

Staying in the loop

Prior probabilities, Bayes factor, posterior probabilities

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Perspectives on Scientific Error

26 June 2017

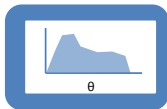
I lost my keys

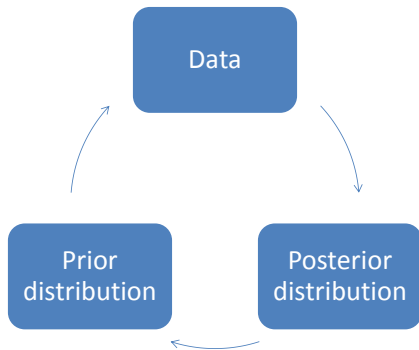
I lost my keys

How long does it take to find them?

n	x
1	7
2	2
...	...
N	1

θ = how long it
takes to find my
keys





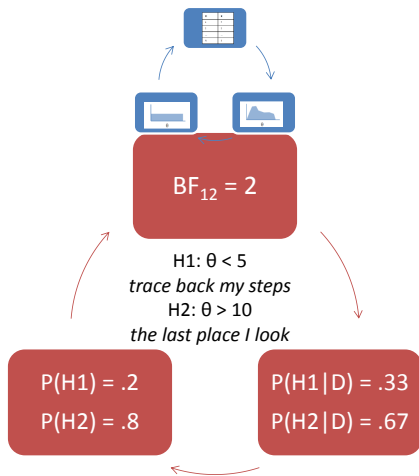
Two theories

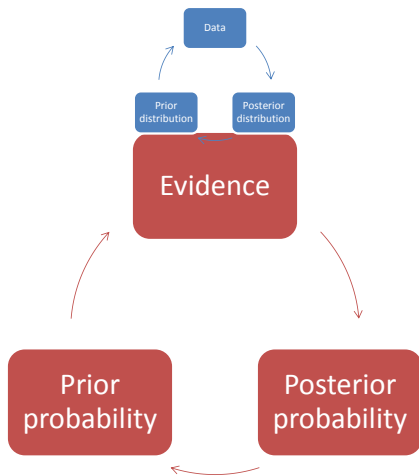
▶ $H_1 : \theta < 5$

Trace back your steps

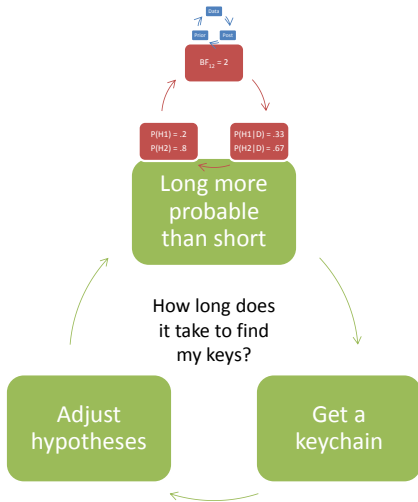
▶ $H_2 : \theta > 10$

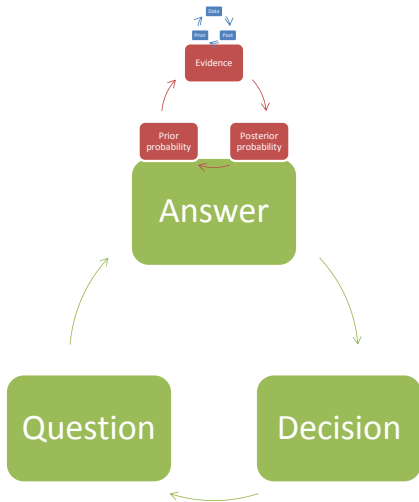
It's always the last place you look





What now?





Overview

The loop

Prior probabilities

How to specify prior probabilities?

