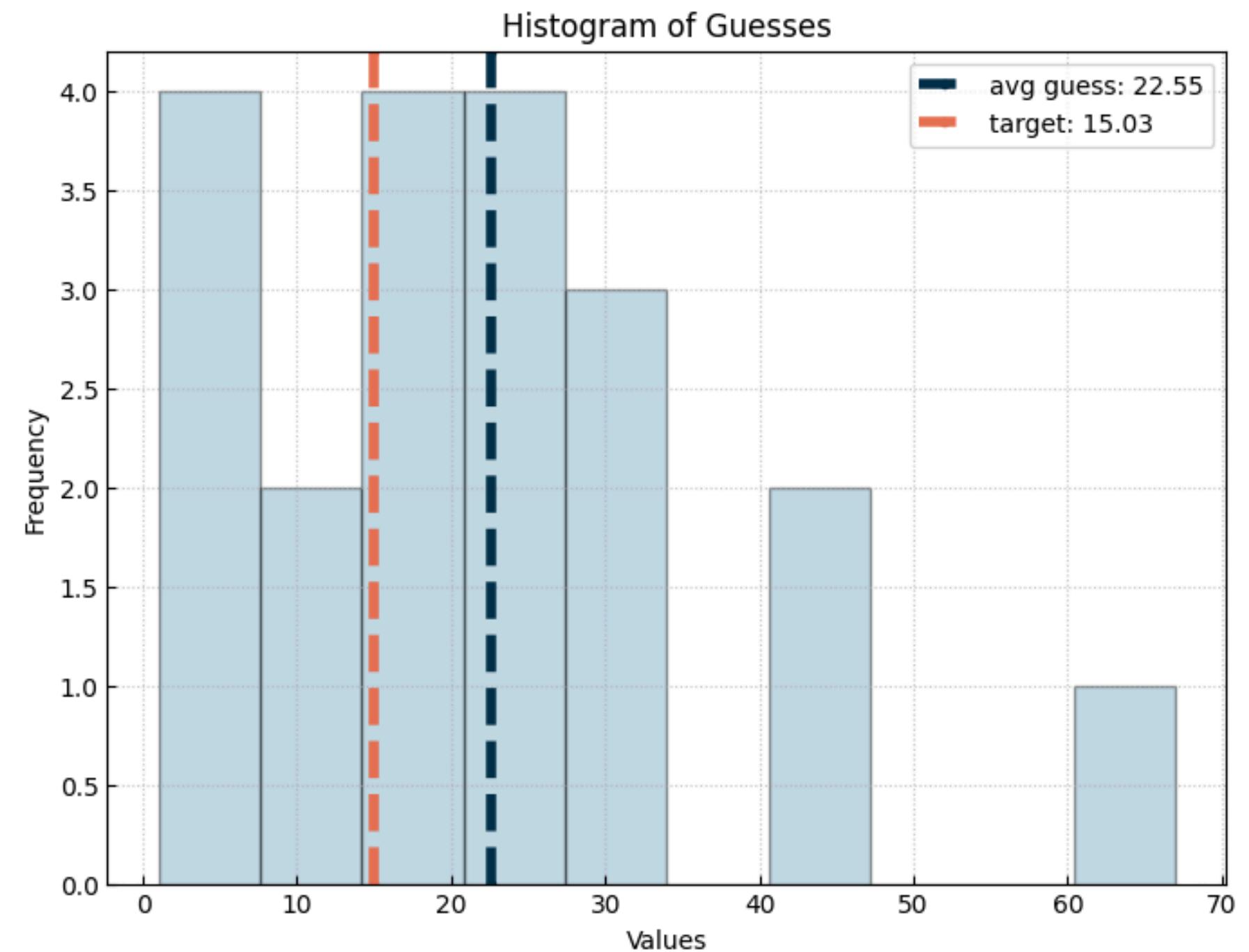


# GUESS $\frac{2}{3}$ OF THE AVERAGE: RESULTS

There were 20 guesses.

