

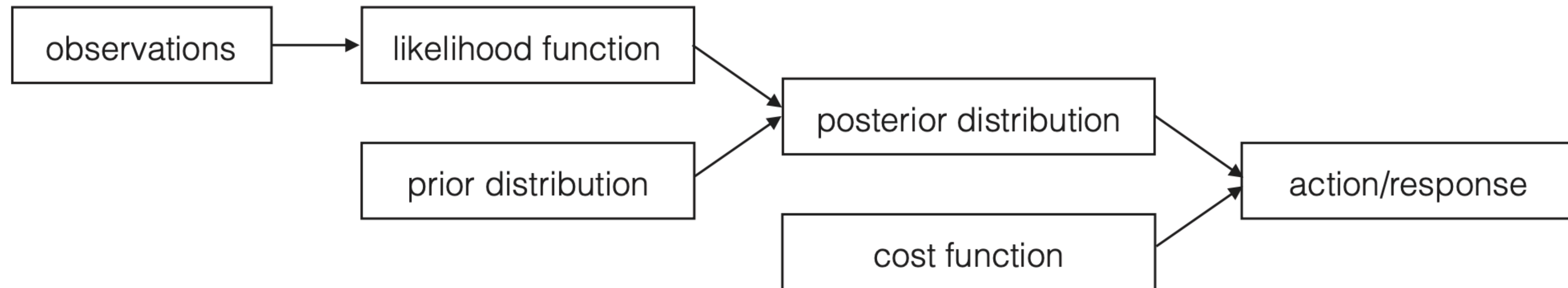


# Day 3 Tutorial BAYES!!! Part 2

BAMB! Summer School

19-27 July 2023

# Bayesian decision making



# Tutorial overview

## Part 1: Bayesian decision theory + perceptual decisions

**How to make a categorical decision?**

- In the face of unequal priors
- In the face of unequal rewards, costs

## Part 2: Hierarchical inference

**How to Bayes when there are hidden variables of interest (e.g. context)?**

- Inferring hidden context by observing spikes
- In the face of changing contexts

