Dimension Hopper

A Tool for Exploring Multidimensional Data in Design Research

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CHIGREECE 2023 CHAPTER
Connect. Engage. Inspire.

Challenges in exploring multidimensional data

- Designers often find it difficult to explore relationships between data in design research
- Lack of tools that facilitate the simultaneous visualization of different data types

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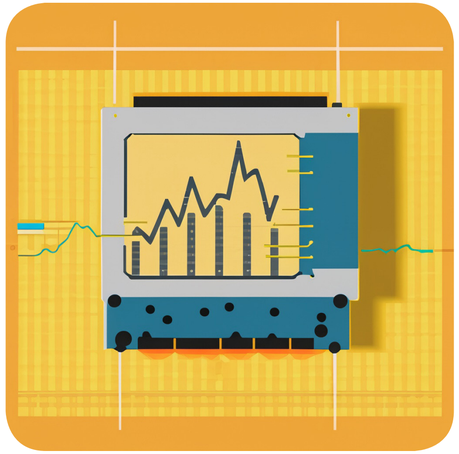
Focus on combination of subjective and objective data

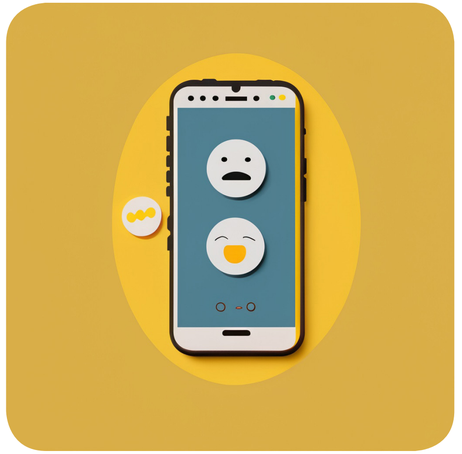
Sensor data



Numerical

+

Experience sampling data



Numerical/Categorical

Likert scales
Open text field
Multiple choice

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Design requirements

- Understanding the main patterns in the user's behavior

- Identifying relationships between different data types

-> identify parameters which affect user behavior and interconnections between them

- Identifying significant changes or anomalies

->understand issues related to the data collection system or the behavior and experience of the user

- Understanding the context

DIMENSION HOPPER

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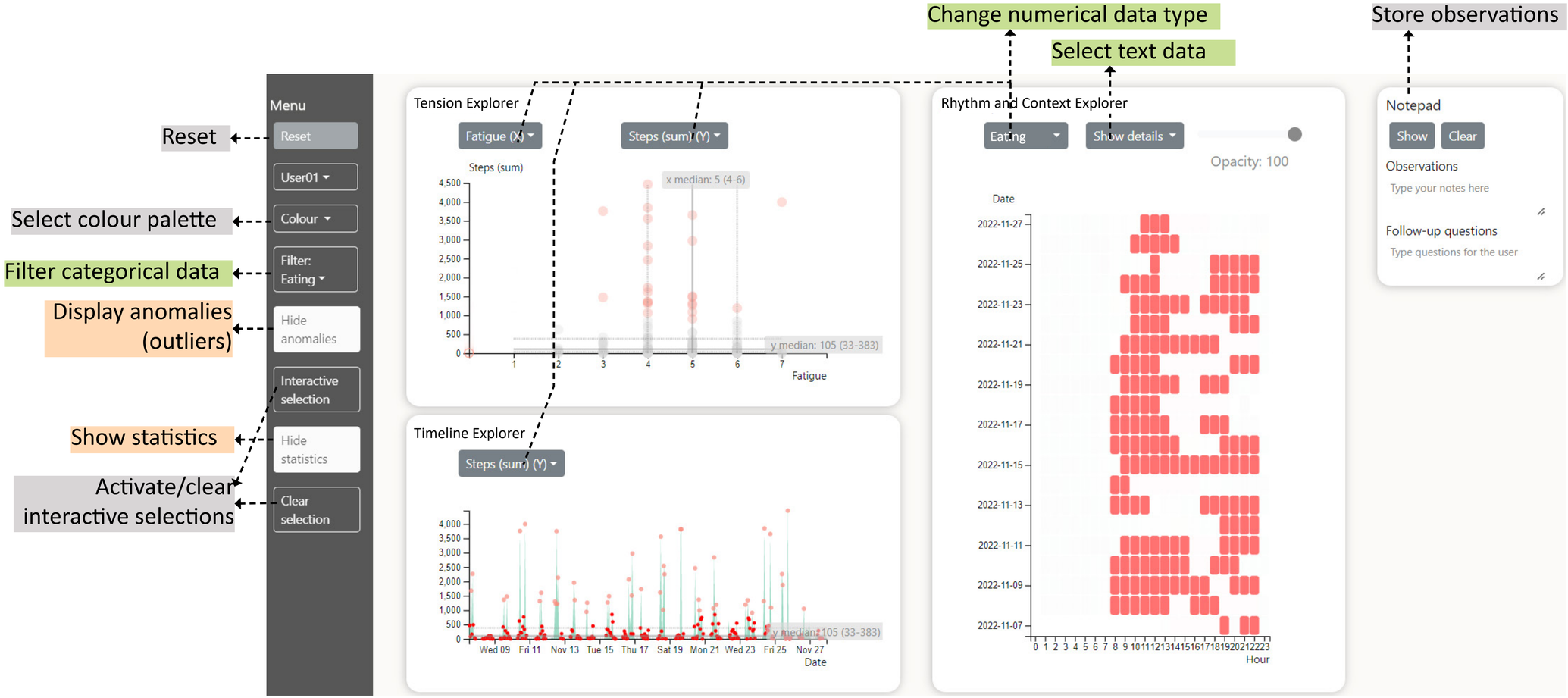
DIMENSION HOPPER: Overview