Elicitation of subjective prior probabilities

Subjective input - subjective output

Overview

The loop

Updating

Hypothesis updating

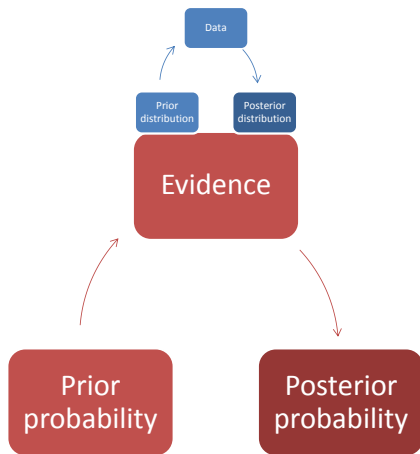
Prior probabilities

How to specify prior probabilities?

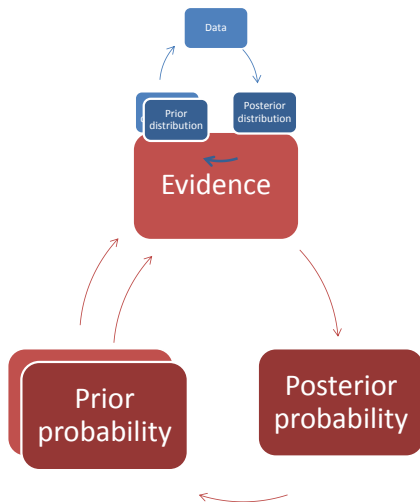
Elicitation of subjective prior probabilities

