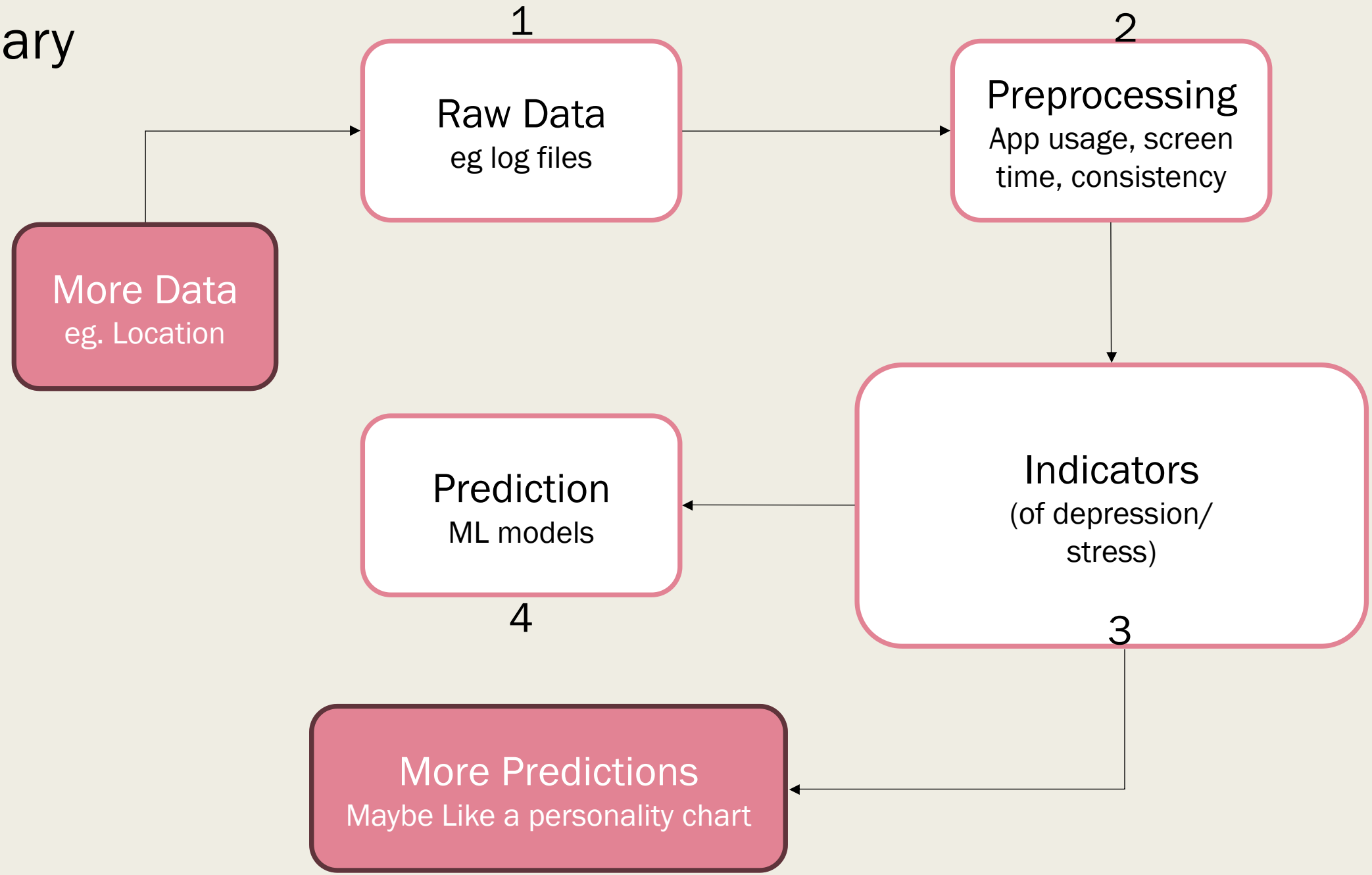
Summary


1
Raw Data
eg log files
2
Preprocessing
App usage, screen time, consistency
More Data
eg. Location
Prediction
ML models
4
Indicators
(of depression/ stress)
3
More Predictions
Maybe Like a personality chart

Work:

→ Dive deeper into how the features were studied in the papers.
→ Basically, try to find out an y = f(x) kind of equation, and understanding this function.

