

# Cognitive Science • Behavioral Science • Usability Research

## MS by Research with Dr Priyanka Srivastava | IIT Hyderabad



### Master's Thesis

PSYCHO-MOTOR AND  
PSYCHO-PHYSIOLOGICAL  
CORRELATES  
OF AFFECTIVE-STATE WHILE  
EXPLORING 360° VIDEOS  
USING  
HEAD-MOUNTED VIRTUAL  
REALITY



### Interests

UX Research

Interaction Design

Data Science

### Why RESEARCH?

Pitch

Love to stay long with problem and look from different perspectives

# CASE STUDIES

01

## Head–Movement Analysis of 360° Affective Experience

Emotion • Virtual Reality • Experimental • Quantitative

02

## Cause for Mess Food Wastage

Usability Research • Survey • Fishbone • Pareto • DMAIC 6–Sigma

03

## Can mentalizing shapes lead to empathy in humans?

Empathy • Social Cognition • fMRI Data Research • Quantitative • Python



01

Team size: 6

# Head-Movement Analysis of 360° Affective Experience

Emotion  
assessment

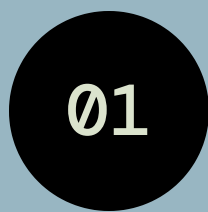
Objective  
Measures

Virtual  
Reality

Virtual Reality

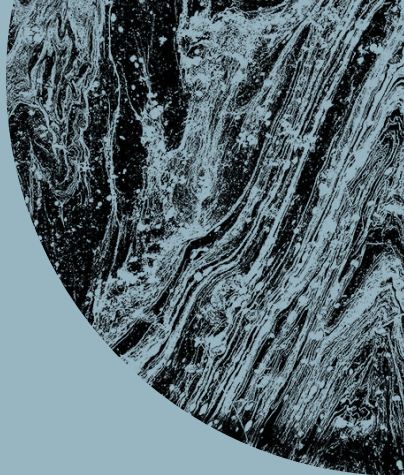
Quantitative





# Head-Movement Analysis of 360° Affective Experience

Emotion • Virtual Reality • Experimental • Quantitative • Team size: 6



## THE PROBLEM

- 1. Self-report subjective measures are not reliable to assess affective-emotional state
- 2. Require one-on-one human interaction

## THE SOLUTION

- 1. Need objective assessment measures (here, Virtual Reality (VR) is used)
- 2. No human-intervention would be required

## MY CONTRIBUTION

- Conceptualisation
- Design & Plan of experiment
- Stimuli selection & data collection
- Devised algorithms for head-tracking parameters
- Statistical & Inferential data analysis

## RESEARCH IMPACT

PRONENESS to DEPRESSION can be diagnosed and monitored which will not only delay the onset of depression but will also mitigate the risks of the onset.