Subjective input - subjective output

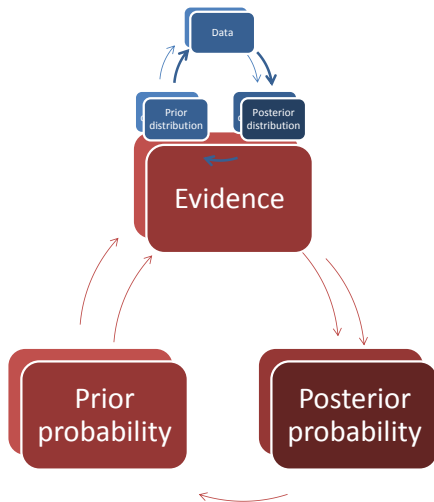
Updating



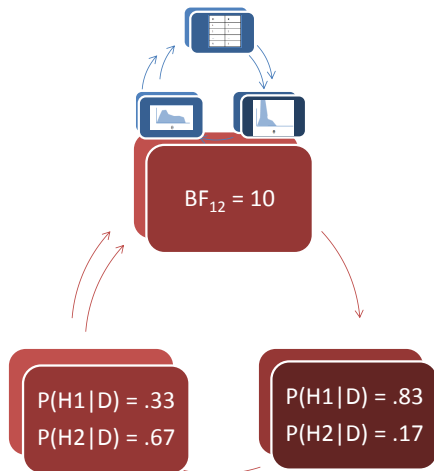
Updating



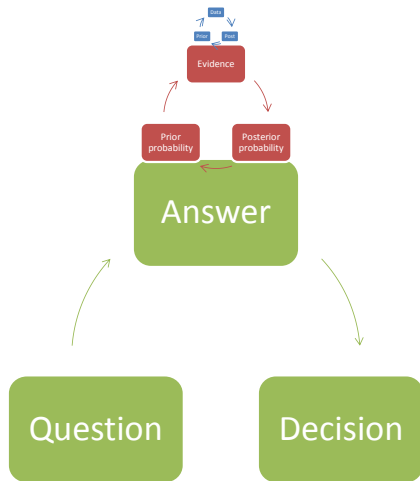
Updating



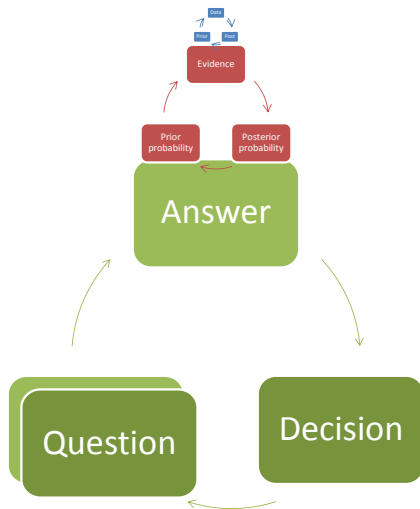
Updating



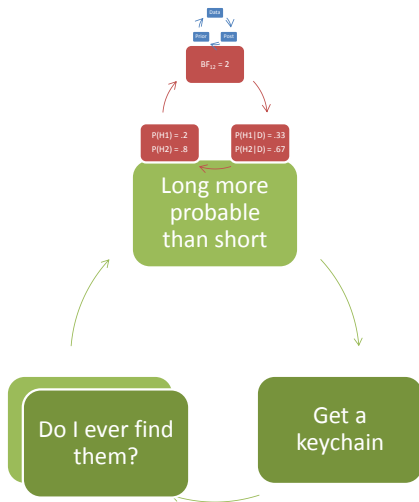
Hypothesis updating



Hypothesis updating



Hypothesis updating



The loop

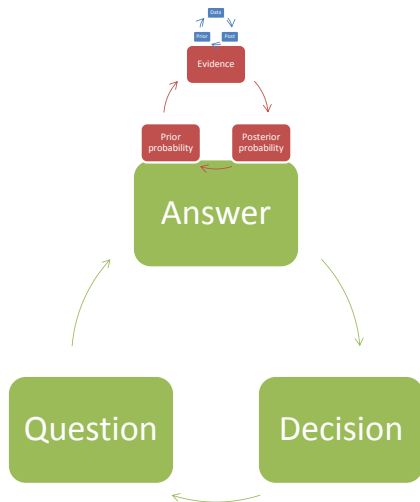
Prior probabilities

How to specify prior probabilities?

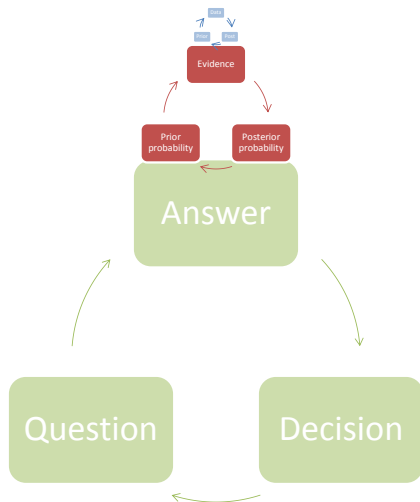
Elicitation of subjective prior probabilities

Subjective input - subjective output

Prior probabilities

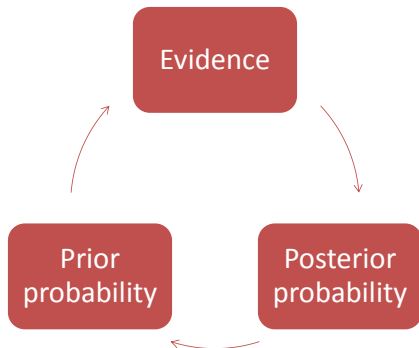


Prior probabilities



Prior probabilities

- ▶ Often focus on **evidence**
- ▶ while the interest is in **posterior probabilities**



What about these prior probabilities?

Hypotheses and probability

I want my hypotheses to be...

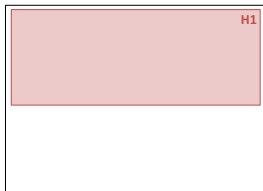
- ▶ possible
- ▶ plausible



Hypotheses and probability

I want my hypotheses to be...

- ▶ possible
- ▶ plausible



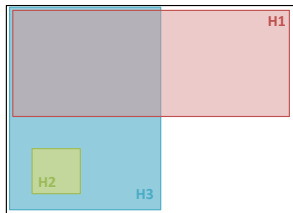
Hypotheses and probability

I want my hypotheses to be...