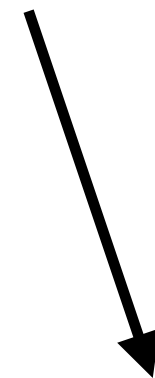
## Part 3 (BONUS): bayes + RL

- Using Bayes to do state inference for RL

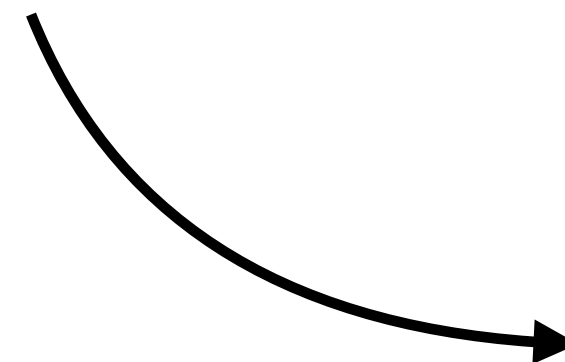
**BEE ANALYZES FLOWER COLORS TO DECIDE  
WHICH CONTEXT IT IS IN**



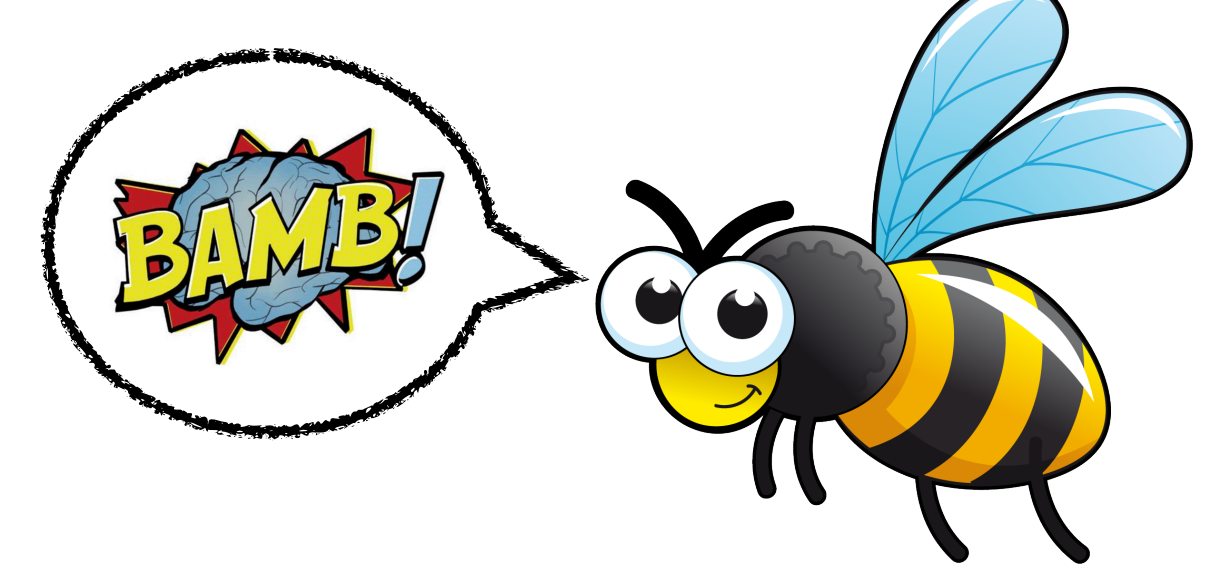
**BEE HAS INTERNAL (OR EXTERNAL) COSTS  
THAT INFLUENCE THIS DECISION**



**BEE ANALYZES THE SPIKES IT PRODUCES WHEN IT  
LOOKS AT FLOWERS TO DECIDE  
WHICH CONTEXT IT IS IN**



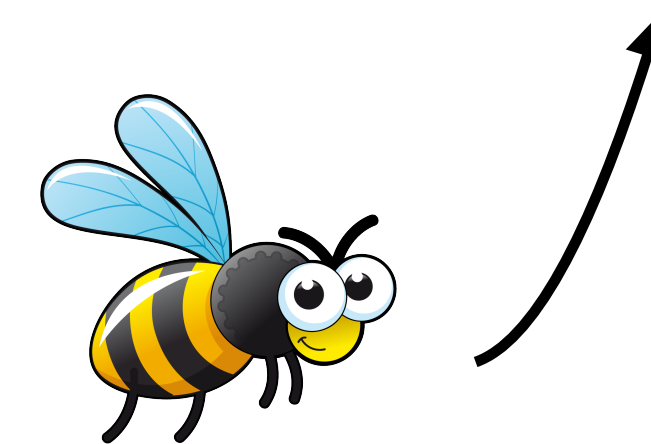
**BEE'S CONTEXT CAN UNDERGO CHANGE.  
IT DOES ONLINE INFERENCE OF ITS CONTEXT  
BASED ON ITS SPIKES**



