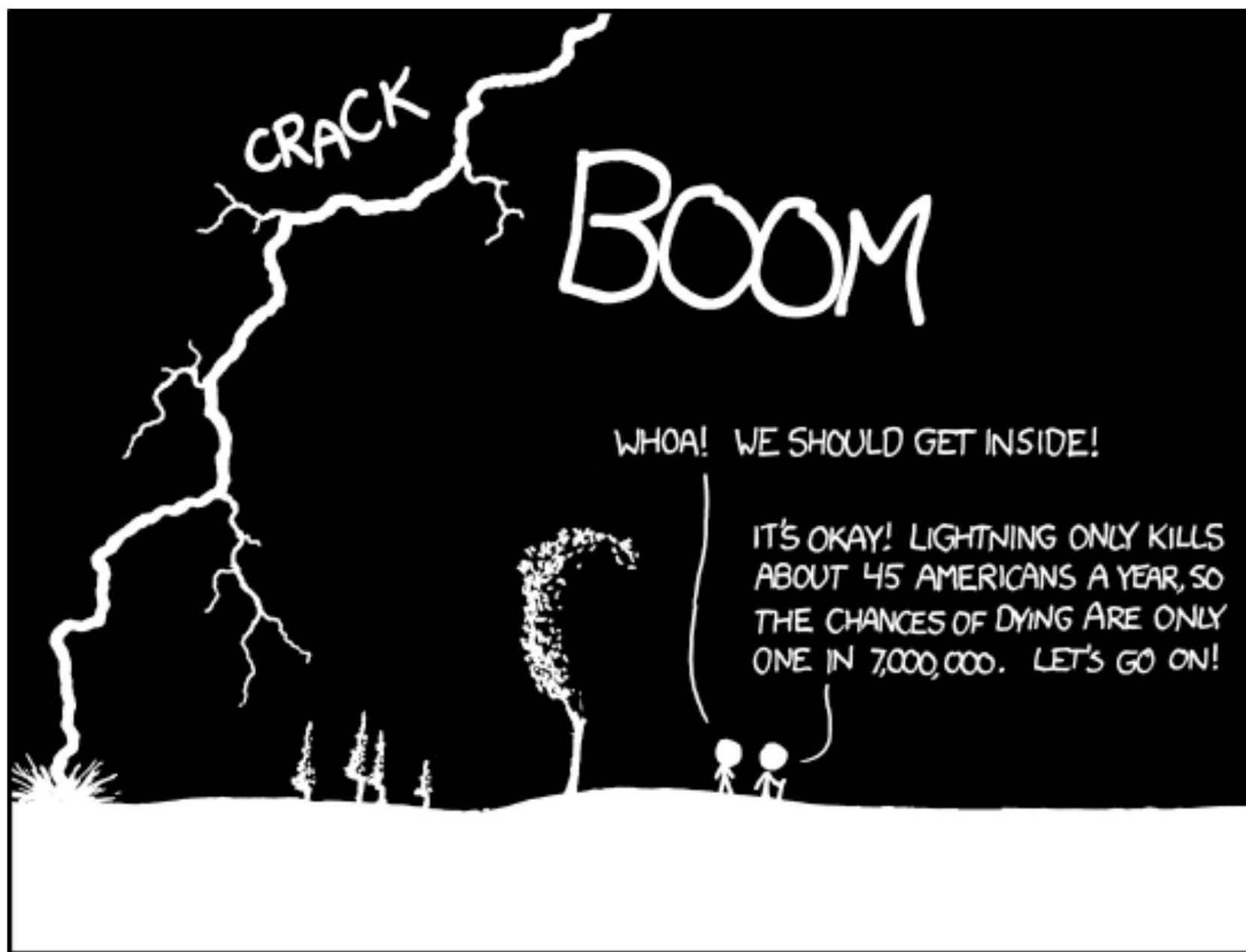


MSE-213

Probability and statistics for materials science

Lecture 2



THE ANNUAL DEATH RATE AMONG PEOPLE
WHO KNOW THAT STATISTIC IS ONE IN SIX.

Exclusive and independent

Two possible ($P > 0$) events A and B are mutually exclusive.
Are they independent?



Yes



No



Depends

Expectation Value: Dice game

Pay 2CHF. Odd number : get 1CHF

6: get 10CHF

otherwise: get nothing.