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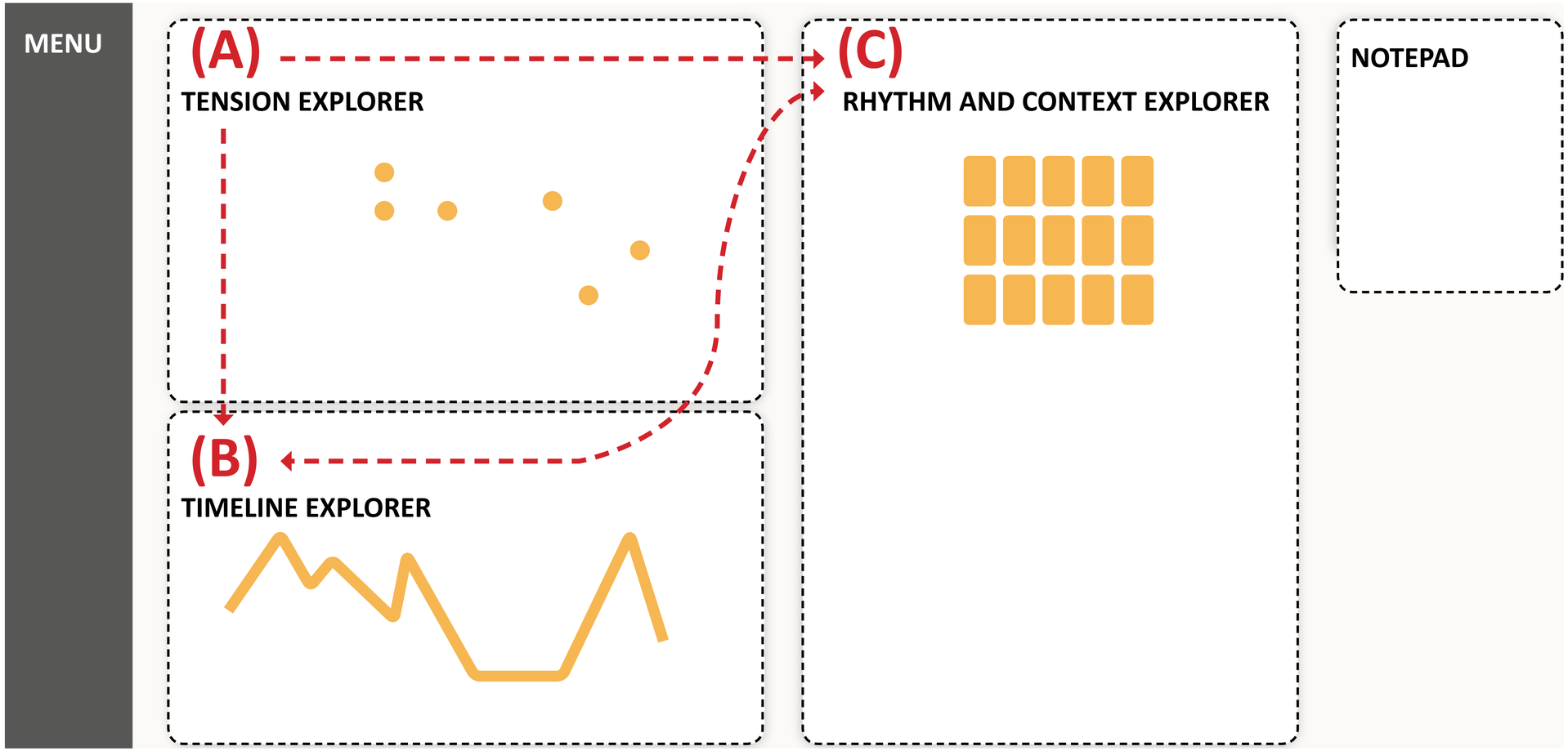
Multiple coordinated views (MCV)



