

Hypothesis Testing

My story!

Hypothesis

- An assumption/hunch
- I hypothesize that

I can make a roti /
chapati.



Null Hypothesis

- Current state of being
- State of no change
- I can't make a roti



Alternate Hypothesis

- Desired outcome
- Claim
- I will make perfect roti



What does it take?

- Not too thick, not too thin!
- Not dry!
- Should be round!
- Should be soft!
- Not too brown!
- Not too white!



What to do?

- Practice!
 - Make a roti a day!
 - Called BOOTSTRAPPING!
 - Bootstrapping helps gathering data points!
-
- Can I do it? How confident am I?
 - What if I mess up? How much mess up ok?



DAY 1

- Shape is better (not a map :-P)
- It is too thick!

TRY AGAIN!



DAY 2

- Improved shape
- Not as thick as Day 1

TRY AGAIN!



DAY 3

- Nearly perfect shape
- Too thin as it got extra brown edges
- Looks sort of dry

TRY AGAIN!



DAY 4

- Drastic improvement
- Perfect shape
- Not much browning
- Perfect thickness
- Still looks a bit dry

TRY AGAIN!



DAY 5

- Added Ghee
- Problem Solved!

PERFECT ROTI!



What did I do?

- Defined Null and Alternate
- Defined Metrics
- Define significance level
- Bootstrapped - tried again and again!
- Evaluated performance



Am I being over-confident?

- Type 1 error : Rejection of True NULL
- I'm a pro at roti making in just 6 days!
- Can I sustain the performance?
- Can I make perfect rotis for the next:
 - Few days
 - Few weeks
 - Few months
 - Few years

