

## **Motivation (2 minutes)**

### **Planning**

Making a decision while trying to maximise the cumulative reward on the long-term

### **Two main approaches**

#### **Machine Learning**

Exhaustive search through all possible states

Too many combinations – not efficient.

Use of sub-goals (hierarchy) could help solving this combinatorial explosion.

Example: Going from room-by-room, cell-by-cell

How to choose the sub-goal?

#### **Neuroscience**

Humans are sensitive to context [Schapiro, 2013]

Participants reported transitions between different contexts as discrete events

HP can emerge from transition probability matrix between states.

### **Motivation**

Understanding the NN of HP achieved in humans can help research in ML.

## **Task (2 minutes)**

### **Task**

The task exploits a hierarchical structure (lines, stations)

Participants are asked to plan in minimum amount of steps.

They won't see the map!!

We can track distances to goal/subgoal to decorrelate the two levels of HP.

Bailing out:

motivates a good performance.

Two levels of reward:

randomly selected for each journey

how reward modulates each level of HP.

## **Pilot (2 minutes)**

### **Differences (NOT IN SCAN)**

Participants asked to learn a map they are not familiar with.

Map is shown at the start of each journey

Current line colour is shown

Waiting time

No rewards, no bailing out

Quizzes!

### **Results**

Y-axis is performance normalised with chance level

9 participants

Learning over time

## **Neural Predictions (2 minutes)**

### **Background**

vmPFC: Vchosen - Vunchosen

dACC: Executive Control

### **Predictions**

Number of step distances – modulated by reward.