

# QUANTIFY SELF

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## ABOUT ME:

Freelance MLE by day, hobbyist learner and programmer by night. Love reading about new health-related researches. Love playing around with gadgets. Have time.

## WANNA CONNECT?



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Prompt: crazy female scientist is surrounded by different gadgets and laughing

# STRUCTURE

1. Motivation
2. Data sources
  - a. Definition
  - b. Bias
  - c. Examples
  - d. Tipps
3. Sample analysis
4. QA



DATA COLLECTION

# SCOPE

- Lifestyle tracking
- Consumer grade devices
- Not suitable for medical advice
- Structured data collection (numeric representation)

**Active DC (manual):** questionnaire style data collection. Topics are predefined, score is actively provided by the participant (mental state and interpretation of physical markers)

**Passive DC (automated):** data is collected without intervention of the participant (physical markers).

**Hybrid DC:** user controls conditions of data collection without intervention during the process (physical markers).

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# BIASES

Bias is systematic patterns of deviation from norm and/or rationality in judgment

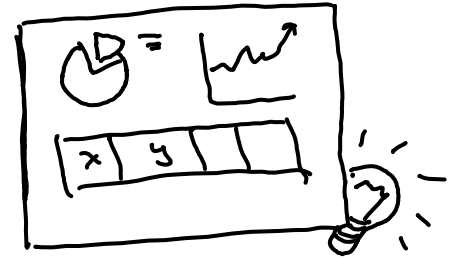
## Data Collection



## Data Analysis



## Data Representation



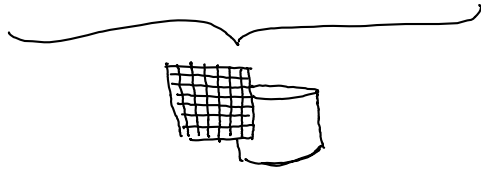
ACTIVE TRACKING

# Structured

- Scale
- Predefined questions
- Frequent

- 
- 
- Graphs
  - Numbers

- 
- 
- Wrong scope
  - Wrong scale
  - Wrong time/frequency
  - “Wrong” representation

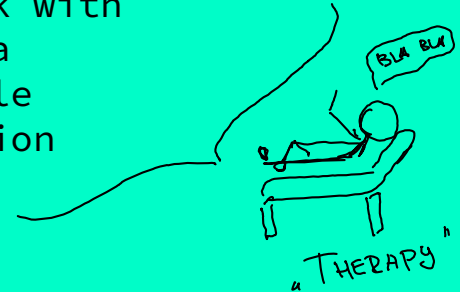


# Unstructured

- Free text/images
- No topic limitations
- On “desire”

- 
- 
- Text
  - Img

- 
- 
- Hard to standardize and automate
  - Hard/Impossible to scale
  - Hard to work with missing data
  - Hard to scale representation





## Biases minimized

- **Anchoring** (one feature to rule them all)
- **Apophenia** (everything is connected!)
- **Availability heuristic** (attention span)
- **Conformation bias** (data torture)
- **Egocentric bias** (can do it all!)
- **Extension Neglect** (undersampling)
- **Logical fallacy** (ignore data drift)
- ...

## Biases caused

- **Apophenia** (everything is connected!)
- **Conformation bias** (data torture)
- **Framing effect** (presentation matters)
- **Curse of knowledge** (decision paralysis)
- **Information bias** (need more data!)
- **Outcome bias** (hindsight)
- ...

**myfitnesspal**

TODAY

418  
CALORIES REMAINING

Add to Diary

1,210 GOAL +1,077 FOOD -285 EXERCISE 792 NET

**News Feed**

**christian120**  
a few secs ago

christian120 burned 254 calories doing 30 minutes of Running (jogging), 5 mph (12 min mile)

**Comment**

**Carrie\_Brown**  
57 mins ago

Carrie\_Brown completed her food and exercise diary for 10/02/2013 and was under her calorie goal

**Comment**

**Diary**

TODAY

1,210 GOAL 1,077 FOOD 285 EXERCISE 792 NET 418 REMAINING

**Breakfast** 500 cal

Strawberries - Raw 49  
1 cup, halves

1 Scrambled Egg White 17  
1 egg white

Honey 304  
100 g

Nonfat Greek Strained Yogurt 130  
Fats: 1 cup (227 g)

