

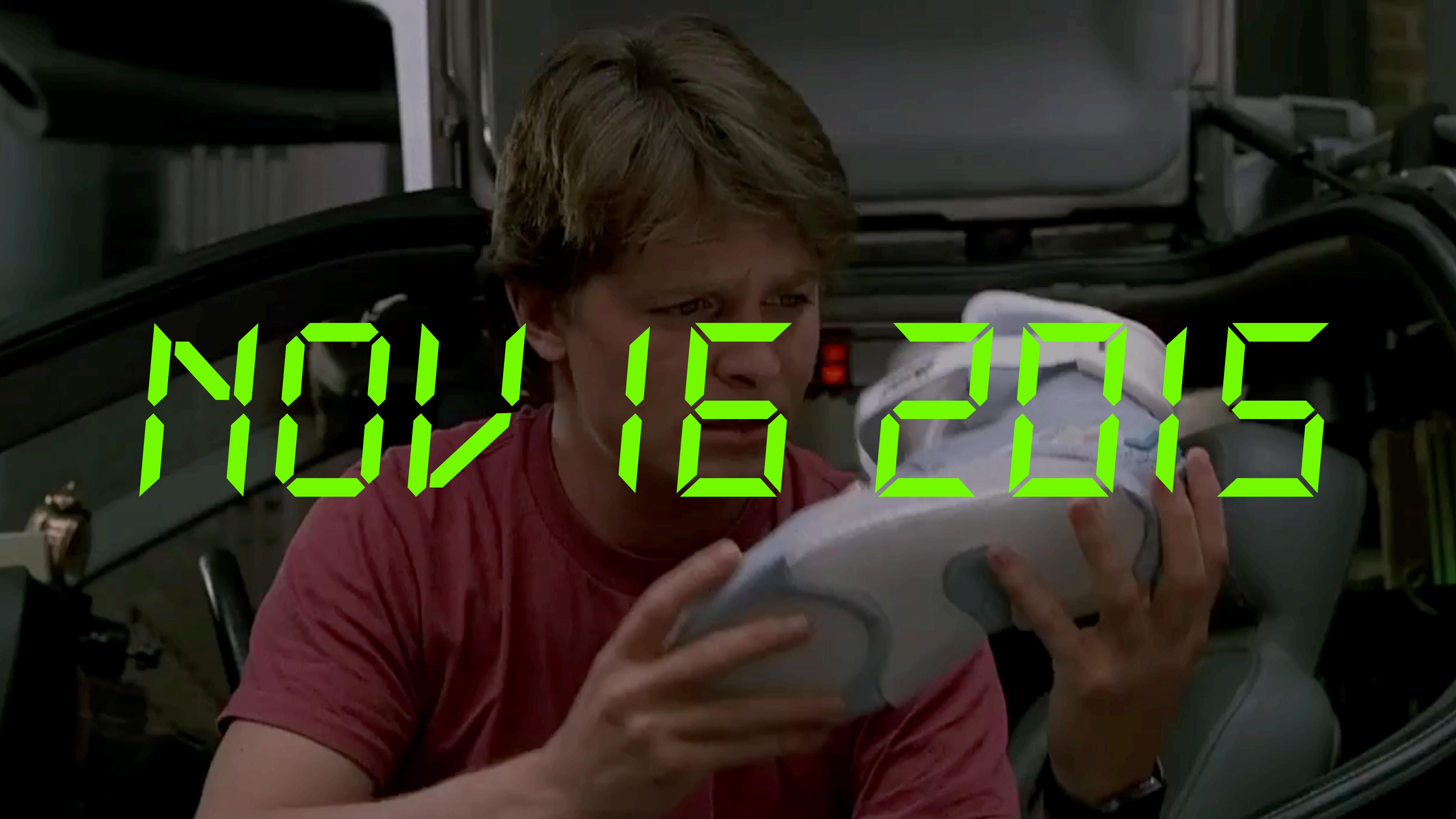
BINGO! DINO DNA!

