Slide 1

Mathematics for Computer Science
MIT 6.042J/18.062J

Confidence versus Truth

Albert R Meyer,   April 29, 2016

truth.1

Slide 2

99% accurate TB testing

Your doctor tests you, and it says TB! He says

"The hypothesis that you have TB holds at the 99% confidence level."

Albert R Meyer,   April 29, 2016

truth.2

Slide 3

99% accurate TB testing

Actually, it's a rare doctor who would say this. Most likely they would say

"The probability you have TB is 99%."

Albert R Meyer,   April 29, 2016

truth.3

Slide 4

Probability of TB?

But we know probability someone has TB, given they test positive

Albert R Meyer,   April 29, 2016

truth.4

1

A Random Person

But we know probability someone has TB, given they test positive depends on the probability a random person has TB.

A Random Person?

But you personally are not a random person. Either you have TB, or you don't.

A Random Person?

But you personally are not a random person. Either you have TB, or you don't. Nothing probabilistic about this.

You are not Random

Whether you personally have TB is unknown, but not a random event!

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You are not Random

Talking about
"the probability that you
personally have TB"
--technically meaningless

Confidence

We can model the outcomes
of our TB test as random.
Then we can talk about the
probability the test is
correct.

Confidence

We can model the outcomes
of our TB test as random.
Then we can talk about the
probability the test is
correct. We can say "A test
which is correct 99% of the
time shows you have TB."

Confidence

For simplicity say

The hypothesis that you
have TB holds at the
99% confidence level.

3

Confidence

In other words,
either you have TB or
something unlikely (1%)
happened.

Confidence

But lots of things happen
all the time, and many
are unlikely.

Confidence

But lots of things happen
all the time, and many
are unlikely. The unlikely
event may offer little
information about TB.

Confidence

Claiming a fact holds at a
high confidence level,
does not mean that it is
true or even probable.

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