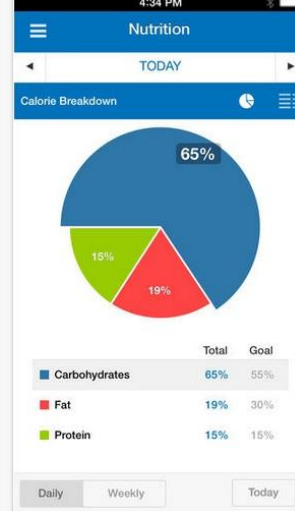
**Lunch** 577 cal

Cilantro Lime Vinaigrette Dressing 180  
Nordstrom Cafe, 2 TBSP

Beans - Black, cooked, boiled, with salt 227  
1 cup

100% Apple Juice 120  
Old Orchard, 8 oz

Guacamole Medium 60



4:34 PM

Lvl 23

46 / 50

★124 / 500 all

25 / 108

**Habits**

Habit

Stairs instead of elevator

1 Vegetable

Productivity

History

Score

**Dailies**

New Daily

Productive Work 1h

Read 30m

5 Vegetables

Exercise 20m

Family Time 1h

Meditate 45m

Floss

Bed by 11:30

**To-Dos**

New To-Do

Call Mom

Finish Taxes 01/06 0/2

File 1099s

Register on TurboTax

Text:

Finish Taxes

Extra Notes:

Remember to call CPA on Wednesday

**Rewards**

13 36

New Reward

10 1h Video Games

10 1 TV Episode

120 Golden Scepter

150 Dark Souls Blade

170 Crystal Blade

200 Stephen Weber's Shaft of the Dragon

Anxiety (11)

Burning pain

Depression (7)

Muscle ache

BDD & Anorexia (6)

Joint pain

Rheumatoid Arthritis (3)

Group Settings

OCD Counting

Physical (30) Added

Acute Illness (1)

Digestive (10)

Long covid (5)

Mental (2)

Other (1)

Add Symptom Group

Reproductive (1)

tap multiple times to increase the severity level

None 06 06-12 12-18 18+

**PAIN**

Burning pain

Set overall pre am

Muscle ache

Set overall pre am

Joint pain

Set overall pre am

+ Add/Edit

**ANXIETY**

**DEPRESSION**

**BDD & ANOREXIA**

Home Insights

9:41 AM

TODAY

7 Set daily goals

32 8 glasses of water 5/8

-1 Meditate 0/3

14 Walk Mr. Incredible

6 Take medicine 3/4

-2 Stand 1 hour

1 Clean-desk

9:41 AM

8 glasses of water 8 per day, Every

Calendar

December 2

29 30

13 14 15 16 17

20 21 22 23 24

27 28 29 30 31

WEEKLY MONTHLY

Select your mood...

HOW ARE YOU?

Today, 21 Jun 20:30

😊 😐 😞 😡 😱

Select things you've been up to...

WHAT HAVE YOU BEEN UP TO?

work relax friends date sport

party movies reading gaming shopping

travel good meal cleaning outside

Jun 2017

WEDNESDAY 21 JUN

GOOD 10:15 reading

RAD 10:40 friends + date + reading Having a blast

THURSDAY 22 JUN

GOOD 10:15 work + friends + sport Very effective day

MEH 10:15 Head-ache

# SOLUTION MAYBE...

1. Simple goal
2. Dimension reduction
3. Detailed raw data export
4. Applicable filters
5. Configurable UI
6. Gamification (optional)
7. Frequent aggregated analysis (very optional)



AUTOMATED TRACKING

# Wearables + apps

- Hardware-driven
- Data collection algorithm
- Data analysis algorithm
- Real time + Hybrid tracking
- Manual input possible

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- Graphs
  - Numbers
  - Real time feedback

- 
- Pre-defined baseline
  - Wrong scale (results presentation)
  - “Wrong” representation
  - Measurement obstructions
  - Insufficient time/frequency
  - Data loss
  - Undisclosed algorithms



# Sensors and Approaches

- **Optical sensors** (Photoplethysmography)
- **Bioimpedance sensor**
- **Accelerometer**
- **Temperature sensor**
- **Gyroscope**
- **GPS**
- ...
- **ECG**
- **EEG**



