Project Portfolio – Yash

Note: First four projects are already compiled in earlier document versions. This document resumes from Project 5.

# Project 5: Behavioral Decision-Making Analysis Under Physiological States

A cognitive data science project exploring how hunger alters temporal reward preferences across food and money using statistical modeling and experimental psychology.

## Overview

Project Name: Reward Valuation & Delay Discounting Under Physiological States

Role: Research Analyst & Behavioral Data Engineer

Tech Stack: Python (Pandas, NumPy, SciPy, Matplotlib), Excel I/O, Statistical Modeling

Dataset: 2,880 decision trials from 20 participants across four conditions: food/money × fasted/control

Outcome / Impact: Identified how physiological state (hunger) modulates impulsive reward choice using empirical trial-level behavioral data.

## Problem Statement

How does fasting alter decision-making when choosing between immediate and delayed rewards in the domains of food and money? This project aimed to model cognitive discounting behavior across different physiological states.

## Methodology Highlights

🧪 Experimental Setup: Participants completed 36 decision trials in each of four categories: food/control, food/fasted, money/control, money/fasted.

🧮 Reward Devaluation Modeling: Implemented custom formulas to compute trial-level subjective value (V) and discounting rate (k) per participant per condition.

📉 Switch Point Detection: Detected choice reversals (switches) and used geometric means to compute cumulative discount rates, capturing the cognitive inflection points.

📊 Relative Rate Analysis: Computed mean rate differences between fasted and control groups and stratified by reward size (small vs large).

📈 Statistical Testing: Used Wilcoxon Signed-Rank tests to test significance of reward valuation differences across conditions, including delay-period sensitivity.

📉 Visualization: Generated comparative bar plots with error bars (SEM) for commodity-specific reward valuation under hunger.

## Results Summary

Fasting significantly increased impulsivity toward food rewards (p ≈ 0.000015), but not as strongly for money (p ≈ 0.000134).

Delay sensitivity (waiting tolerance) remained relatively stable, highlighting a dissociation between value and time tradeoff under hunger.

Small vs large reward differences suggest magnitude effects—hunger amplifies desire for larger food rewards disproportionately compared to money.

## Resume-Ready Entry

Behavioral Discounting Research – Learning & Memory Experiment (PSY306)

📍 Conducted an empirical study modeling human reward-based decision-making under different physiological states using Python-based statistical pipelines.

- Designed and analyzed a 4-condition × 20-subject dataset (2,880 trials) for fasted/control × food/money preferences.

- Computed trial-wise discounting rates and cumulative devaluation using switch-point based geometric averaging.

- Applied Wilcoxon Signed-Rank tests and plotted SEM-bar graphs to assess and visualize behavioral differences.

- Uncovered robust hunger-driven shifts in impulsivity for food, contributing to research on state-dependent cognitive valuation.