Virtual Reality  
Oculus Rift CV1

Pitch

10 VR affective  
videos

5 Pleasant  
5 Unpleasant  
Pseudo-randomised

30 IIIT-Hyderabad  
Participants

# The Process

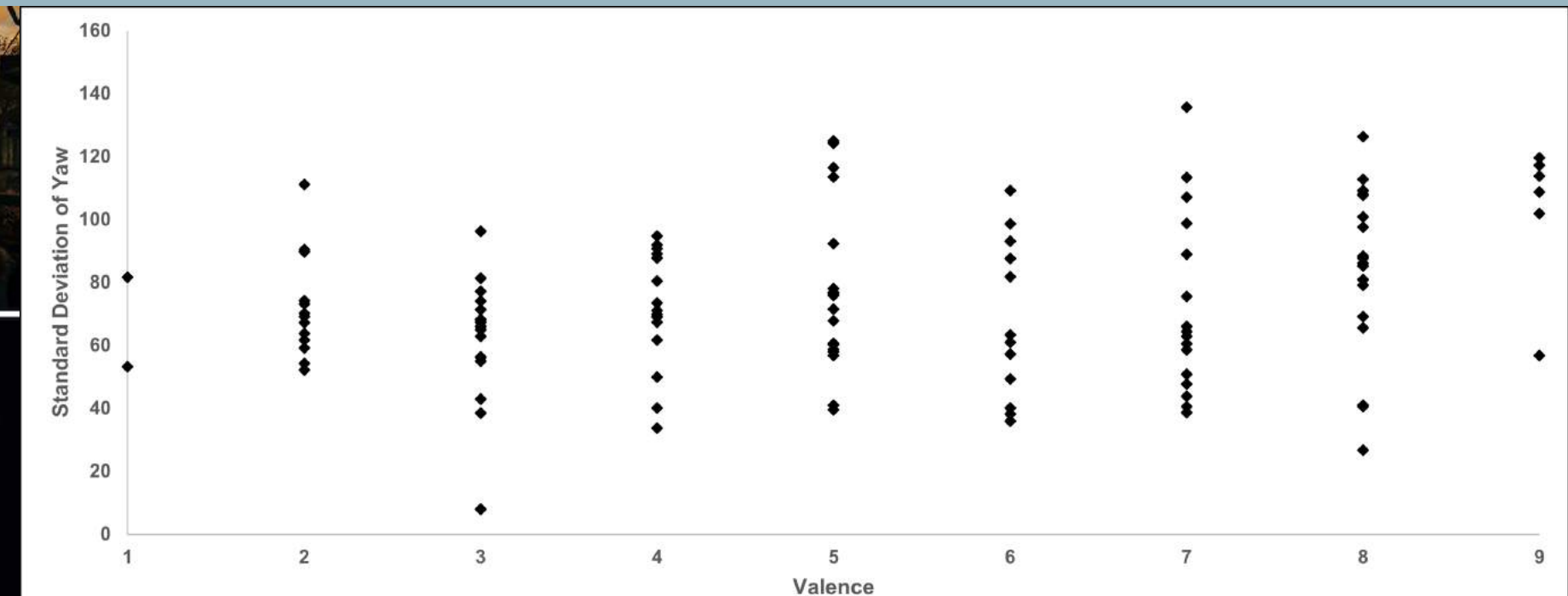
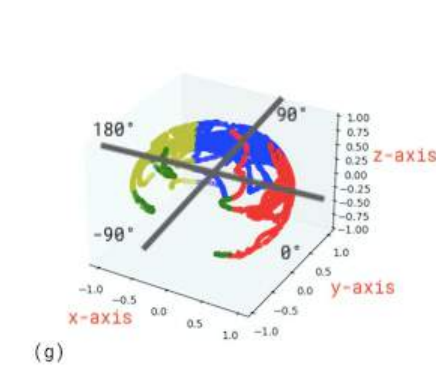
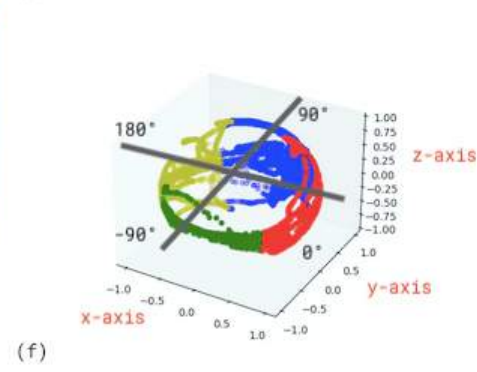
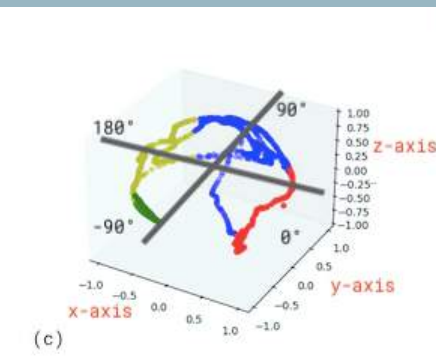
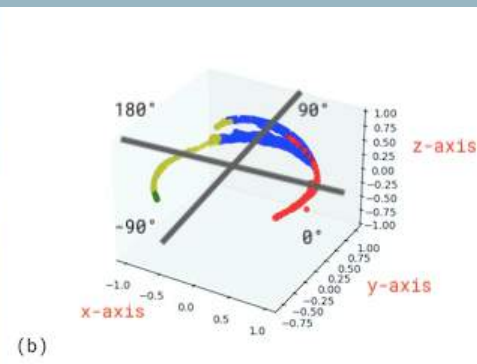
Participant watches 4 VR affective videos

Head-movement data is logged by the Oculus sensor

Affective state is captured by SAM scale response after each video

Correlation b/w head-movement parameters and affective state is computed

Significant +ve correlation b/w valence and head-yaw suggests larger scan dring +ve induction of mood