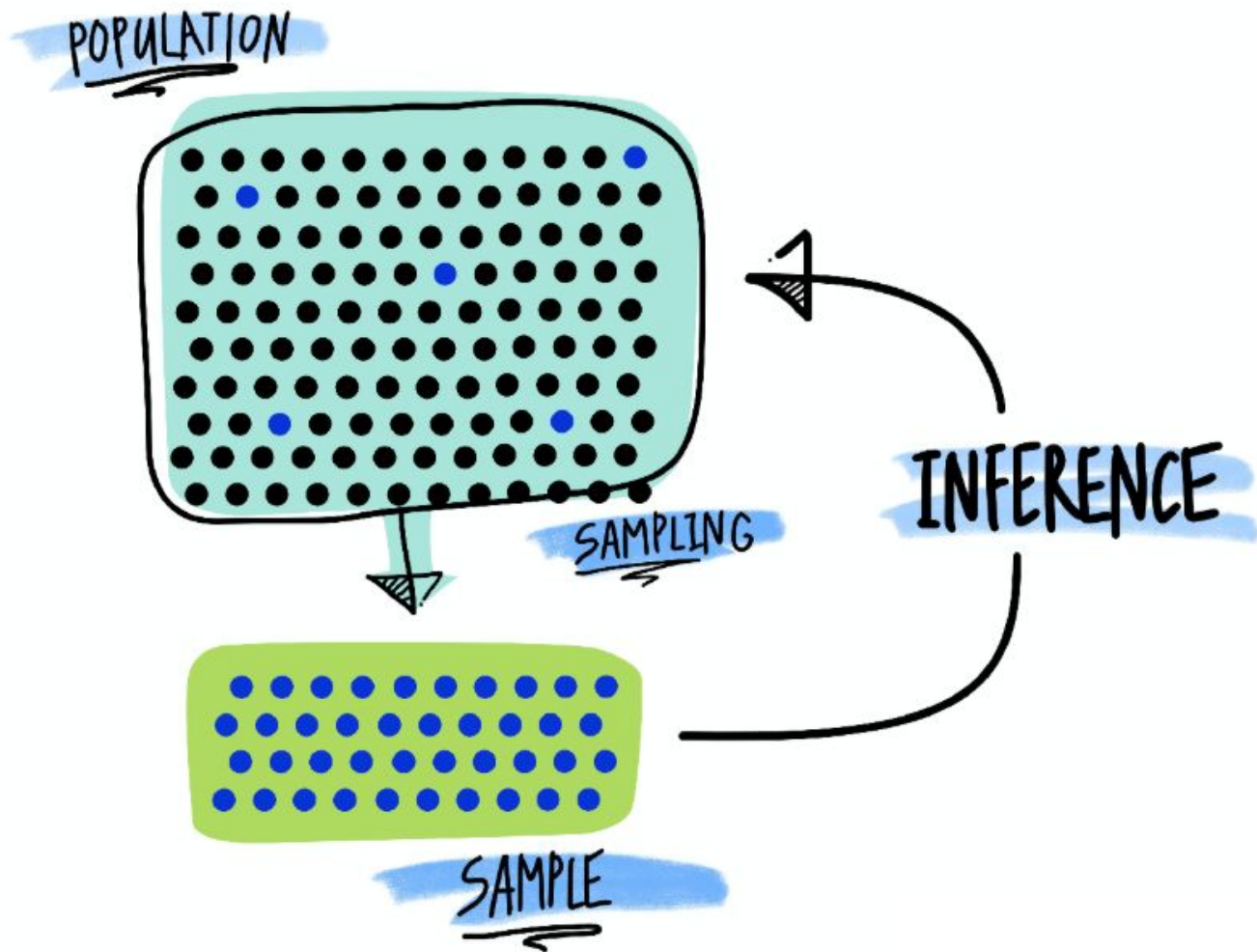


Am I under-confident?

- Type 2 error : Acceptance of False Null Hypothesis
- I am such a loser! I can never cook!
- Am I?
- I made perfect rotis in 6 days,

I should get better at it!





Let's bring in the numbers, shall we?

- What should the average thickness of a roti be? I asked my mom.
- According to my mom, who's been making roti's for years, it should be 0.5cm.
- So my population mean comes from expert opinion.

- $\mu = 50\text{mm}$

Since I forgot to record the actuals,

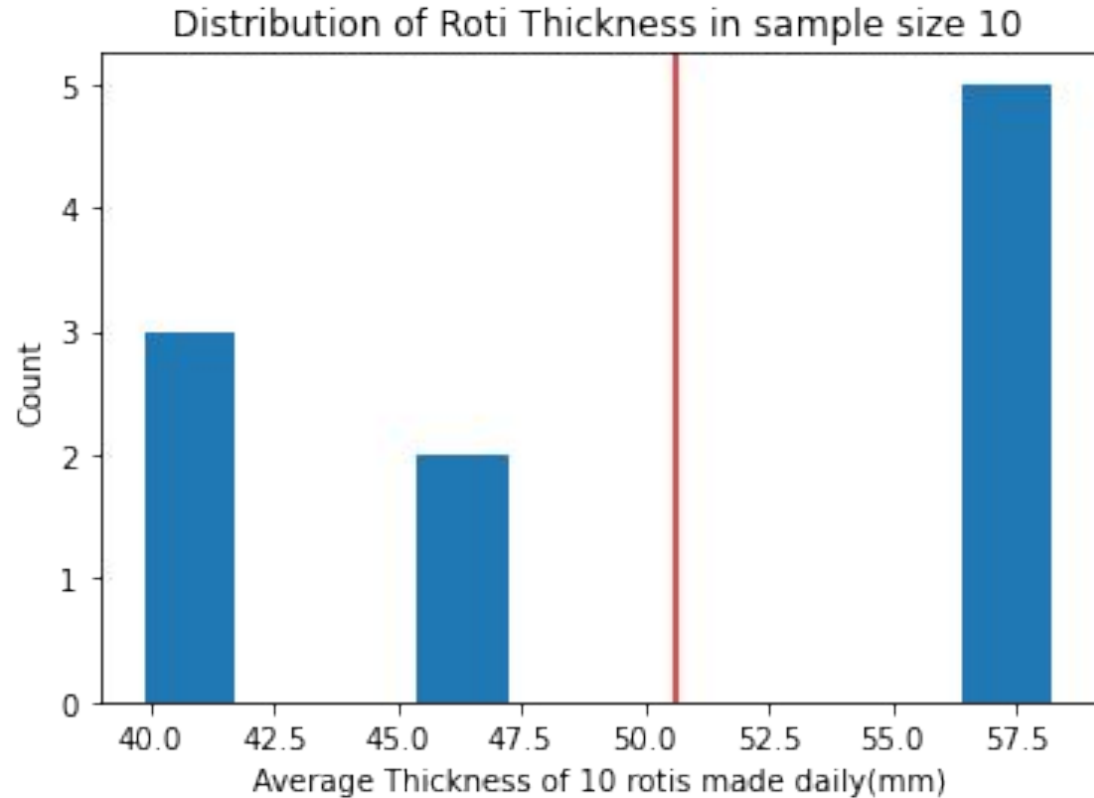
I simulated data in Python!



