**Exercise 3 : Machine learning – MCMC**

**Context :**

You are working with data collected from a 3-armed bandit task where participants choose among three targets. Correct responses are rewarded, while incorrect ones are not. The probability of being rewarded depends on the target chosen:

* Most rewarded target: 80% probability.
* Other targets : 10% probability each.

Every 40 trials, the location of the most rewarded target changes without a cue. Each participant experiences 3 switchesduring their session. The main goal of the task is to maximize rewards.

The dataset includes the following columns:

* **episode**: A identifier for the episode.
* **trial**: Trial number (1–40 for each block).
* **choice**: The target chosen by the participant (0, 1, or 2).
* **reward**: Whether the response was correct (1) or incorrect (0).
* **subject**: Identifier for the participant.

**Instructions :**

1. **Data Exploration :**
   * Load the dataset and inspect its structure.
   * Identify and handle missing or outlier values.
2. **MCMC :**
   * Implement a Rescorla-Wagner reinforcement learning model with parameters with alpha for learning rate and beta for inverse temperature
   * Perform Bayesian inference to estimate the posterior distributions of α and β for each participant using Monte-Carlo MarkOv-Chains. Define the likelihood function based on the Rescorla-Wagner model. Use Metropolis-Hastings to sample from the posterior.
3. **Visulisation :** 
   * Plot the samples for alpha and beta
   * Plot the distributions
   * Plot the means

**Packages :**

import numpy as np

import pandas as pd

import seaborn as sns

import matplotlib.pyplot as plt

**Outputs :**

Une image contenant diagramme, origami, Tracé

Description générée automatiquement