

# Cognitive Science • Behavioral Science • Usability Research

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



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### 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

# 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.

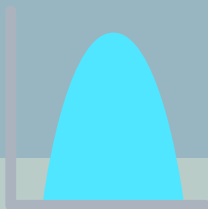


Virtual Reality  
Oculus Rift CV1

Pitch



10 VR affective  
videos



5 Pleasant  
5 Unpleasant  
Pseudo-randomised



30 IIIT-Hyderabad  
Participants



# The Process

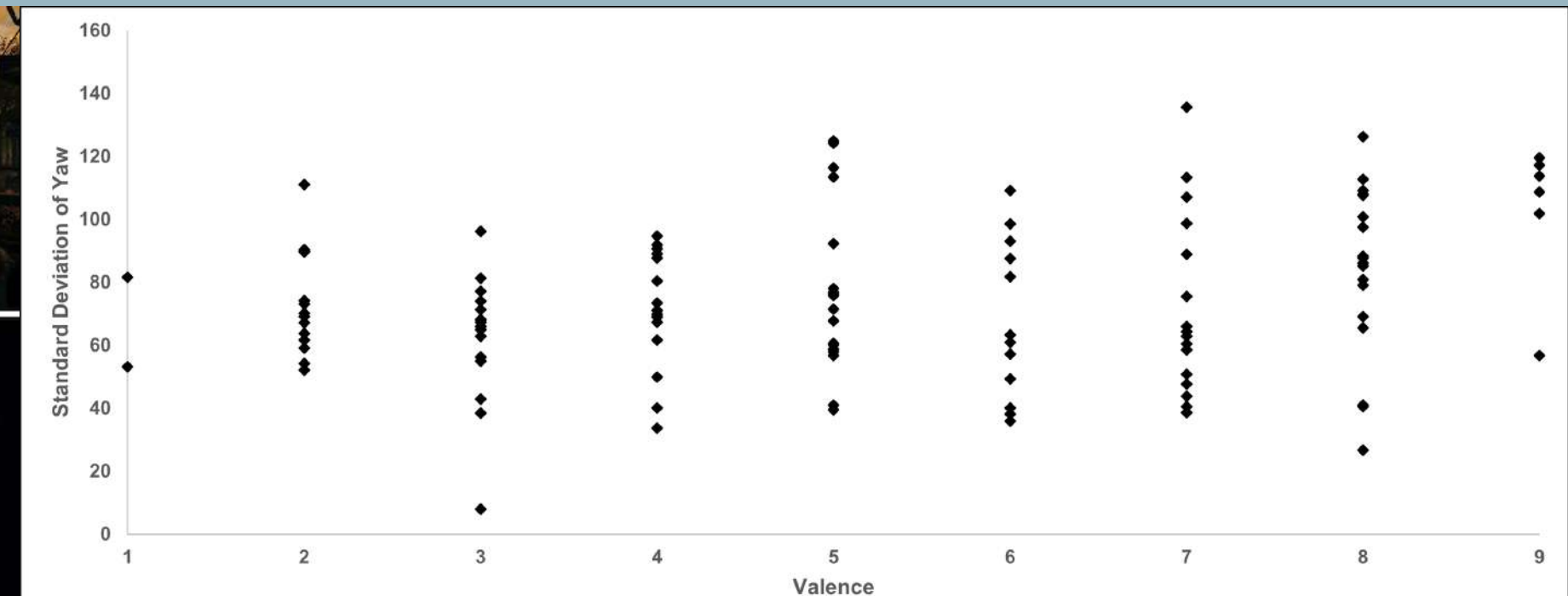
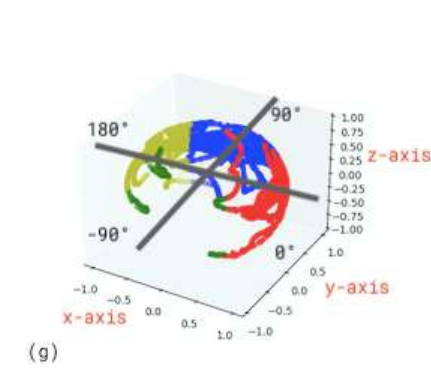
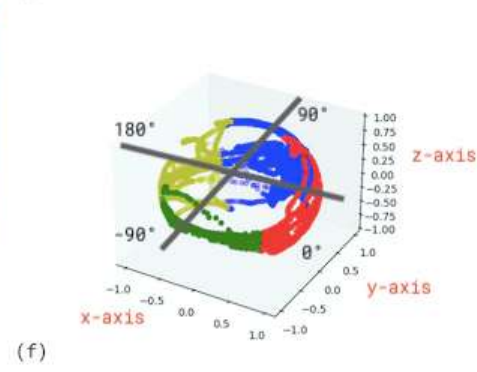
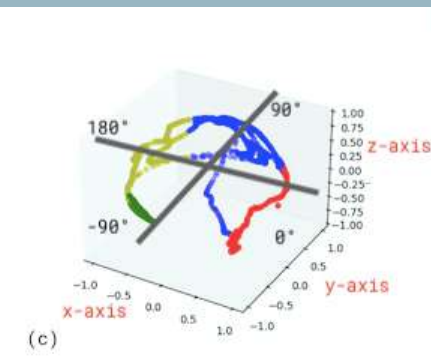
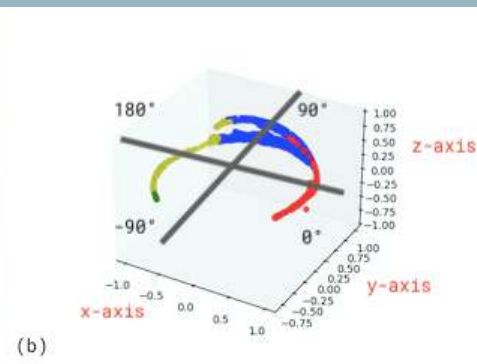
Participant  
watches 4  
VR affective  
videos