One day figures!

Not pretty! Not reliable!

So I increased samples.



10 rotis a day for 365 days!

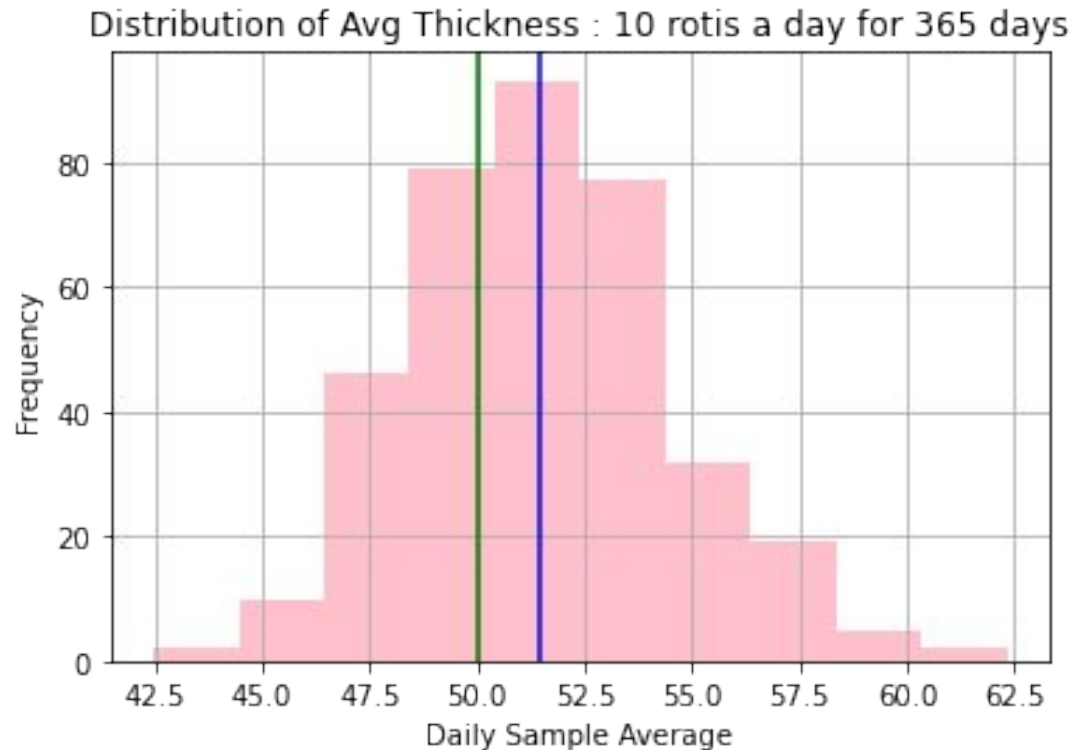
- $\mu = 50$
- Sample Mean = 51.48

Looks better than the last one,

What if I make 20 rotis a day?