HEALTH IDENTITY FROM THE WRIST

BRIAN WILT HEAD OF DATA SCIENCE AND ANALYTICS



NOV 18 2005



“THEY TOLD
ME TO SLEEP
NORMAL”







**BRIDGING
SCIENCE AND
ENGINEERING**





UP3

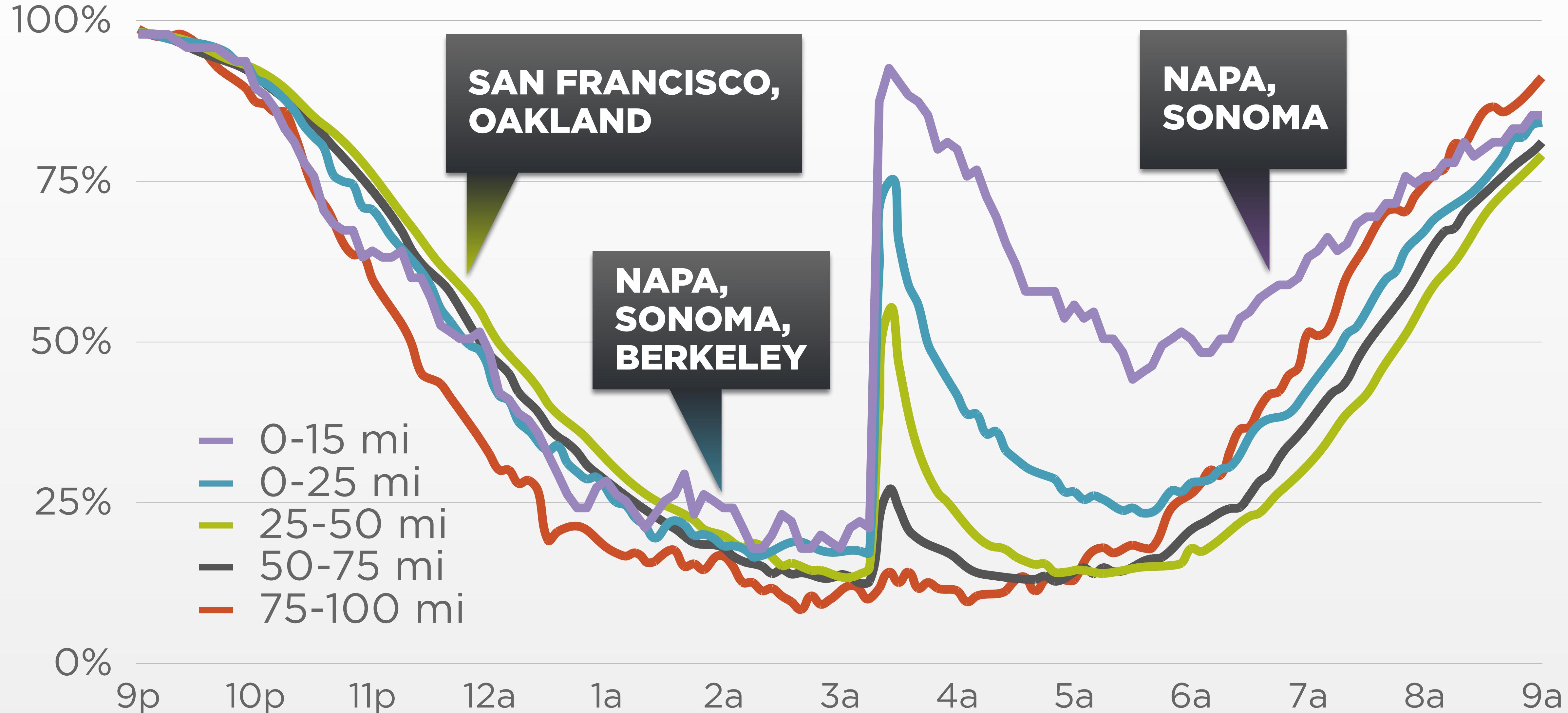
ROLE OF DATA+ML AT JAWBONE

- SCIENCE
- PERSONALIZATION
- MOTIVATION

A group of people, including men and women of various ages, are gathered in a dimly lit, smoky environment. They appear to be in a cave or a mining setting, with rocky walls and debris around them. Some individuals are wearing hard hats and safety gear. They are focused on something they are holding in their hands, possibly scientific equipment or samples. The atmosphere is one of concentration and discovery.