Components: Tension explorer

(A)

TENSION EXPLORER

Identify
- correlation/mismatches between data
- anomalies, extremes and unexpected events based on data combinations

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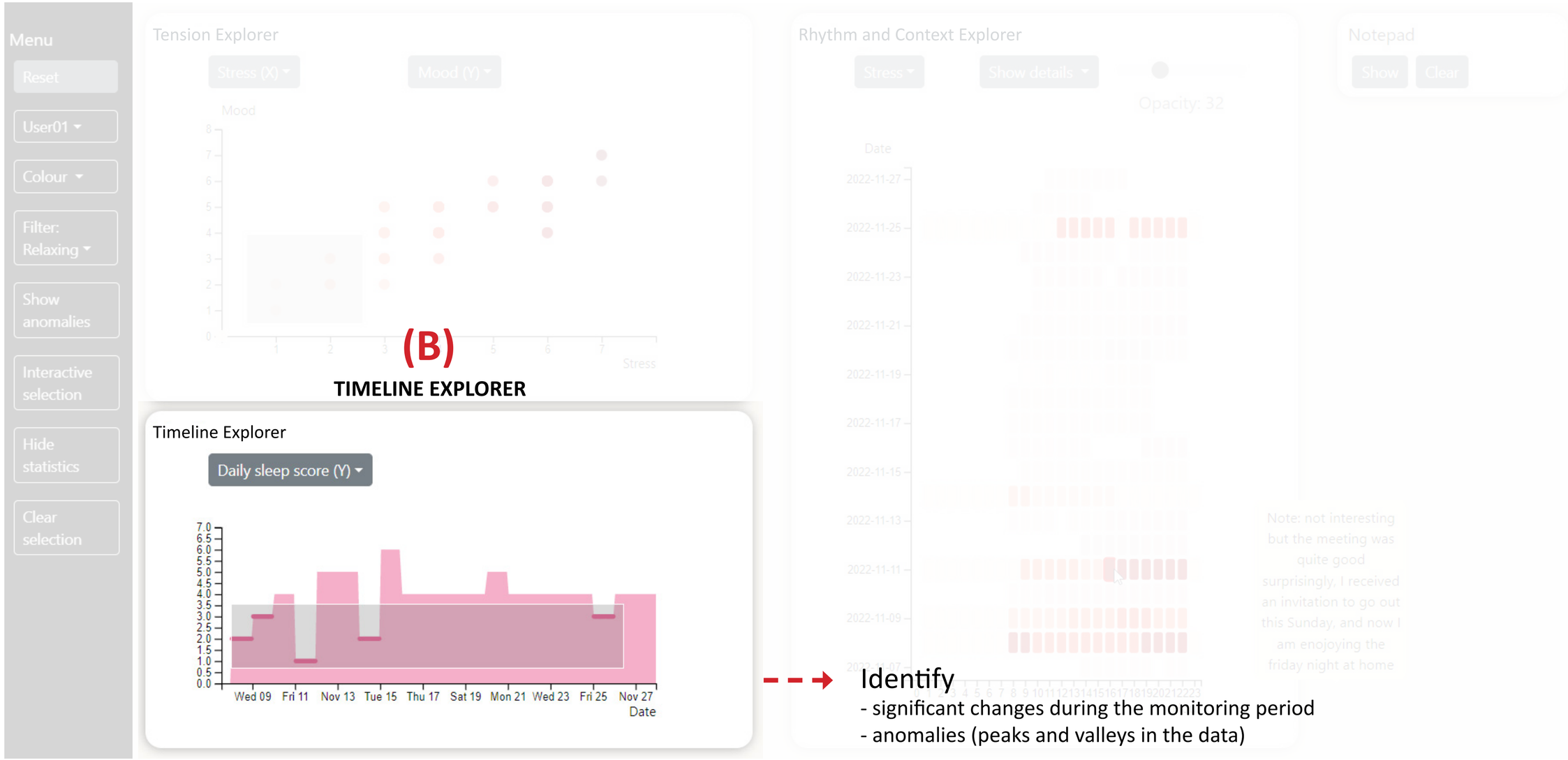
Components: Timeline explorer