The target value was 15.03!

The closest guesses were: 15, 18, 12.

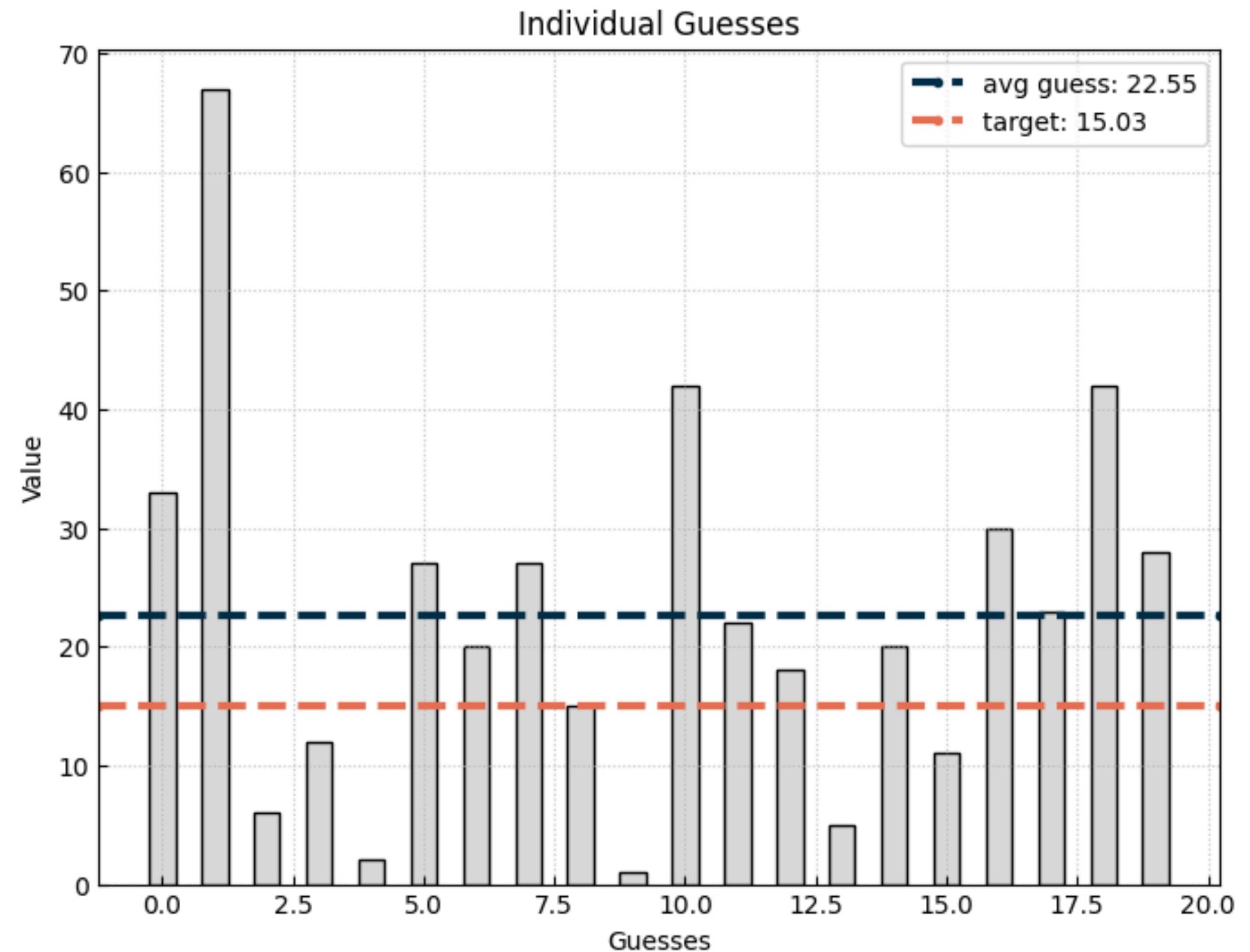