02

Team size: 2

# Cause for Mess Food Wastage





# DMAIC 6–Sigma Process

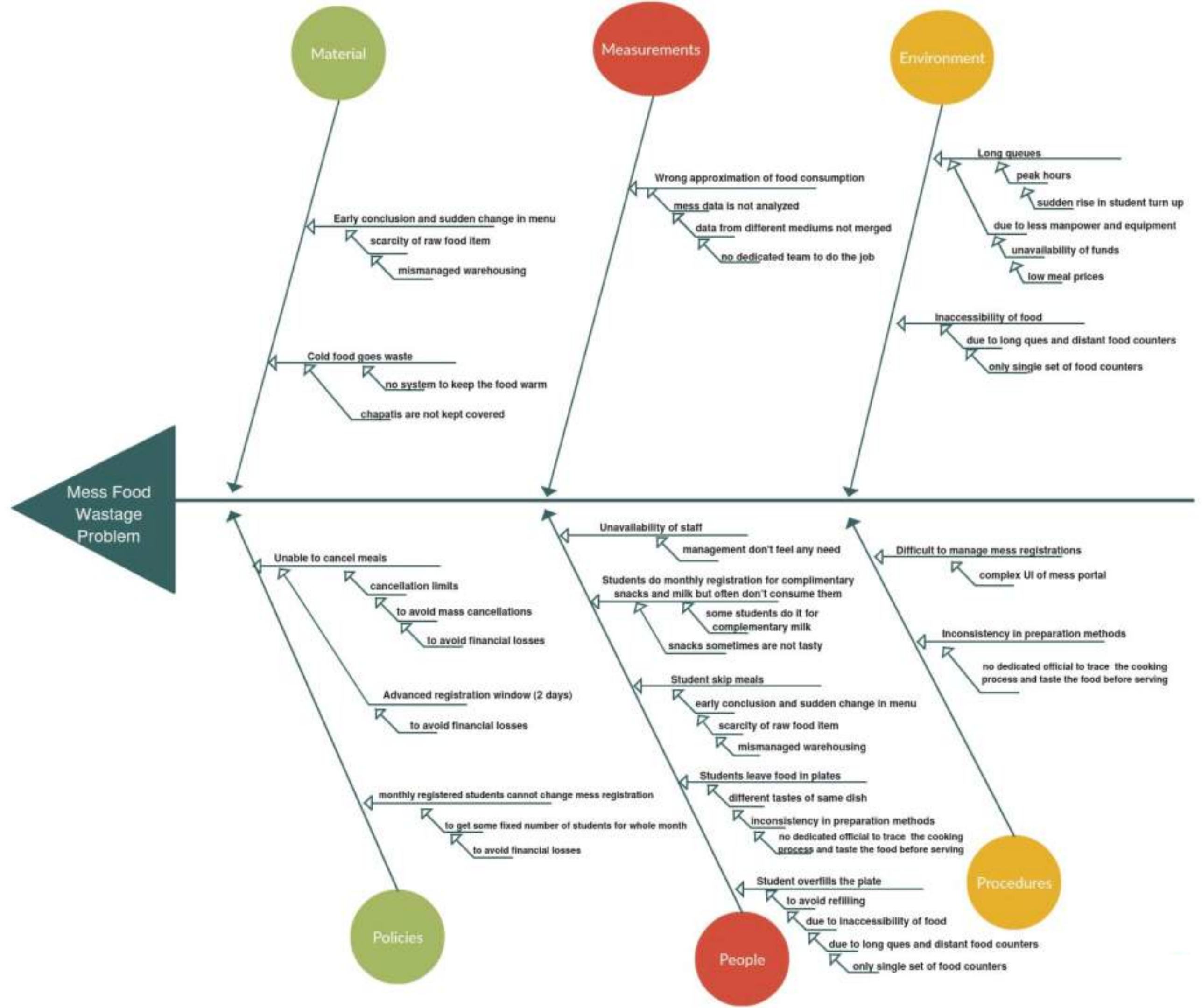
I contributed equally in all the phases of this research (team of 2).