Identify
- significant changes during the monitoring period
- anomalies (peaks and valleys in the data)

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Components: Rhythm and Context Explorer

(C)

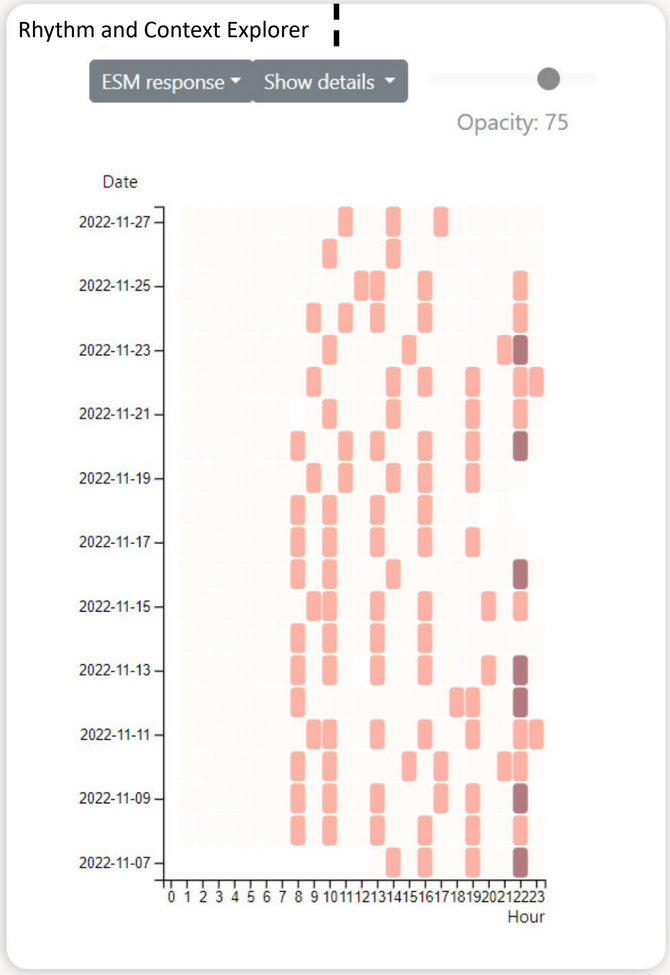
RHYTHM AND CONTEXT EXPLORER

Identify

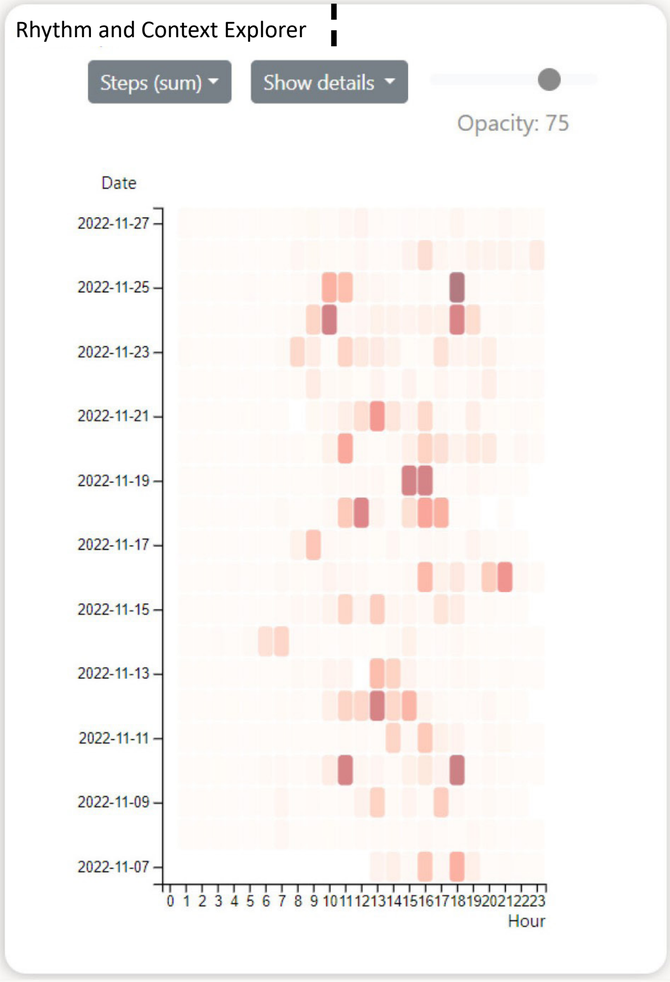
- the daily rhythm of events/behaviors
- the context behind outliers, anomalies and interesting observations