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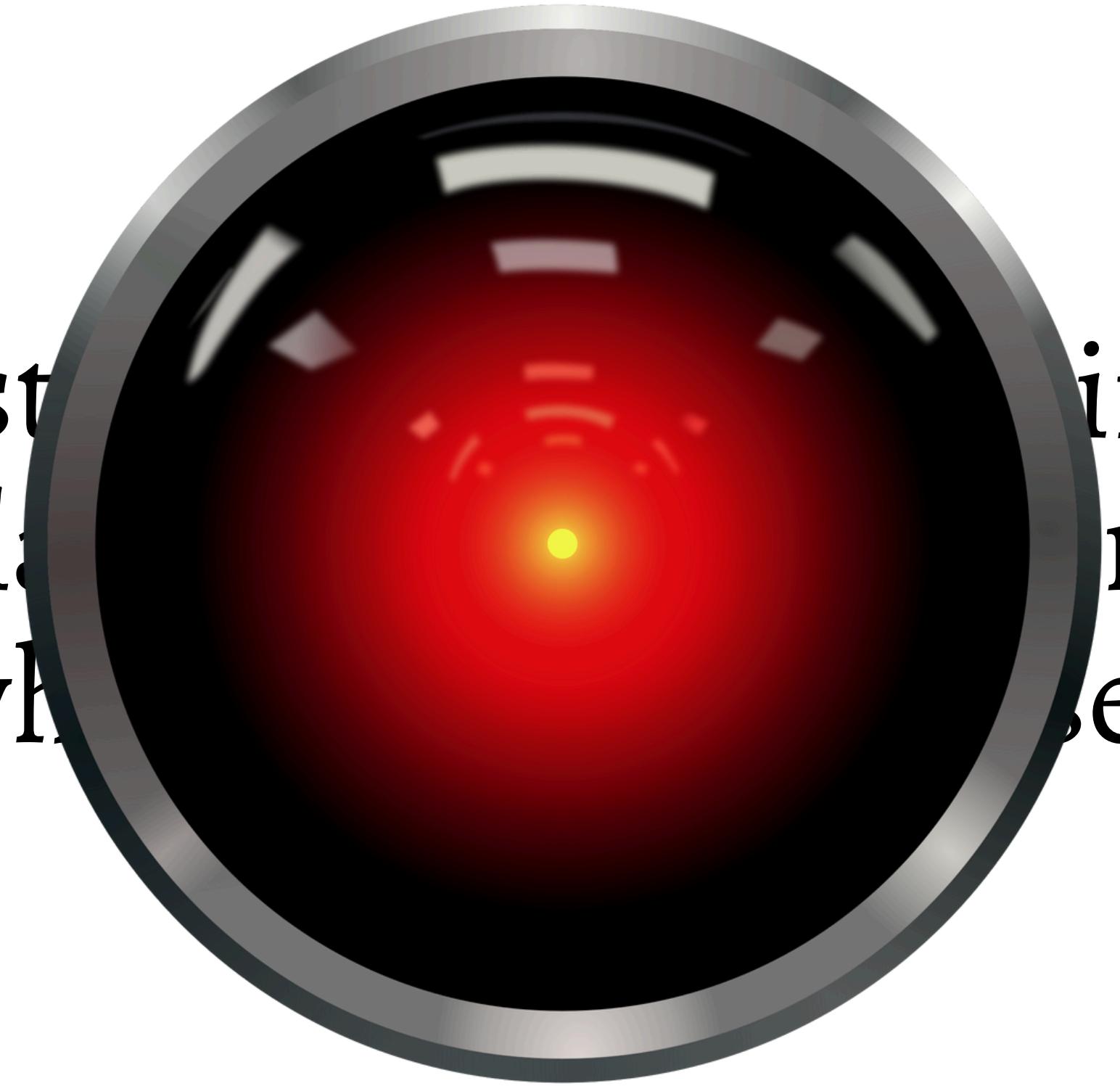
The closest guesses were: 15, 18, 12.