Process Steps	Define	Measure	Analyze	Improve	Control
Strategies	<u>Where we are today?</u> 3 barrels of food	Fix a cooking manual and a person to taste	Find root cause of each dish, one by one, by analyzing the survey	Based on responses, either <ul style="list-style-type: none"><li>Fix the issue</li><li>Replace the dish</li><li>Increase the cancellation limits</li></ul>	Do repetitive survey to monitor the changes
	<u>Where we want to go?</u> Reduce to 1 barrel	Survey to capture each dish			
Tools	<ul style="list-style-type: none"><li>Fishbone</li><li>Pareto</li><li>Data records in mess</li></ul>	<ul style="list-style-type: none"><li>Survey</li><li>Discussion with authorities</li></ul>	Correlational analysis to suggest an optimal menu for a day	Test different models for optimization	<ul style="list-style-type: none"><li>Survey</li><li>Interviews</li></ul>

# Fishbone Diagram (ISHIKAWA APPROACH)

## Stakeholders

- Students
- Faculties
- Mess Staff
- Mess Administration
- College Administration
- Food Suppliers

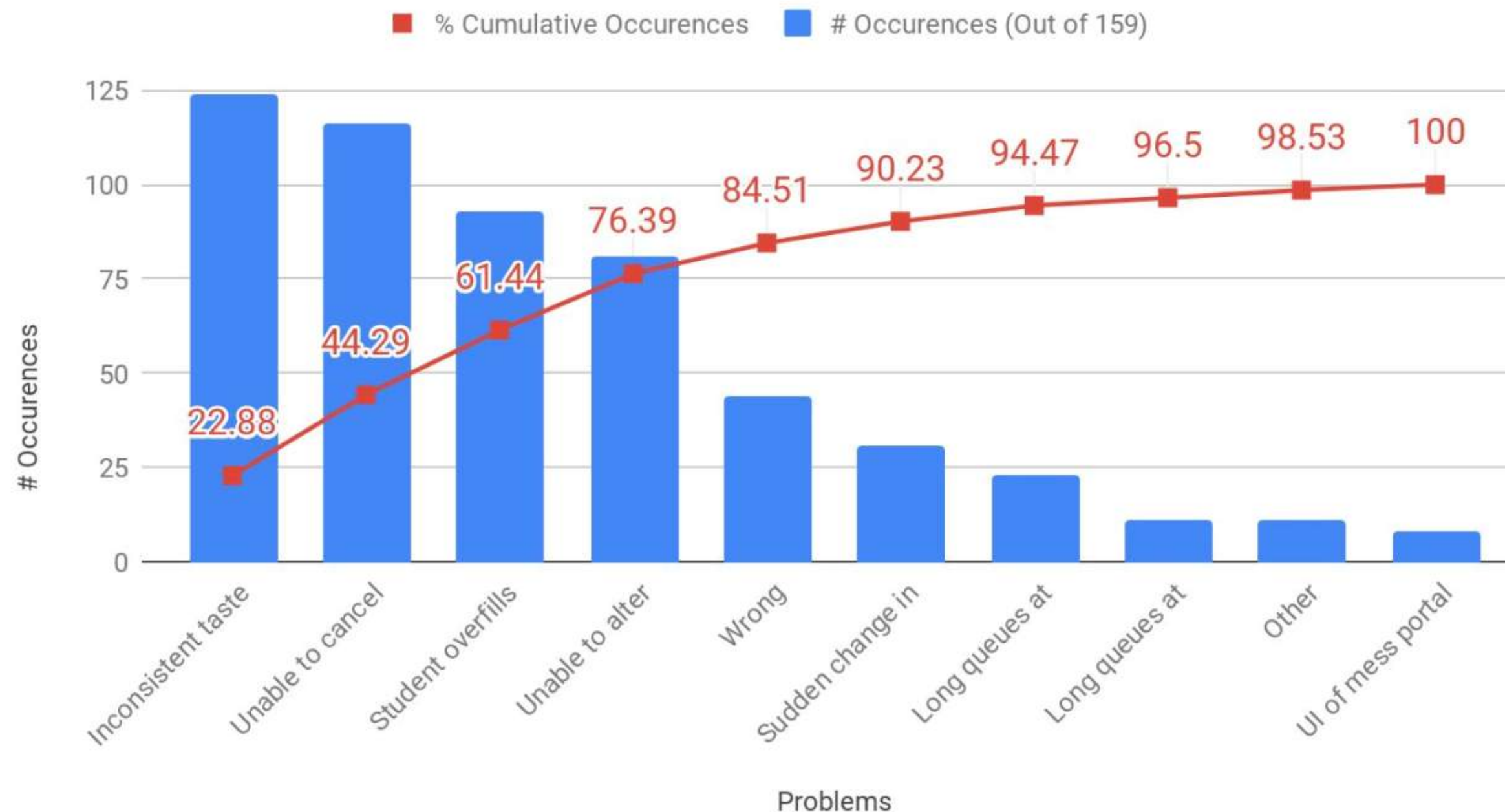




# Pareto Chart

80% of problems can be resolved by addressing 4 issues:

1. Inconsistent taste
2. Unable to cancel due to limits
3. Student overfills the plate
4. Unable to alter registration due to advances registrations window



03

Team size: 4

# Can mentalizing shapes lead to empathy in humans?

fMRI

Empathy

Social  
Cognition

Quantitative

Python



# THE PROBLEM

- 1. Do people empathize with socially interacting shapes?
- 2. Which networks in the brain are associated with empathy?