**BEE SIMULTANEOUSLY INFERS THE CONTEXT  
AND LEARNS THE VALUE OF DIFFERENT FLOWERS**



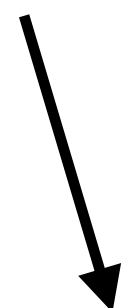
**BEE FORAGES IN A 2D ENVIRONMENT BY  
INFERRING THE CONTEXT THAT IT IS IN**



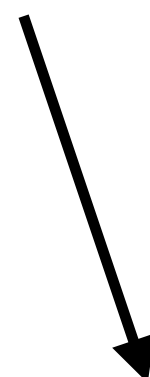


**PART 1**  
**(45 MINS)**

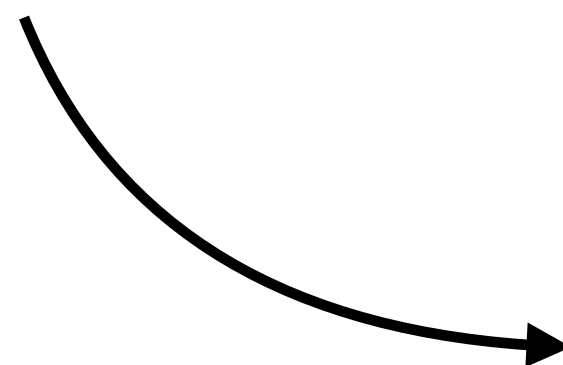
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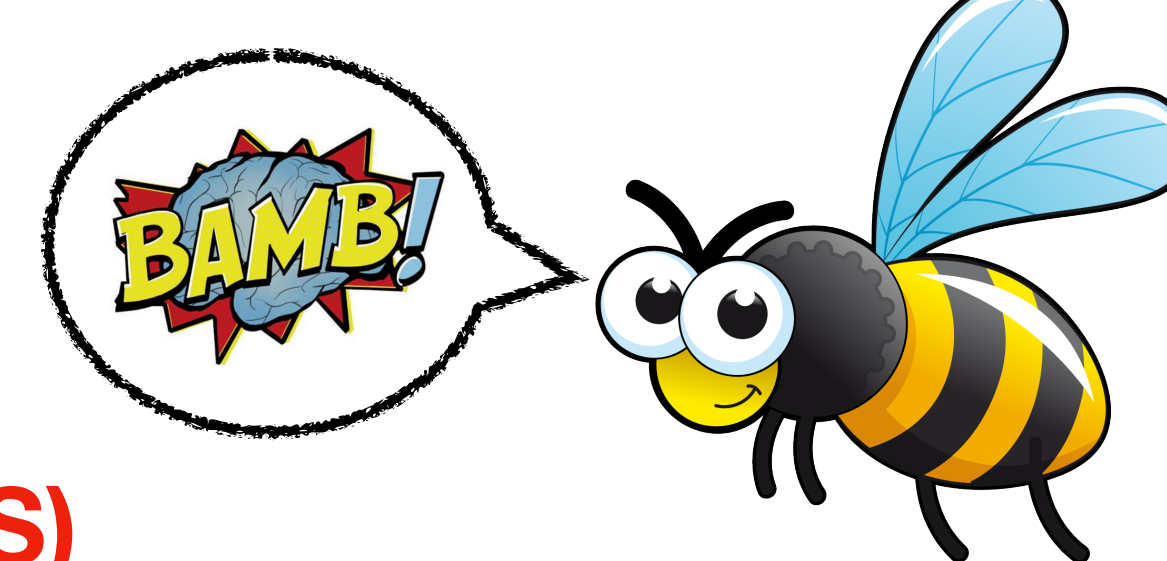
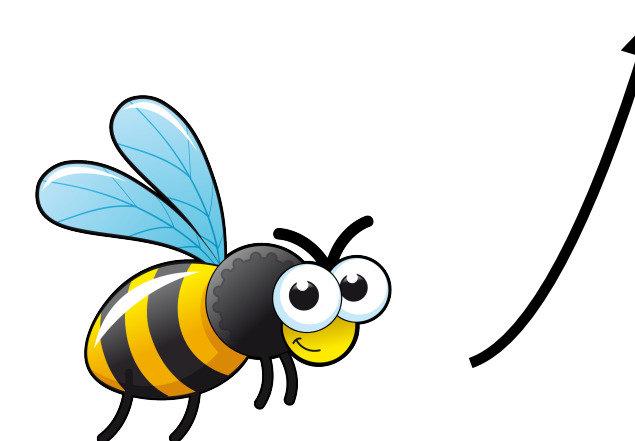
**PART 2**  
**(1 HOUR)**



**PART 3 (BONUS)**

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AND LEARNS THE VALUE OF DIFFERENT FLOWERS**

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**BEE'S CONTEXT CAN UNDERGO CHANGE.  
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