What's the strategy here?

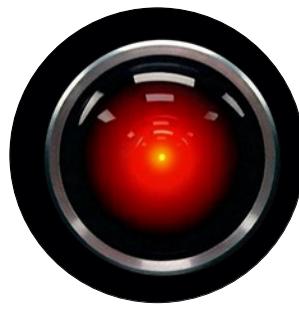
What's the strategy here? Imagine you're a coldly calculating rational player, trying to figure out what the other guesses have are.

What's the story? You're  
coldly calculating, trying to  
figure out what your  
rivals have.



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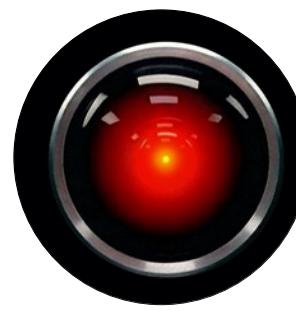
# GUESS $\frac{2}{3}$ OF THE AVERAGE: REASONING



HAL (FROM 2001: A SPACE ODYSSEY)

The maximum anyone can guess is 100, in which case the target is ~66.

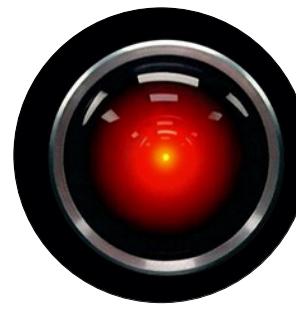
# GUESS $\frac{2}{3}$ OF THE AVERAGE: REASONING



HAL (FROM 2001: A SPACE ODYSSEY)

The maximum anyone can guess is 100, in which case the target is ~66. So there's no point guessing more than 66.

# GUESS $\frac{2}{3}$ OF THE AVERAGE: REASONING

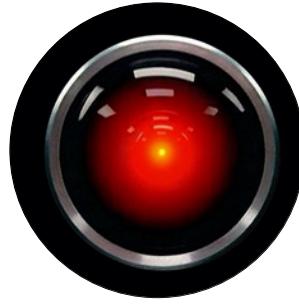


HAL (FROM 2001: A SPACE ODYSSEY)

The maximum anyone can guess is 100, in which case the target is ~66. So there's no point guessing more than 66.

But everyone else knows this.

# GUESS $\frac{2}{3}$ OF THE AVERAGE: REASONING

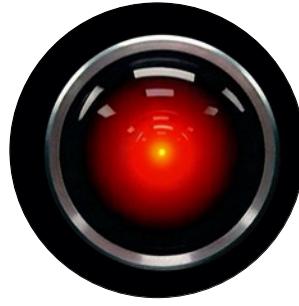


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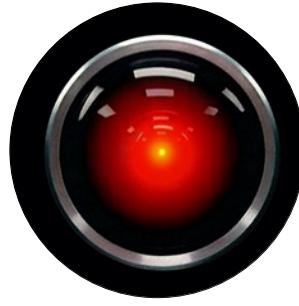


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The maximum anyone can guess is 100, in which case the target is ~66. So there's no point guessing more than 66.

But everyone else knows this. So no one will guess more than 66. So the target can't be larger than 44.

# GUESS $\frac{2}{3}$ OF THE AVERAGE: REASONING



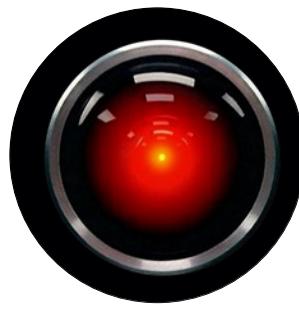
HAL (FROM 2001: A SPACE ODYSSEY)

The maximum anyone can guess is 100, in which case the target is  $\sim 66$ . So there's no point guessing more than 66.

But everyone else knows this. So no one will guess more than 66. So the target can't be larger than 44.

But everyone else knows *this* as well, so the target can't be larger than  $\sim 29$ .