**SCIENCE: UNDERSTANDING
THINGS NEVER BEFORE SEEN**

SOUTH NAPA EARTHQUAKE



HEALTH WITH SHARED CONTEXT IN REAL TIME



Last Updated:
11/15/2015 02:53 PM PT

All data is anonymized and
presented in aggregate.



**PERSONALIZATION: AN
EXPERIENCE THAT KNOWS YOU**

RISE OF THE DATA NATIVES

MONICA ROGATI

YouTube was abuzz with viral videos of small children – yet to speak, read or write – “pinching” magazine articles with their fingers as they would an iPad. These children were heralded as [...] “**digital natives**”.



[Now is a] new revolution, this time of “**data natives**” who **expect their world to be “smart”** and **seamlessly adapt** to them and their **taste** and habits.



Johnny V @johhnnyv · 10m

By far my favorite app is #UP by @Jawbone. It's insights like these from #smartcoach that help me stay on track.

The screenshot shows a summary of activity for Nov 16. It includes a progress bar at the top with 7h 40m, 34min, and 1,690 cal to go. Below this is a section titled "TODAY NOV 16" which says "Put Through the Paces". It notes that over the past 7 days, 40,793 steps covered 20.40mi, averaging 5,827 steps per day. It highlights a "Wednesday was an especially big day for you, clocking in 13,167 steps". At the bottom, there are "All Activities" and a blue "+" button.

2:04 PM - 16 Nov 2015 · Details

The screenshot shows a "SMART COACH Routine Strong" insight. It states that Smart Coach noticed the user has been consistently working out on Mondays. Today's 34m was no exception. It encourages building healthy habits and rewarding oneself. It also notes that the user is close to maintaining their 7-day average of 5,827 steps with another 263 steps or a 3m walk. There are like, dislike, and share icons at the bottom.



Michael Goodwin @michaelgdwn · Nov 13

Right on cue. Every time I go out #drinking @Jawbone #smartcoach catches me. Time to hit the water tank

The screenshot shows a "SMART COACH Start with Hydration" insight. It points out that the user's morning resting heart rate was higher than 58bpm, which is above their 30-day average. It suggests dehydration might be the cause and recommends drinking 8 glasses of water. There is a green progress bar at the bottom.



Larry Taylor @lgt41 · 2h

Love this insight from my #SmartCoach! Smart Coach Remembers via UP by @Jawbone jawbone.com/up/insight/rzT...

SMART COACH

Smart Coach Remembers

Remember how you took 13068 steps on Nov 2? Smart Coach remembers! On your health journey, don't forget to stop and celebrate. Tap the Share icon so your friends can send congratulations.

[Learn more](#)



Paul Ritchie @crossderry · Nov 11

An unsurprising insight on the perils of conference life from my #SmartCoach! Sleep Deficit via UP by @Jawbone jawbone.com/up/insight/rzT...