Will win on average

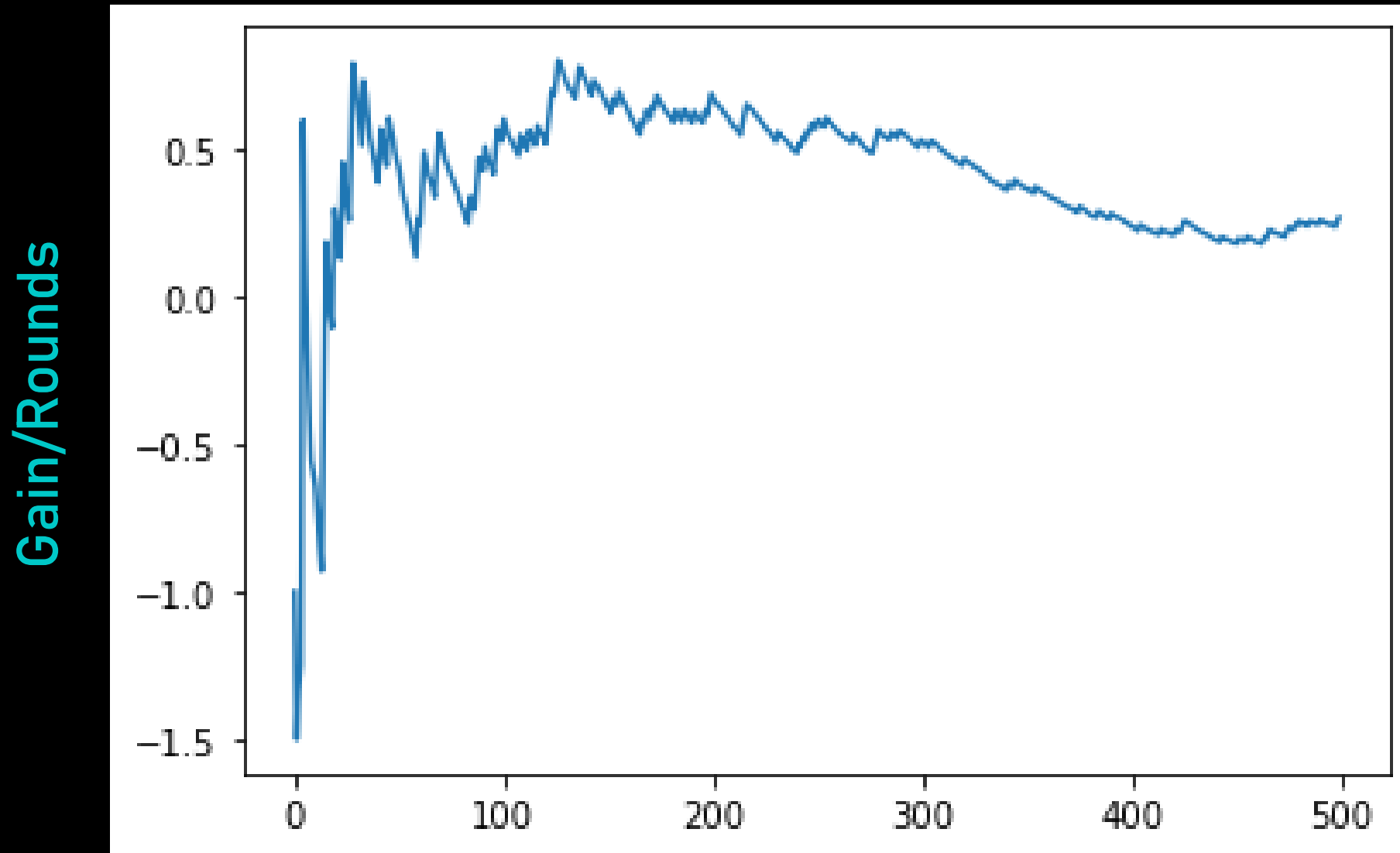


Will lose on average



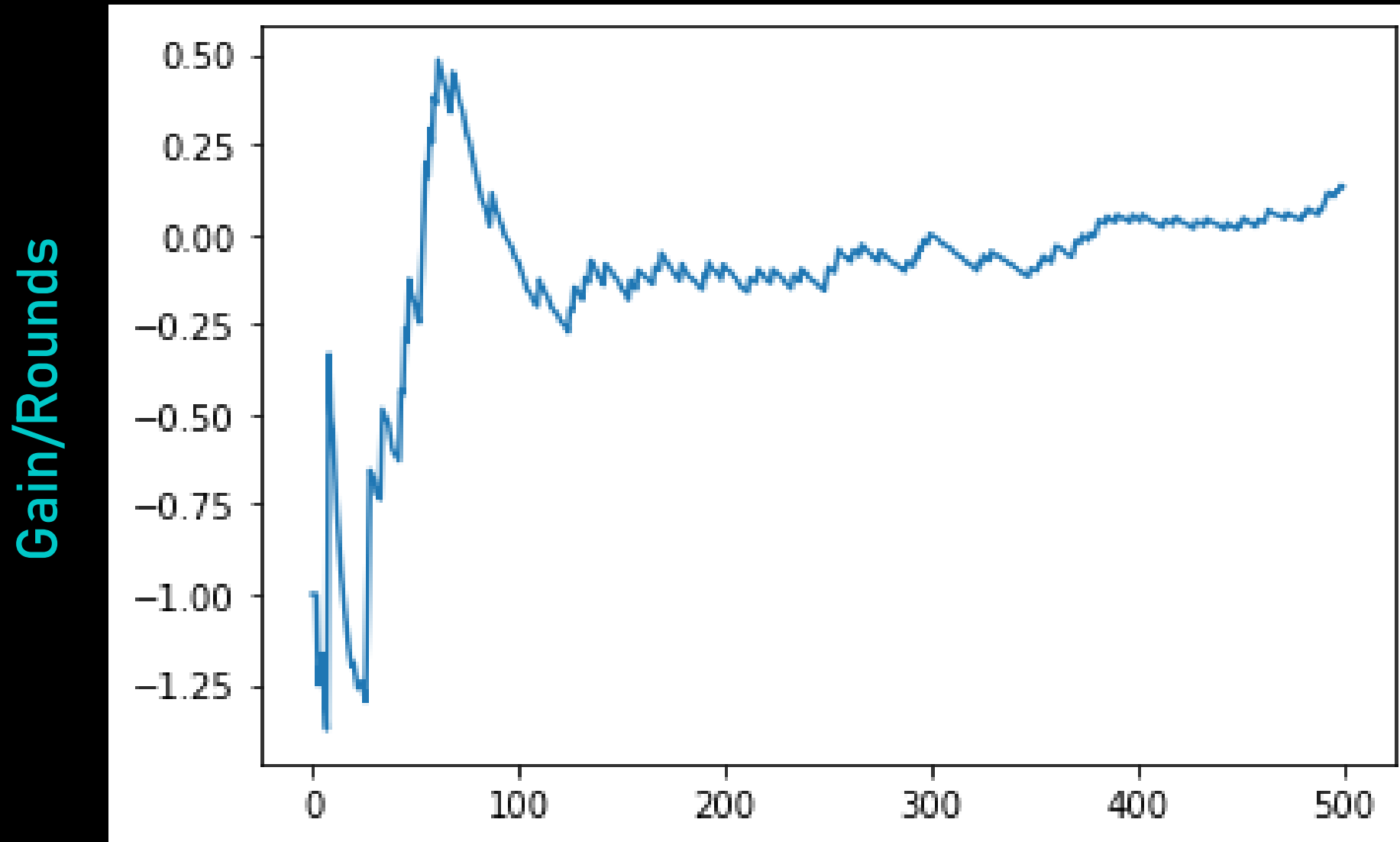
Will break even

Expectation Value: Dice game



Rounds played

Expectation Value: Dice game



Rounds played

Expectation Value: Dice game