# GUESS $\frac{2}{3}$ OF THE AVERAGE: REASONING



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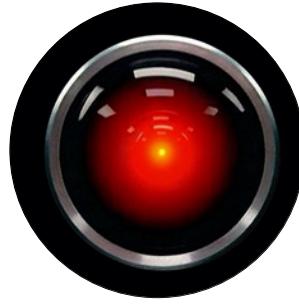
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And so on...

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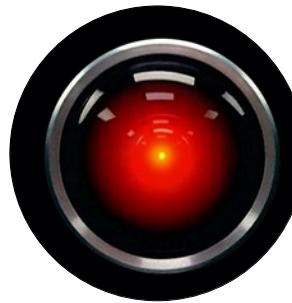
But everyone else knows *this* as well, so the target can't be larger than ~29.

And so on...

In the end, the only rational guess is 0.

Now, this is assuming that everyone else is thinking like Hal.

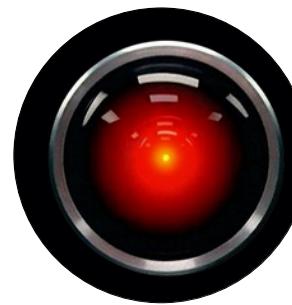
# GUESS $\frac{2}{3}$ OF THE AVERAGE: REASONING



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Hmm... if not everyone follows this chain of reasoning, the average will be above 0.

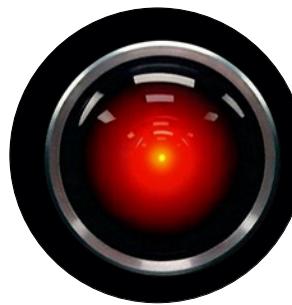
# GUESS $\frac{2}{3}$ OF THE AVERAGE: REASONING



HAL (FROM 2001: A SPACE ODYSSEY)

Hmm... if not everyone follows this chain of reasoning, the average will be above 0. So I should also guess above 0.

# GUESS $\frac{2}{3}$ OF THE AVERAGE: REASONING

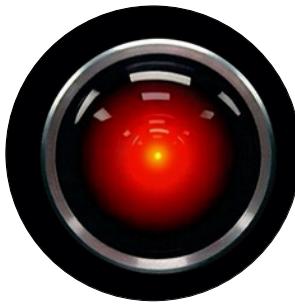


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Hmm... if not everyone follows this chain of reasoning, the average will be above 0. So I should also guess above 0.

For instance, if everyone else guessed randomly, then the average guess would be ~50, and the target would be ~33...

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Hmm... if not everyone follows this chain of reasoning, the average will be above 0. So I should also guess above 0.

For instance, if everyone else guessed randomly, then the average guess would be ~50, and the target would be ~33...

But that's going too much in the other direction and assuming others don't reason at all.

The sophistication of players in games like these  
is sometimes referred to as *level-k reasoning*.

The sophistication of players in games like these is sometimes referred to as *level- $k$  reasoning*. A level- $k$  player assumes others are playing at level  $k-1$ , and reacts accordingly.



ROSEMARIE NAGEL

A level-0 player chooses randomly (no strategy).

A level-1 player assumes the others are level-0, and chooses  $\frac{2}{3}$  of 50, which is ~33.

A level-2 player assumes the others are level-1, and chooses  $\frac{2}{3}$  of 33, which is ~22.