SMART COACH

Sleep Deficit

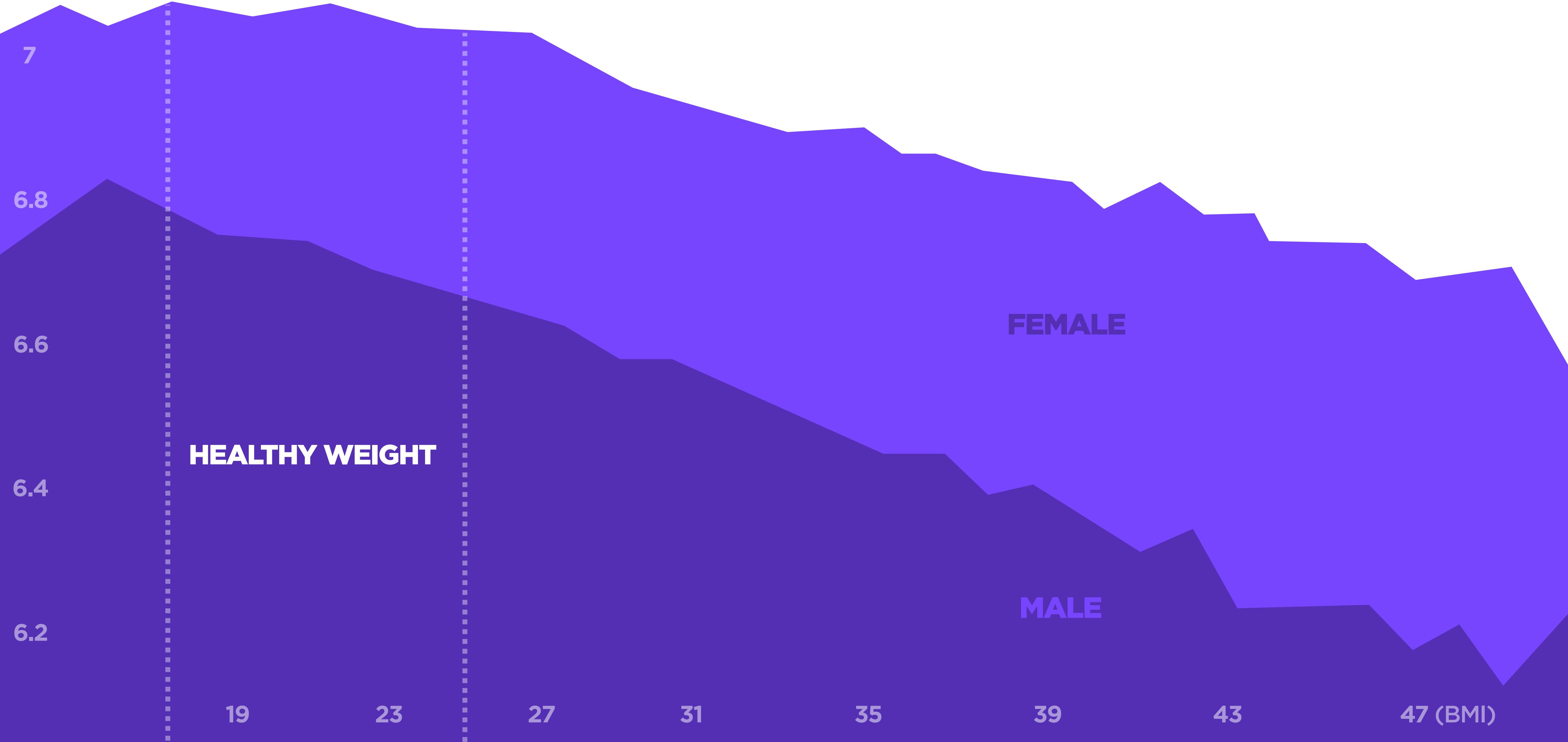
Smart Coach noticed that you haven't slept enough lately, with a 7d average of 4h 58m. Sleeping 4-5 hours for 4 days in a row reduces cognitive function and is equivalent to being legally drunk. For more about how sleep deficit impacts your ability to focus, react and make

A dark, grainy photograph of a vintage car, possibly a Ford Mustang, driving through a dense forest at night. The car's headlights illuminate the dark trees ahead. The license plate on the car reads "JURASSIC PARK".