Pay 2CHF. Odd number : get 1CHF, 6: get 10CHF, otherwise: get 0

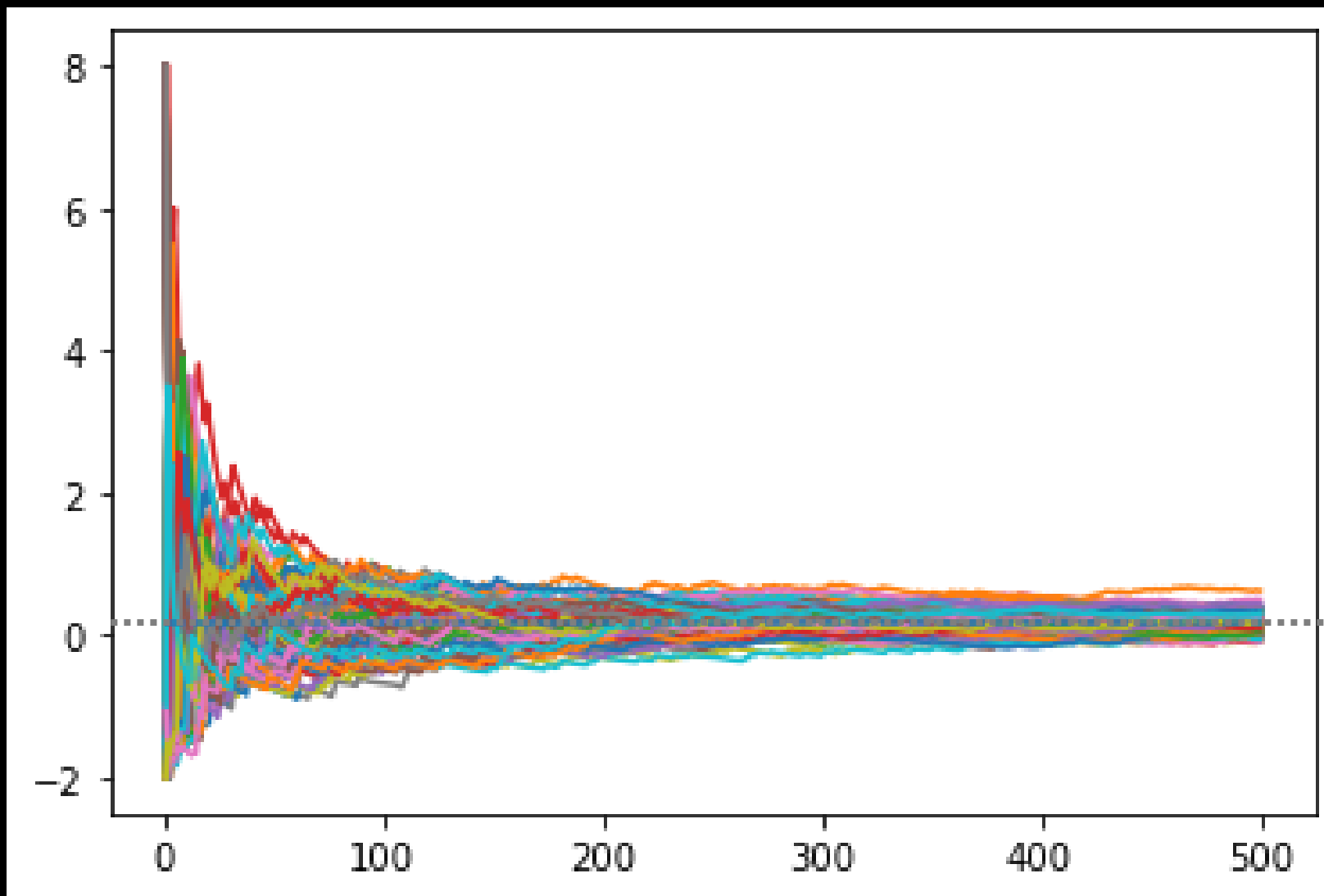
Expectation Value: Dice game

Pay 2CHF. Odd number : get 1CHF, 6: get 10CHF, otherwise: get 0

$$E(X) = 1/6$$

Expectation Value: Dice game