*Green Line = μ

*Blue Line = sample mean



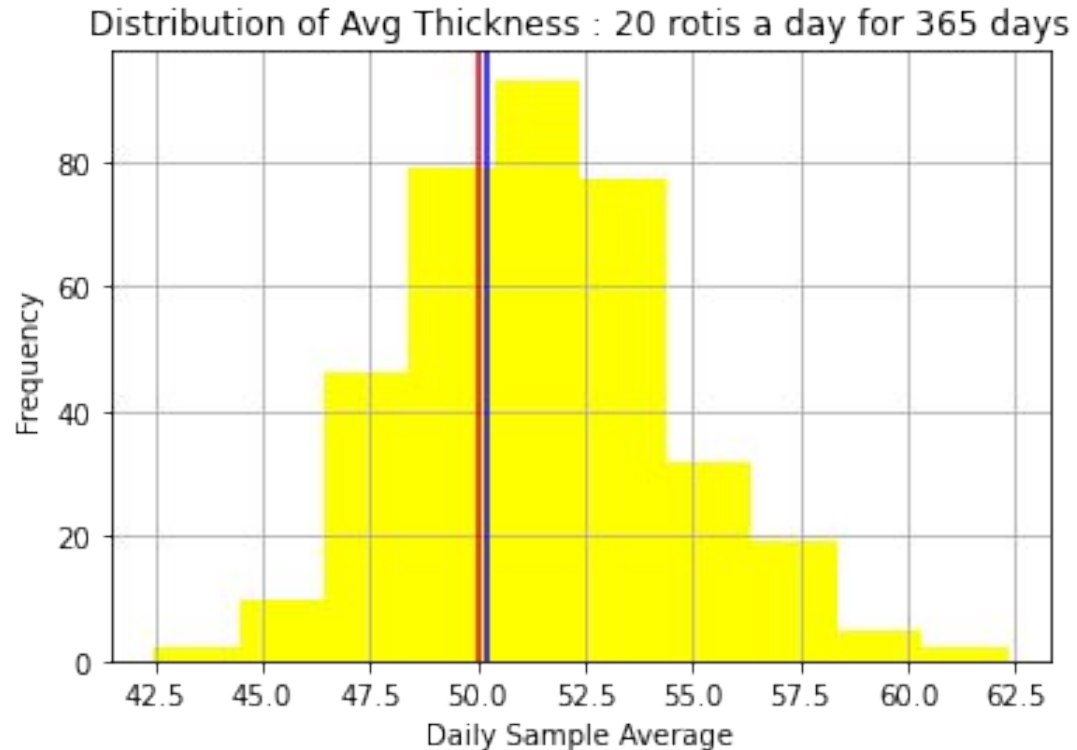
20 rotis a day for 365 days?

- $\mu = 50$
- Sample Mean = 50.23
- More symmetric distribution

Let's check for 50 rotis a day!

*Red line = μ

*Blue line = sample mean



50 rotis a day for 365 days!