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

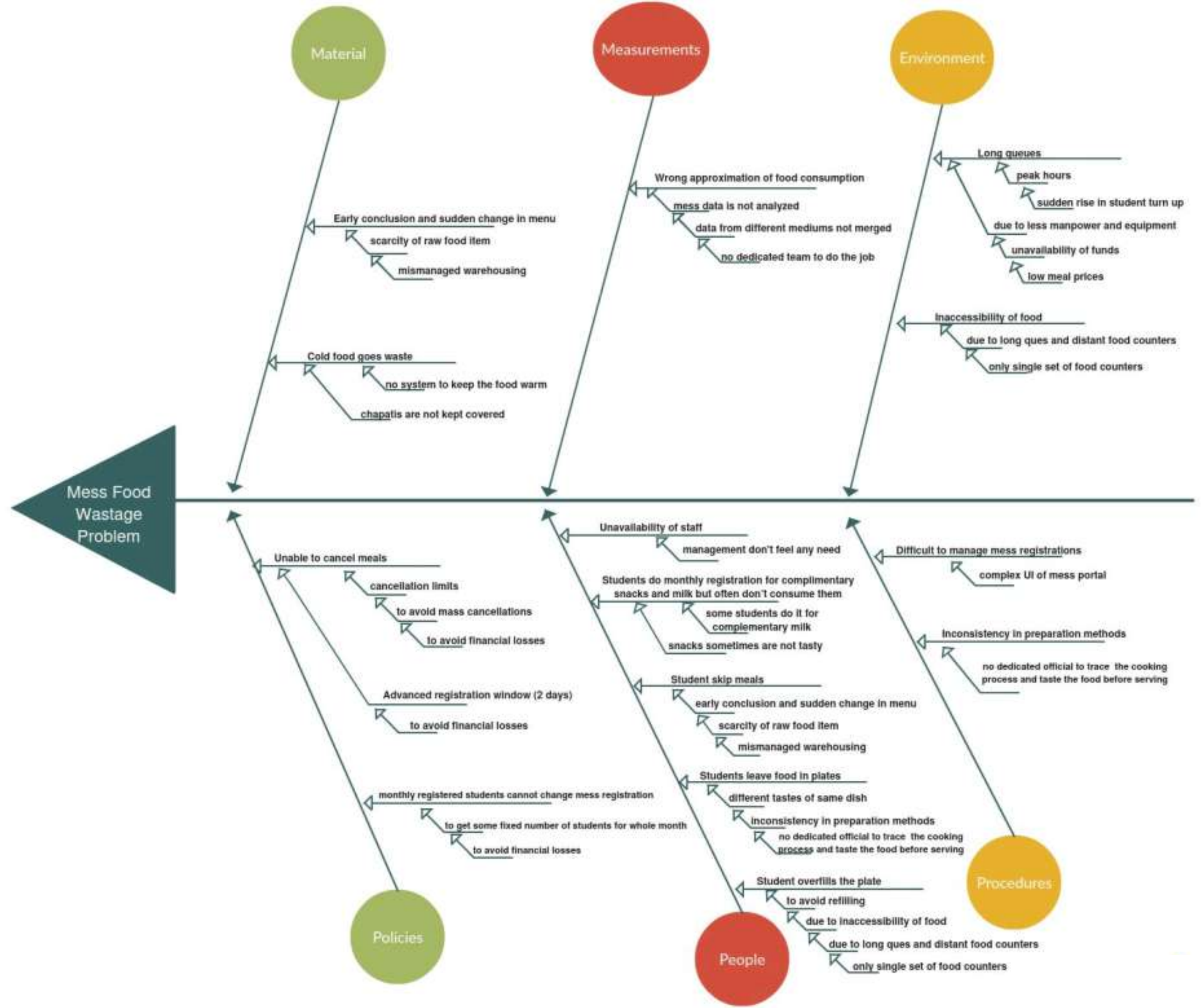
I contributed equally in all the phases of this research (team of 2).