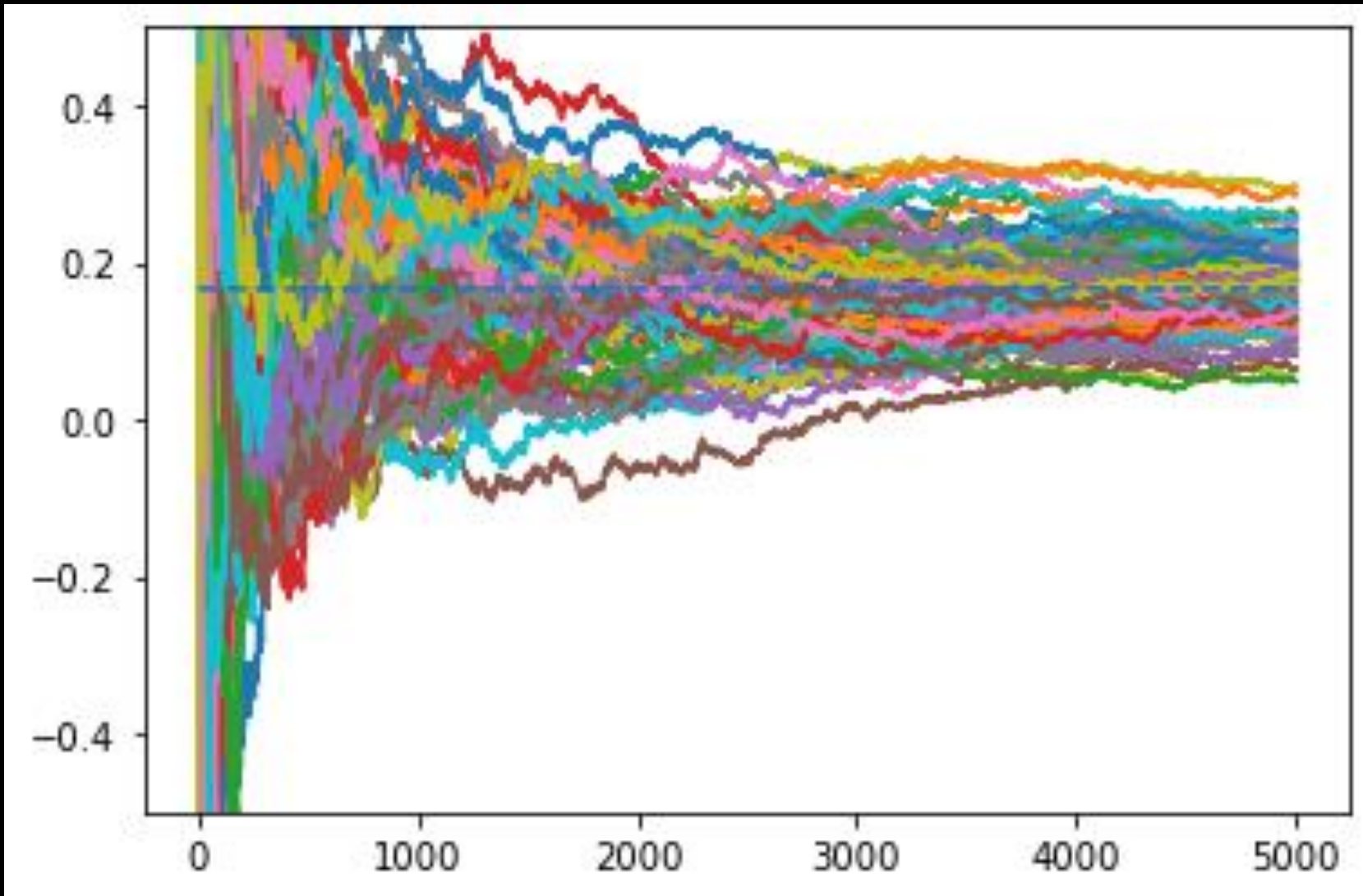
Gain/Rounds



Rounds played

Expectation Value: Dice game

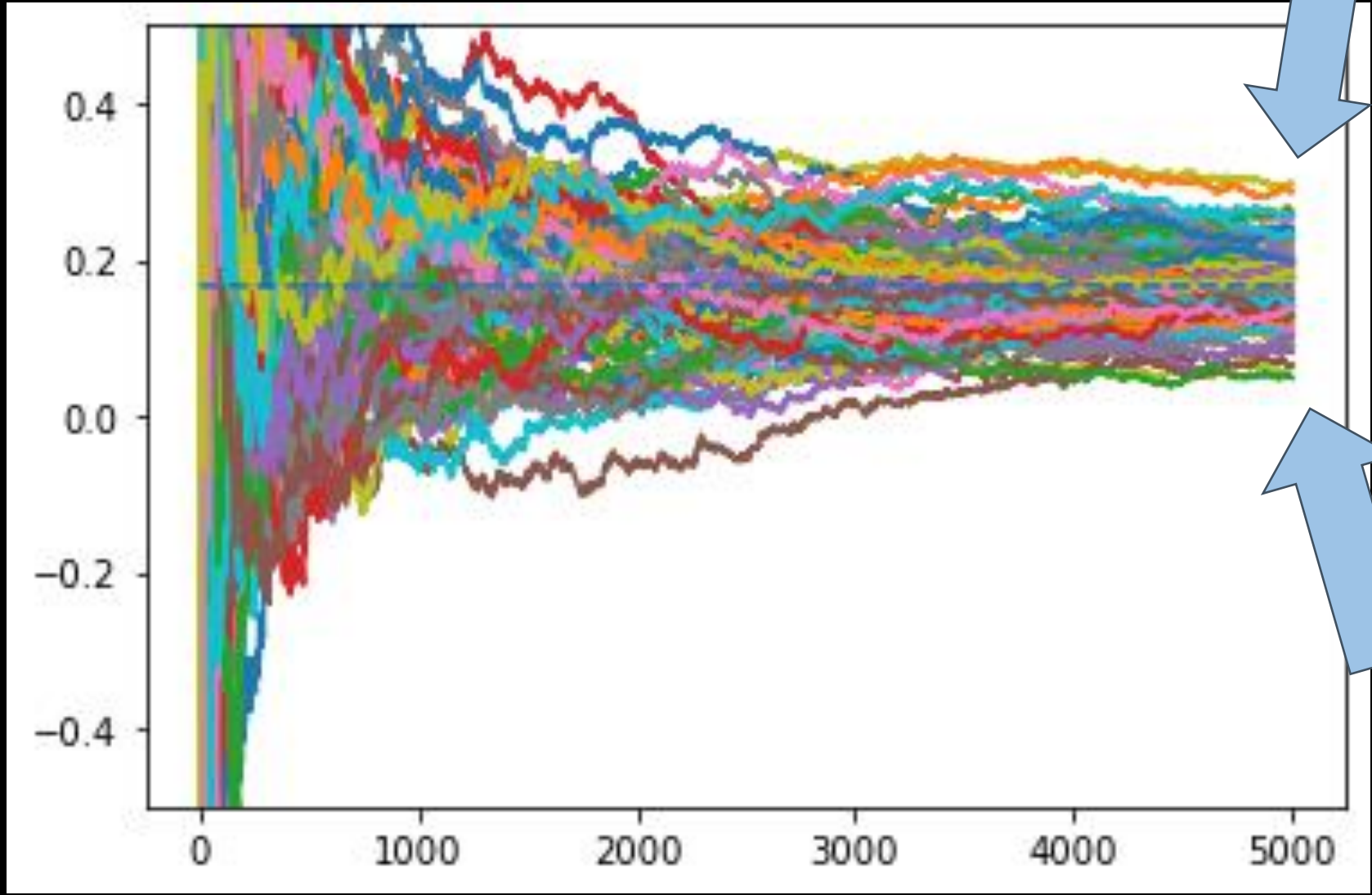
Gain/Rounds



Rounds played

What about the width?

Gain/Rounds



Rounds played

The BERNOULLI distribution function