Components: Rhythm and Context Explorer

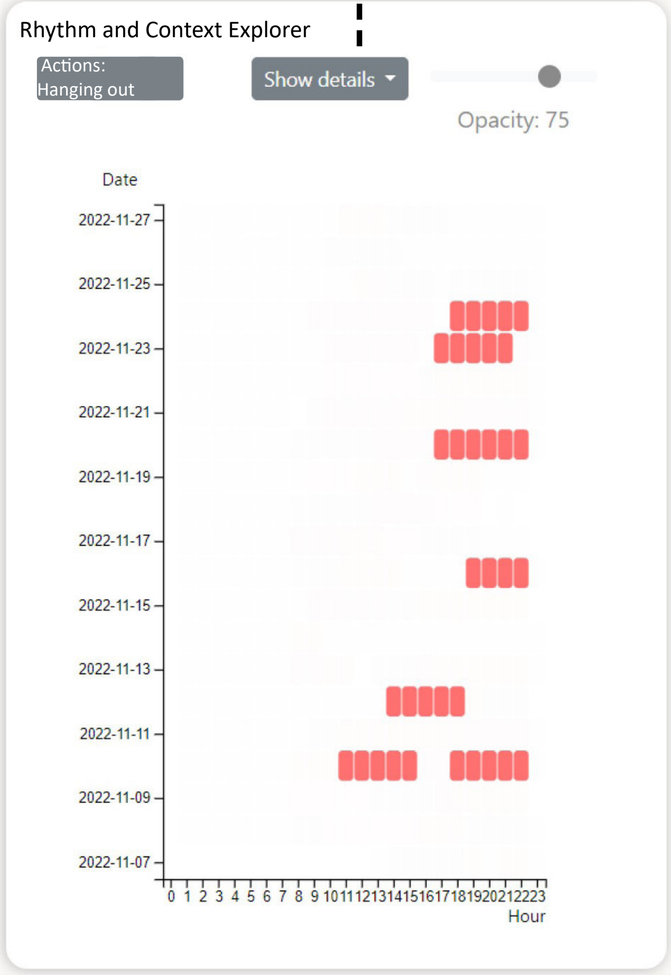
Checking
ESM response rhythm



Checking
daily steps rhythm



Checking rhythm in hanging
out with friends



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Interactive selections between views

Mood fluctuates during these days, with ESM data providing context

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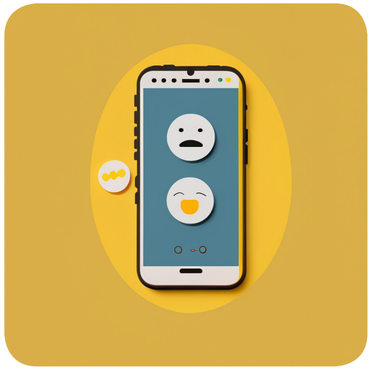
Demonstration

We used the dashboard to explore data collected from 16 users for 3 weeks:

FitBit data

+

Experience sampling via m-Path



Subjective/objective data:

Sleep duration and quality
Stress
Fatigue
Steps
HR
Activities
Interesting events
...

Demonstration

1 - Start exploration

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Demonstration - Anomalies

2 - See anomalies

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Demonstration - Context behind anomalies

3 - See more details related to anomalies -> Mood fluctuations and HR surrounding highlighted points with low stress and mood

Demonstration - Filtering

4 - Filter points where user is “Hanging out with friends” -> Socialisation happens in the evenings, and is associated with good mood

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Demonstration - Filtering

5 - Filter points where user is “working” -> it sometimes happens outside of normal working hours, and is associated with various moods

Demonstration - See context behind contrasting subjectibe and objective data

6 - Select points where subjective and objective sleep quality disagree -> the sleep duration was high, but the user had nightmares

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Open problems and future directions

- User tests

- Documenting findings

- Data exploration can still be overwhelming
-> difficult to decide where to start from

- User-friendly data processing is needed

- Collaborative sensemaking