Sleep (x)

→ Accelerometers : A sensor that can detect motion. Sleep is inversely related to motion detected.

→ Heart Rate Variability : Measured using Wrist-worn devices. Lower HRV implies light sleep or wake states. Often associated with stress. High HRV implies Deep sleep stage.

→ Microphone : Detects ambient audio to infer conversations. Sleep is inversely related to noise detected.

→ Light Sensors : Measures ambient light intensity. Lower light levels directly related to sleep.

→ Phone lock/ Unlock status : Analyze the duration for which the phone is locked or not used. Prolonged periods of inactivity directly related to sleeping time.

Predictions (y = f(x))

→ Irregular sleep patterns and reduced sleep duration are strongly predictive of depressive symptoms.
→ Poor sleep quality (e.g., interrupted sleep or nighttime phone checking) is more commonly associated with anxiety than depression.

Sociability (x)

→ Call Logs : Number of calls made and received. Duration of calls. Fewer calls and shorter call durations are often linked to higher depressive symptoms.

→ SMS Logs : Number of text messages sent and received. Decreased SMS activity is often associated with depression and social withdrawal.

→ Bluetooth Connectivity : Records proximity to other Bluetooth-enabled devices. Fewer co-locations with others are linked to social isolation, a common feature of depression.

→ Microphone : Detects ambient audio to infer conversations. Fewer or shorter conversations correlate with reduced sociability and depressive symptoms.

→ Location Data (GPS/Wi-Fi) : Tracks time spent in social locations (e.g., cafes, workplaces, or schools). Spending more time at home and less time in social environments is linked to both depression and anxiety.

Predictions (y = f(x))

→ Reduced Sociability : Strongly associated with depression, reflecting withdrawal and isolation tendencies.

→ Variability in Sociability (no fixed pattern or showing unpredictable patterns in interactions.) : More common in individuals with anxiety

Mobility/Location (x)

→ Location Tracking (GPS/Wi-Fi) :

1. Features Measured
   - → Location Variance : Variation in the user's location over time, no of unique locations visited.
   - → Homestay Time : Time spent at home versus other locations.
   - → Distance Traveled : Total distance covered within a specific period.
   - → Transition Frequency : Number of times the user moves between different locations.
2. Reduced mobility, such as spending more time at home or visiting fewer locations, is often linked to depressive symptoms.

→ Activity Monitoring (Accelerometer)

1. Features Measured
   - → Physical Activity Level : Amount and intensity of movement (e.g., walking, running).
   - → Inactivity Periods: Duration of time without significant movement.
2. Lower physical activity levels and increased inactivity periods are correlated with higher depression levels.

Predictions (y = f(x))

→ Decreased mobility, such as limited location variance and increased home-stay time, is strongly associated with depression.

→ Anxiety is associated with avoidance behaviors, such as avoiding crowded or unfamiliar locations..

Screen usage (x)

→ Screen Usage : Time spent actively on screen. The number of times a phone was checked per day, as well as the duration of phone sessions throughout the day.

Predictions (y = f(x))

→ Frequent phone checks might indicate anxiety or stress.

App usage and browser history (x)

→ App Usage and Browser history : App usage was recorded, and apps were categorized as entertainment, social media, finance, etc.

Predictions (y = f(x))

→ Researchers tried to investigate if heavy social media use was linked to increased anxiety, or if the use of certain types of apps correlated with stress levels.

Mental health assessment surveys

→ PHQ-8 is the most reliable survey for depressive symptoms.

How often during the past 2 weeks were you bothered by...	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself, or that you are a failure, or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3

Mental health assessment surveys

→ GAD-7 is the most reliable survey for anxiety symptoms.

Over the last two weeks, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid, as if something awful might happen	0	1	2	3

Limitations of previous works:

→ Some features studied are not exactly relevant today (like SMS, Bluetooth) and some important features were not studied properly (like WhatsApp, social media apps) .
→ Phone usage patterns have highly changed, so the conclusion about people's behaviour and it's correlation with mental health might not hold today.
→ Students' life routines are often dictated by deadlines, so the pattern finding approach has to be modified accordingly.

Suggestion/Question:

→ Are we limiting ourselves to just mental health domains ?
→ We can study more behavioural patterns as well. Maybe we can predict the consumer nature of people.