Insane

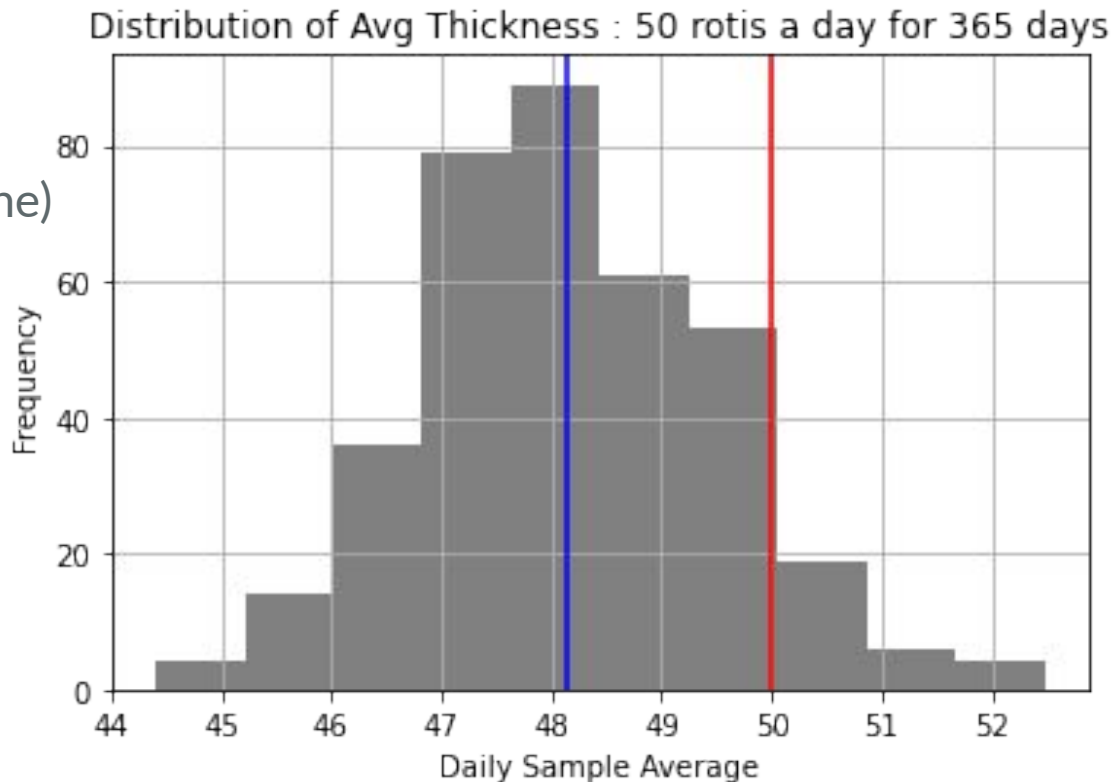


- $\mu = 50$ (red line)
- Sample Mean = 48.15 (blue line)

I can't make more than 50 rotis!

I'll assume it gets normal

Further because of CLT!



Can I get it right? Let's do the final test!

H0 $\mu = 50$ and H1..... $\mu \neq 50$
(Got reversed here)

Population Mean known
$n > 30$
Population Standard Deviation unknown

#used t-test
$\alpha = 0.05$

$P_value > \alpha$, So Accept H0

T_test
p_value

0.3475



Enough of Statistics! Let's talk english!

H0 : I can make a good roti!

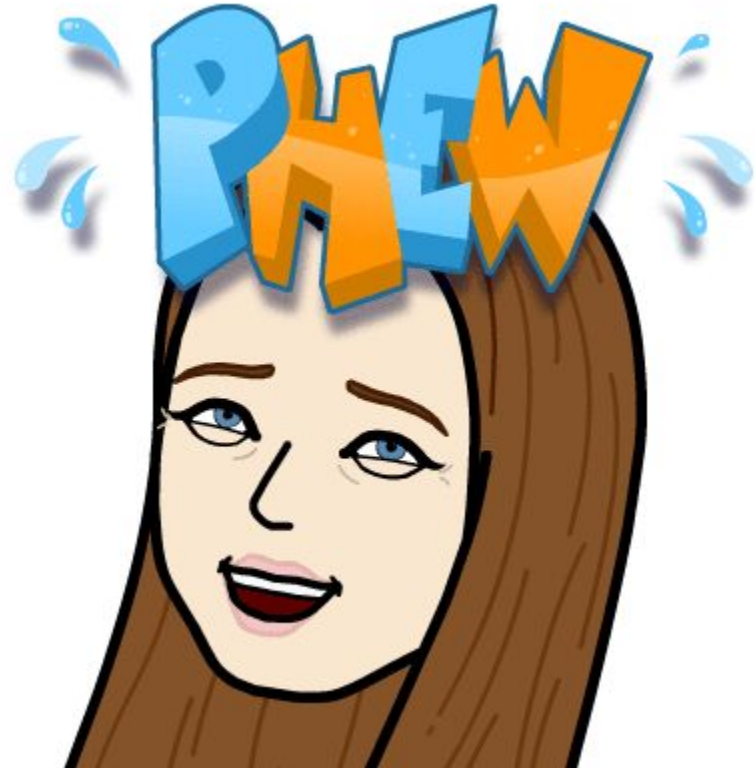
H1 : I can not make a good roti!

P-value > alpha

Fail to reject H0, i.e., accept H0!

So, I'm a good roti cook!

95% confident!



What Next??

- Margin of error = 2.65
- Confidence Intervals
- 45.7 mm to 51 mm

95% of the times, the
Thickness of my roti
Will be 45.7 to 51mm

Confidence Interval of Avg Roti Thickness : 50 rotis a day for 365 days

