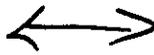


THE GREAT DEBATE BAYES VS. FREQUENTISTS

TRYING TO SHOW THAT

ONE METHOD
IS ALWAYS RIGHT



THE OTHER METHOD
IS ALWAYS WRONG

IS COUNTER-PRODUCTIVE

EXAMPLE: THE BAYESIAN CRUSADE

AGAINST CLASSICAL

GOODNESS-OF-FIT

BAYES 1 NO STOPPING RULE:

FOR BAYESIANS - THE CONDITIONS UNDER WHICH AN EXPERIMENT IS PERFORMED SHOULD NOT ENTER INTO THE CALCULATION OF SIGNIFICANCE



CLASSICAL SIGNIFICANCE DEPENDS ON STOPPING RULE
WHAT IS FIXED? 17, 13, OR 4?

BAYES 2.

THE LIKELIHOOD PRINCIPLE

- ALL RELEVANT INFORMATION IS CONTAINED IN LIKELIHOOD FUNCTION
- RESULTS CANNOT DEPEND ON DATA YOU COULD HAVE OBSERVED BUT DIDN'T

Q: IS THE SUN SHINING?

A: I DIDN'T SEE THE SUN

Q: DID YOU OPEN YOUR EYES?

A: IT DOESN'T MATTER!

BAYES

3

PRIOR PROBABILITIES

EXAMPLE: THE REINDEER IN THE ALPS.

FINNISH PHYSICIST:

"FRED, THEY LOOK LIKE REINDEER,

BUT THEY ARE NOT REINDEER,

BECAUSE THERE ARE NO REINDEER HERE."

LESSON: DON'T PUBLISH SUBJECTIVE
CONCLUSIONS

PUBLISH OBSERVATIONS
EVALUATED OBJECTIVELY

WHAT CAN WE USE FROM BAYESIAN STATISTICS?

PEOPLE (INCLUDING PHYSICISTS)

USE BAYESIAN REASONING

- IN EVERYDAY LIFE
- IN DECISION-MAKING
- WHEN IT IS REASONABLE TO USE APRIORI BELIEFS

SUMMARY

FREQUENTIST METHODS STILL OFFER THE ONLY WAY TO PRESENT EXPERIMENTAL RESULTS OBJECTIVELY WITH THE USUAL SCIENTIFIC MEANING.

BUT

- BAYESIAN METHODS ARE GOOD FOR DECISION MAKING.
DO PHYSICISTS MAKE DECISIONS?
- BAYESIAN METHODS ARE GOOD FOR BETTING
DO PHYSICISTS MAKE BETS?
- BAYESIAN METHODS ARE GOOD WHEN THERE IS A PRIOR PROBABILITY OR PHASE SPACE
MAXIMUM ENTROPY METHOD
- BAYESIAN METHODS ARE A GOOD WAY TO COMBINE NEW KNOWLEDGE WITH PRIOR BELIEFS.
DO WE DO THIS?

WHAT I WOULD LIKE TO SEE:

1. PHYSICISTS LEARN THE VOCABULARY OF STATISTICS
2. ASSUMPTIONS, METHODS, APPROXIMATIONS CLEARLY SPECIFIED IN PUBLICATIONS
3. FELDMAN / COUSINS IN ALL SEARCHES
4. BAYESIAN DECISION THEORY IN POLICY DECISIONS