# THE SOLUTION

By incorporating subtraction and correlation analyses, we found people do empathize with interacting shapes

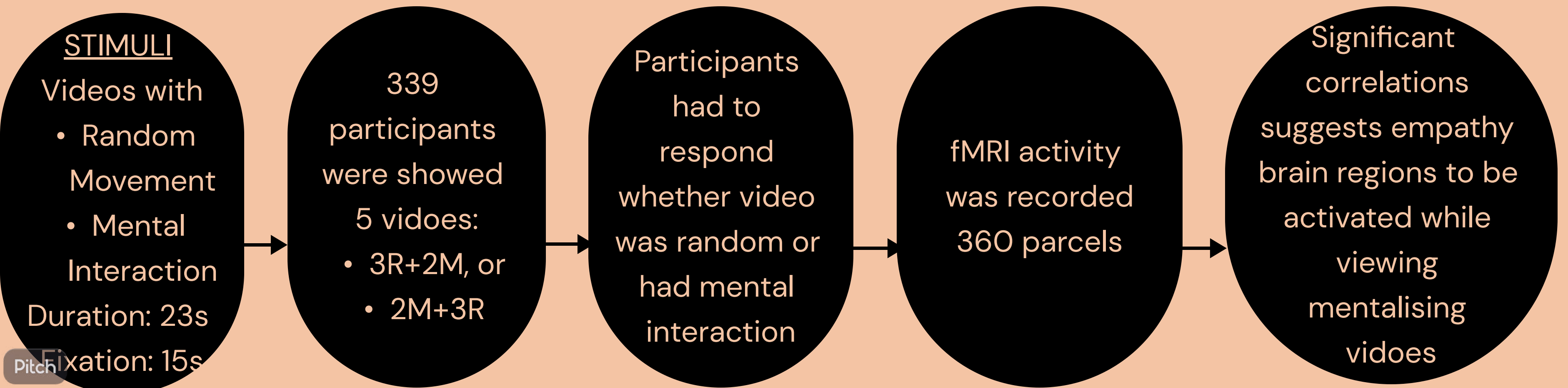
# MY CONTRIBUTION

- Conceptualisation
- Designing research questions
- Brain regions mapping using brain ATLAS
- Data Analysis

# RESEARCH IMPACT

- Assessment of autism like disorders
- Evidence of Mirror Neurons
- Providing Quality health and patient care

# THE PROCESS



# How did we study

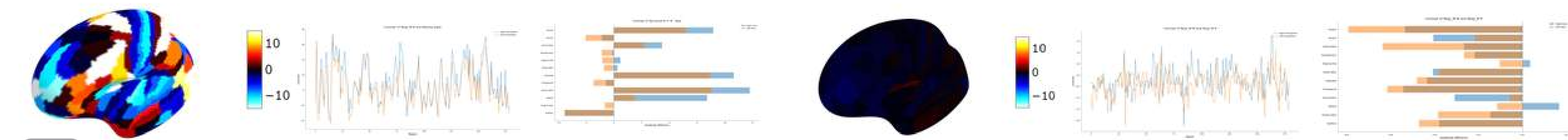
- Subtraction Analysis to analyze of three aspects:
- 1. Contrasts in Parcels for both hemispheres
  - 2. Contrasts in network activations for both hemispheres
  - 3. Visualizing contrasts of activations in parcels



Case A: Subtraction Analysis Based on Video Classes

Case B: Subtraction Analysis Between Resp\_M-M and Resp\_R-R

		True Class of Video	
		Mental Interaction	Random Movement
Participant's Response	Mental Interaction	Resp_M-M	Resp_M-R
	Random Movement	Resp_R-M	Resp_R-R



Pitch Case C: Subtraction Analysis taking Resting State as Control and Resp\_M-M

Case D: Subtraction Analysis Between Resp\_M-M and Resp\_R-M



# How did we study

Correlation analysis to investigate the functional connectivity among the regions responsible for empathy:

1. Temporal-parietal-occipital junction
2. auditory association region
3. Lateral temporal region
4. Medial-prefrontal cortex