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

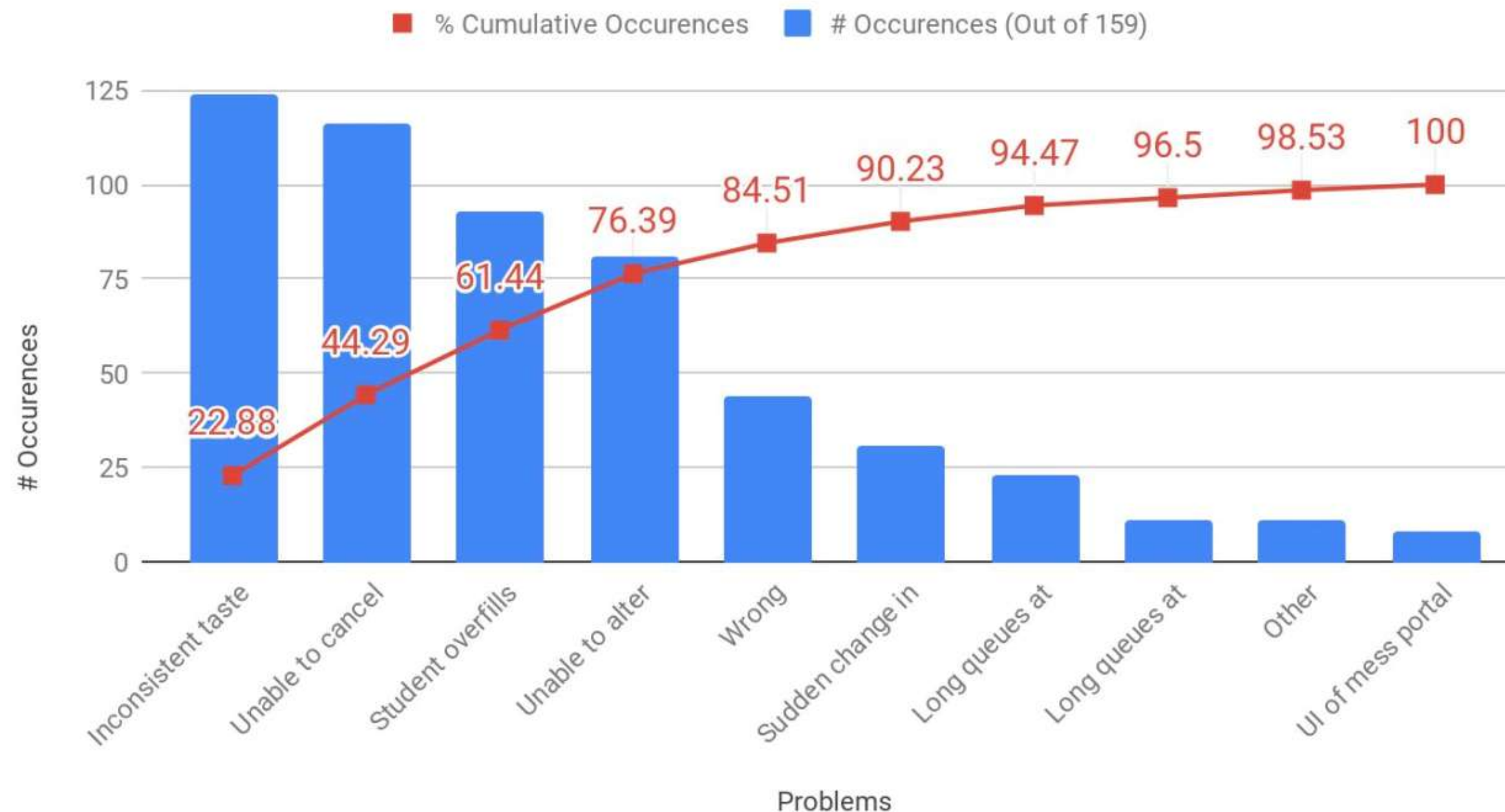




# Pareto Chart

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

### STIMULI

Videos with

- Random Movement
- Mental Interaction

Duration: 23s  
Fixation: 15s

339 participants were showed 5 vidoes:

- 3R+2M, or
- 2M+3R

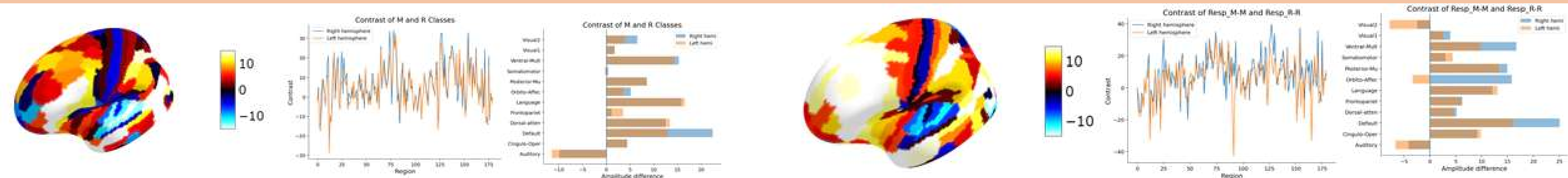
Participants had to respond whether video was random or had mental interaction

fMRI activity was recorded 360 parcels

Significant correlations suggests empathy brain regions to be activated while viewing mentalising vidoes

# How did we study

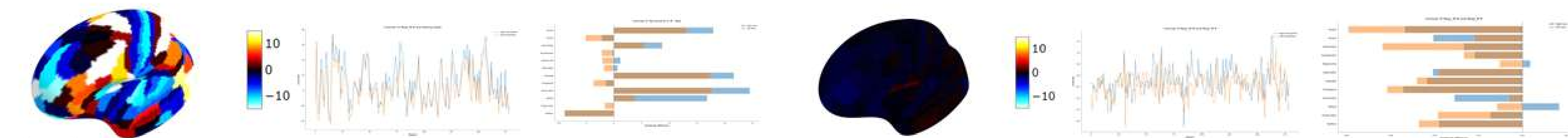
- Subtraction Analysis to analyze of three aspects:
1. Contrasts in Parcels for both hemispheres
  2. Contrasts in network activations for both hemispheres
  3. Visualizing contrasts of activations in parcels



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