DID THE SUN JUST EXPLODE?

(IT'S NIGHT, SO WE'RE NOT SURE.)

THIS NEUTRINO DETECTOR MEASURES
WHETHER THE SUN HAS GONE NOVA.

THEN, IT ROLLS TWO DICE. IF THEY
BOTH COME UP SIX, IT LIES TO US.
OTHERWISE, IT TELLS THE TRUTH.

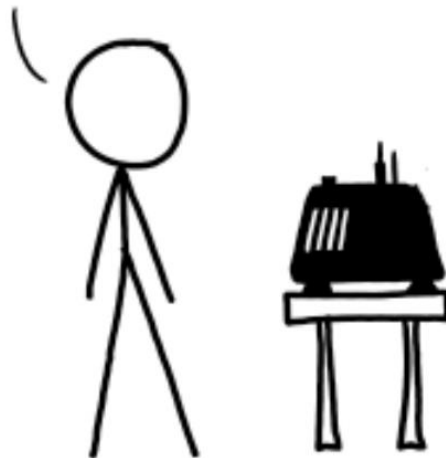
LET'S TRY.

DETECTOR! HAS THE
SUN GONE NOVA?



FREQUENTIST STATISTICIAN:

THE PROBABILITY OF THIS RESULT
HAPPENING BY CHANCE IS $\frac{1}{36} = 0.027$.
SINCE $p < 0.05$, I CONCLUDE
THAT THE SUN HAS EXPLODED.



BAYESIAN STATISTICIAN:

BET YOU \$50
IT HASN'T.