**MOTIVATION: A SMART COACH
HELPING YOU LIVE **HEALTHIER****

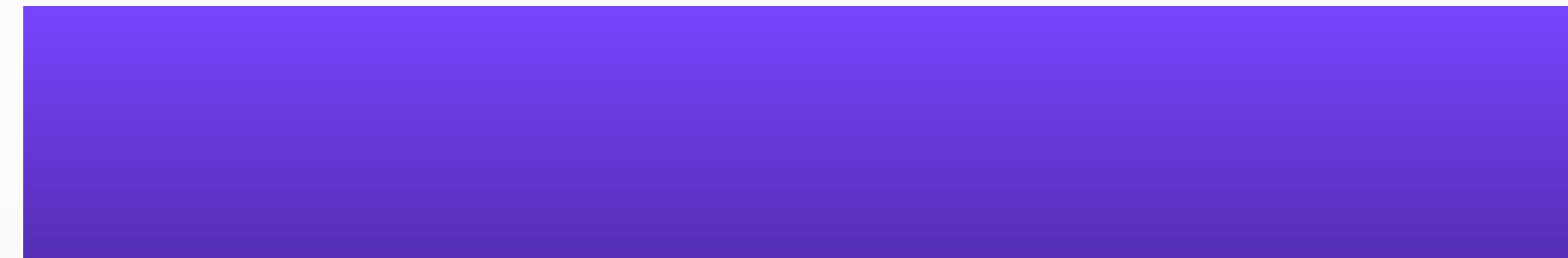
7.2 HRS SLEEP

WEIGHT AFFECTS SLEEP

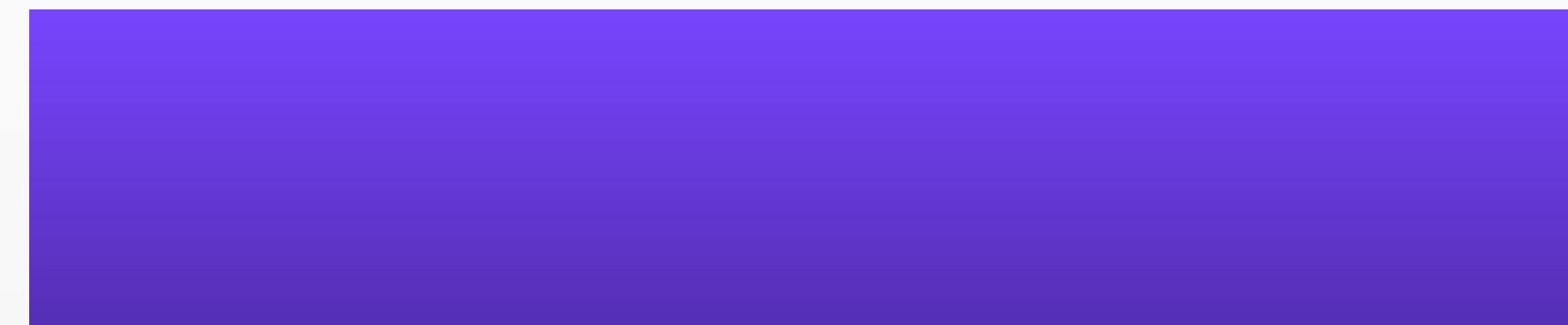


UP USERS WITH MAJOR WEIGHT LOSS

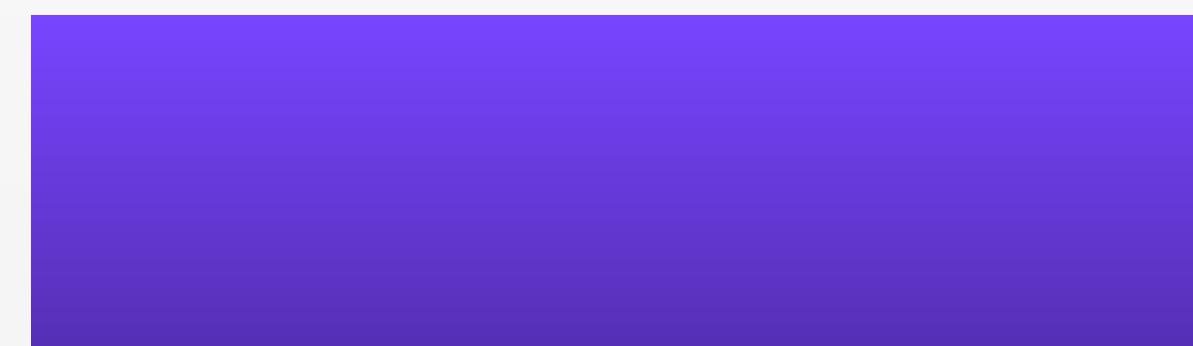
logged 75% more **meals** per week



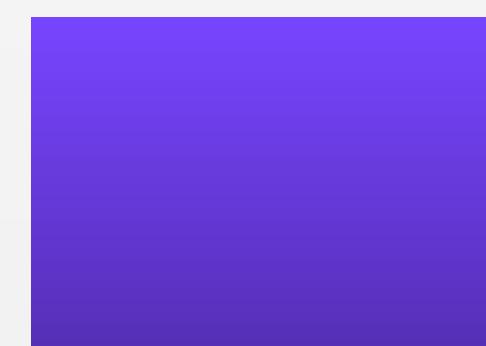
logged 60% more **workouts** per week



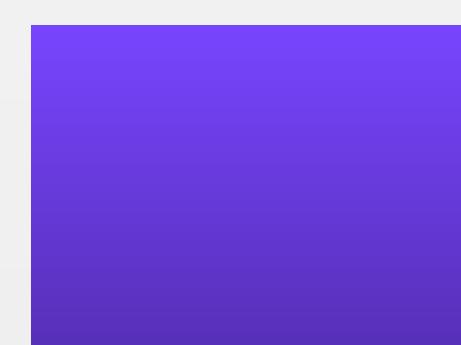
beat their **step goal** 43% more often



averaged 17% more **steps** per day

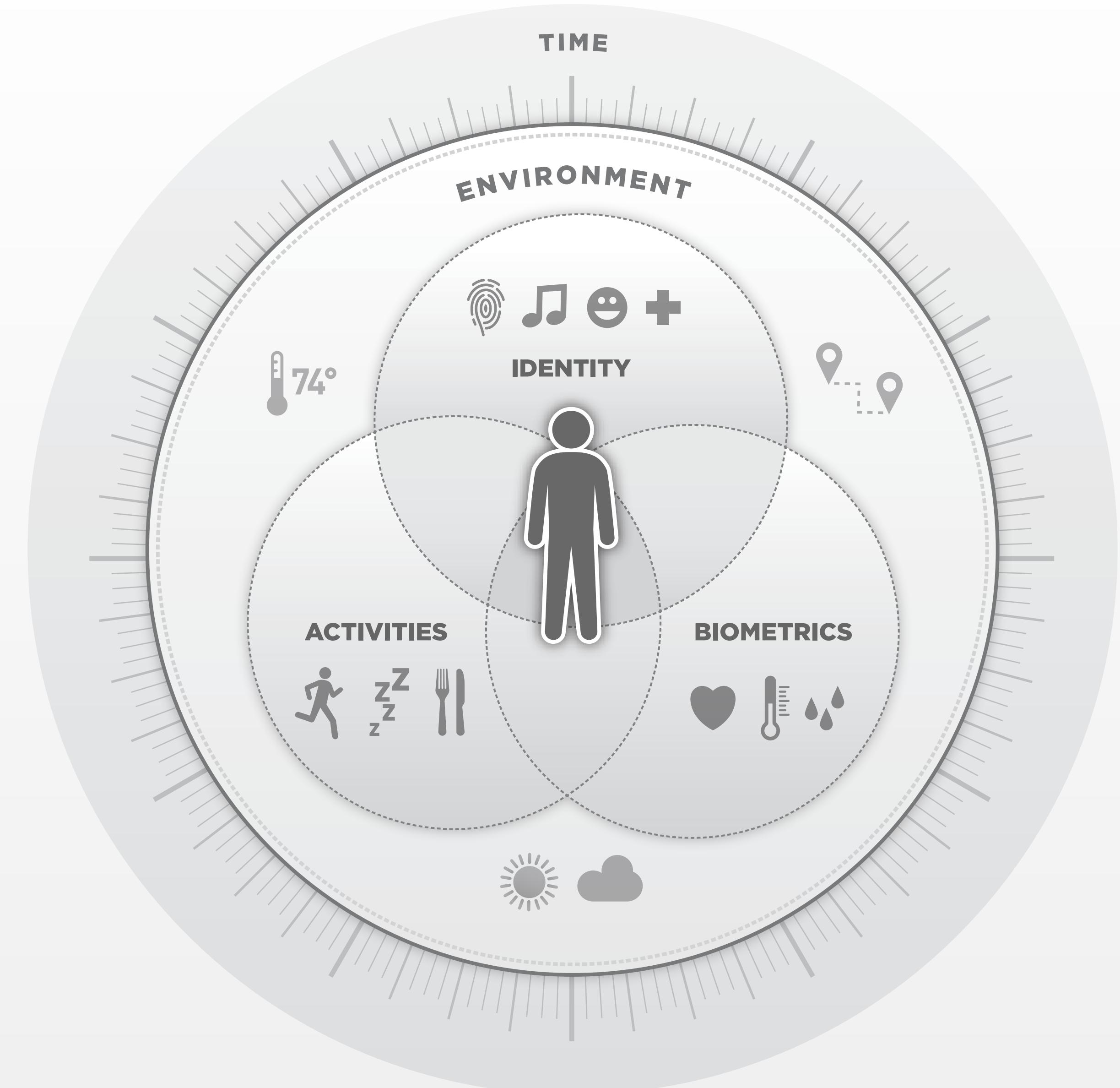


logged 16% more **weigh-ins** per week



24/7 DATA

**A COMPLETE PICTURE OF YOU
FULLY CONTEXTUALIZED**



HOW DO WE MAKE THIS HAPPEN?

DATA PRODUCT ALL-STARS

DATA PRODUCT ALL-STARS

PEOPLE YOU
MAY KNOW