- ▶ possible
- ▶ plausible

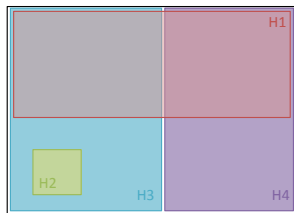


Prior probabilities



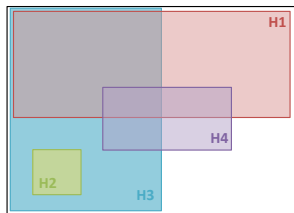
Keys	H_1 : trace-back	H_2 : last place	H_3 : never
	.2	.8	0

Prior probabilities



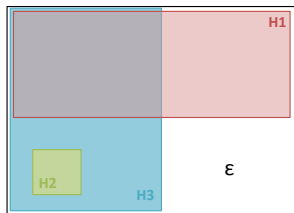
Keys	H_1 : trace-back	H_2 : last place	H_3 : never	H_4 : other
	.2	.8	0	
	.2	.8	0	0

Prior probabilities



Keys	H_1 : trace-back	H_2 : last place	H_3 : never	H_4 : other
	.2	.8	0	
	.2	.8	0	0

Prior probabilities



Keys	H_1 : trace-back	H_2 : last place	H_3 : never	H_4 : other
	.2	.8	0	
	.2	.8	0	0
	.13	.53	.33	ϵ

The loop

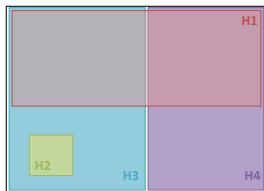
Prior probabilities

How to specify prior probabilities?

Elicitation of subjective prior probabilities

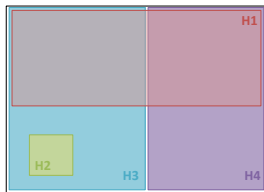
Subjective input - subjective output

How to specify prior probabilities?



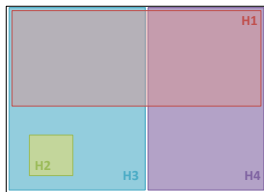
- ▶ Possibility
 - ▶ Forget plausibility

How to specify prior probabilities?



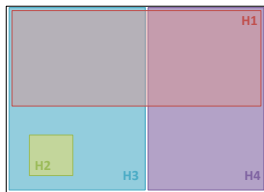
- ▶ Possibility
- ▶ Equal prior probabilities
 - ▶ Default
 - ▶ Realistic?

How to specify prior probabilities?



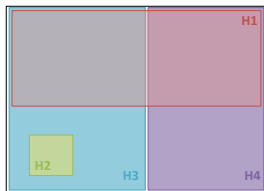
- ▶ Possibility
- ▶ Equal prior probabilities
- ▶ Default starting point
 - ▶ Prove yourself

How to specify prior probabilities?



- ▶ Possibility
- ▶ Equal prior probabilities
- ▶ Default starting point
- ▶ Prior research
 - ▶ Posterior prior probabilities
 - ▶ Prevalence

How to specify prior probabilities?



- ▶ Possibility
- ▶ Equal prior probabilities
- ▶ Default starting point
- ▶ Prior research
- ▶ **Subjective prior probabilities**
 - ▶ How?

The loop

Prior probabilities

How to specify prior probabilities?

Elicitation of subjective prior probabilities

Subjective input - subjective output

Elicitation of subjective prior probabilities

Combine plausibility and possibility of hypotheses
Specify probabilities yourself!

The loop

Prior probabilities

How to specify prior probabilities?

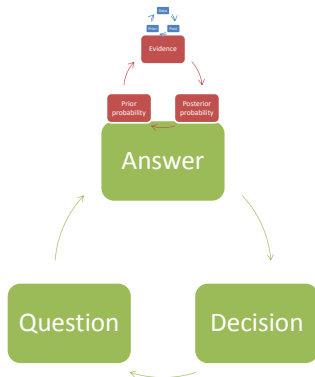
Elicitation of subjective prior probabilities

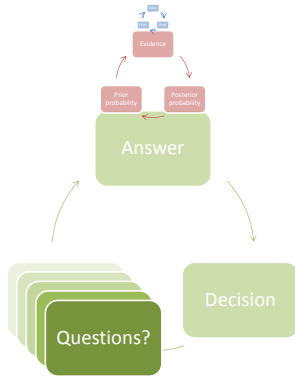
Subjective input - subjective output

The 'key' to take home

Subjective

- ▶ input (question, prior probability and prior distribution)
- ▶ output (decision, posterior probability and posterior distribution)





Want to stay in the loop?
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