SPECIAL

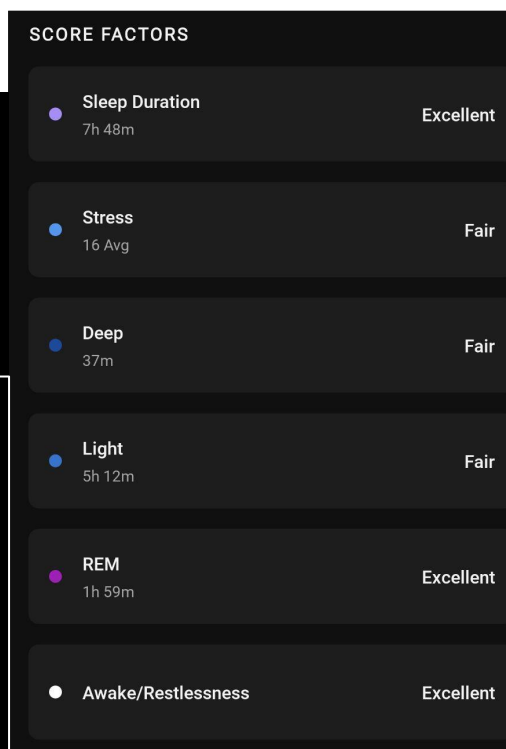
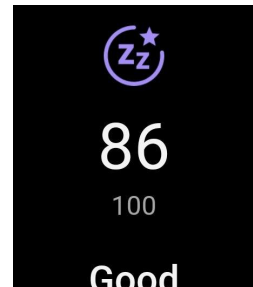




Time asleep

## 7 h 22 min

Total duration 7 h 40 min



## Biases minimized

- **Anchoring** (one feature to rule them all)
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- **Conformation bias** (data torture)
- **Logical fallacy** (ignore data drift)
- **Curse of knowledge** (decision paralysis)
- **Outcome bias** (hindsight)
- ...

## Biases caused

- **Framing effect** (presentation matters)
- **Information bias** (need more data!)
- **Authority bias** (you know better)
- ...



# SOLUTION MAYBE...

1. Detailed raw data export
2. Applicable filters
3. Pair with manual tracking
4. Frequent aggregated analysis (optional)
5. Analyse comparable periods
6. Design proxy features
7. Calibration with other gadgets (super optional)



ANALYSIS

## Scope

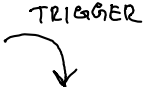
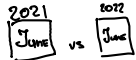

- Time series analysis
- Track anomalies/extremes into separate stream
- Heavily rely on own mappings
- Hypothesis are based of scientific research
- Checking regularly with a doctor

## Components

- Trend
- Cycles / Seasonality
- Noise
- Anomalies - keep an eye on them

# SAMPLE ANALYSIS

# WHEN AND WHAT

1. Look out for outliers 
2. Rely on short-horizon analysis from an app
3. Compare similar time-frames 
4. Compute trend and co yourself
5. Use multiple apps with different context
6. Don't sweat it 

# INSIGHTS

- Best training time: for mood, energy, focus 🕒
- Best meditation time 🧘
- Identify bad things 🔍
- Interesting things about specific types of activities ? ⚡
- How to get into flow 🌀
- Most impactful activities for health targets 🏥
- Are you “ruminating” type of person ☁️
- Better organization 📝
- ...

TURNING INTO CYBORG...



# SOURCES USED:

- Biases list [https://en.wikipedia.org/wiki/List\\_of\\_cognitive\\_biases](https://en.wikipedia.org/wiki/List_of_cognitive_biases)
- Apps examples:
  - [Habitica](#)
  - [MyFitnessPal](#)
  - [Habitslist](#)
  - [Bearable](#)
  - [Daylio](#)
- Sensors:
  - [IPPG](#)
  - [Bioimpedance](#)
  - [ECG](#)
  -
- Interesting reads:
  - Cornell and Washington Universities (2017). [Semi Automated tracking: A Balanced Approach for Self-Monitoring Applications](#)
  - Riggare, S., Scott Duncan, T., Hvitfeldt, H. *et al.* ["You have to know why you're doing this": a mixed methods study of the benefits and burdens of self-tracking in Parkinson's disease.](#) *BMC Med Inform Decis Mak* **19**, 175 (2019).
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