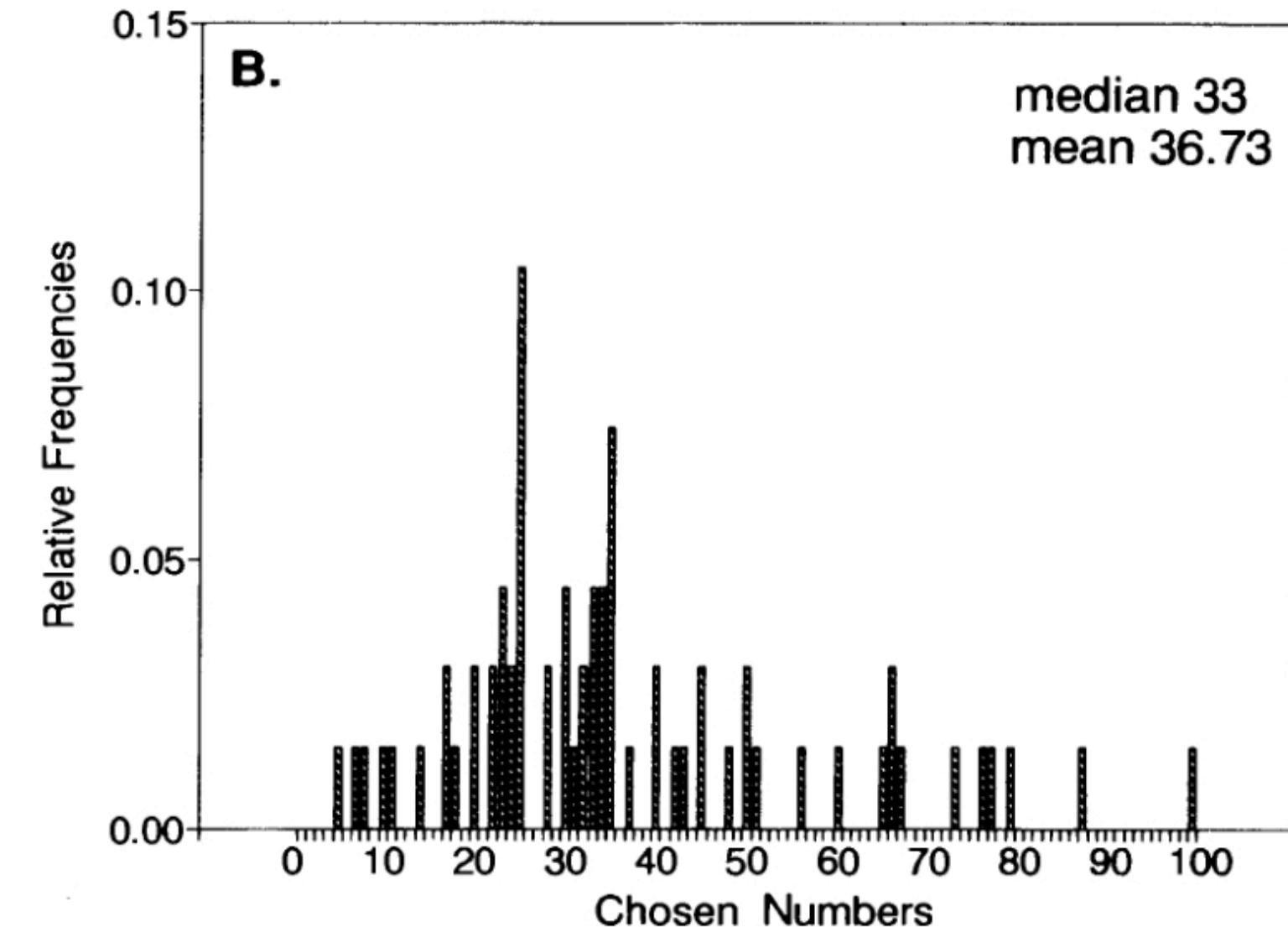
And so on...

Nagel, R. (1995). Unraveling in guessing games: An experimental study. *The American Economic Review*, 85(5), 1313–1326.

# GUESS $\frac{2}{3}$ OF THE AVERAGE: EXPERIMENTAL RESULTS

Seems like most players are around levels 1 and 2.

But there is large deviation from ‘rational’ play.



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This game is sometimes also called a *beauty contest*.



JOHN MAYNARD KEYNES

Certain newspapers used to have competitions, in which hundreds of photos of faces were shown, and competitors had to predict the most attractive.

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This is also what the stock market is like!

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