NEWS FEED



PAGERANK



RELATED ITEMS



DATA PRODUCT ALL-STARS

PEOPLE YOU
MAY KNOW



NEWS FEED



PAGERANK



RELATED ITEMS



CTR

CHRONIC DISEASE CARE IS 86% OF US HEALTHCARE COSTS

CARDIOVASCULAR
67% OF GYM MEMBERSHIPS
 \$193 BN

OBESITY GO UNUSED



\$147 BN

DIABETES
\$175 BN

CANCER

\$157 BN



KPCB



A group of characters from The Lord of the Rings are standing in a dense forest. In the foreground, from left to right, are Gimli the Dwarf (with a long white beard), Gandalf the Wizard (with a very long white beard), Aragorn the Man (with long white hair), Legolas the Elf (with long white hair), and Frodo Baggins (with curly brown hair). Behind them are Merry and Pippin, two other members of the Fellowship. They are all looking upwards and to the right with expressions of concern or awe.

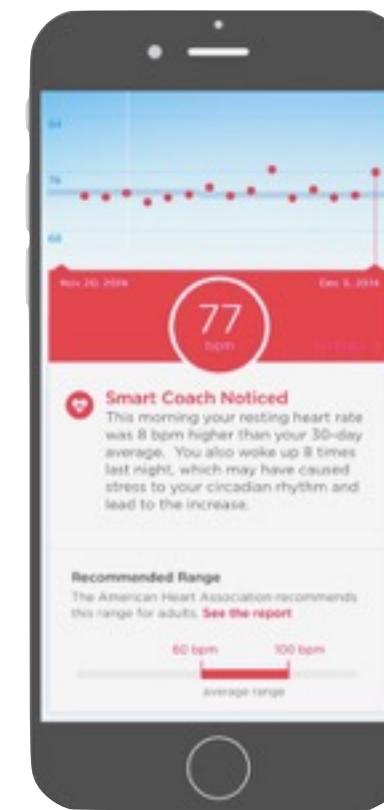
**HOW WILL WE MAKE
HEALTH DATA PRODUCTS?**

DATA SCIENCE FOR THE LITTLE GUY

DATA SCIENCE FOR THE LITTLE GUY

PROBLEM	LARGE COMPANY	SMALL COMPANY
PEOPLE	Where do I put my data science team? Vertical/horizontal organization?	Only one or two people LOL
PRODUCT	Established	Nascent
DATA	A mess	A mess
ML	Deep on solving a problem, predictive	Understanding and interpreting

DATA SCIENCE FOR HARDWARE



SIGNALS	Raw + Rich	Compressed	Limited
CONTEXT	Limited	Sensor fusion	Historical + Population
USERS	Single	Single	Aggregate
LATENCY	Seconds	Minutes	Slow
COMPUTE	Limited	Powerful	HAL 9000
DEPLOYMENT	Months	Weeks	Hours

ACTIVITY CLASSIFICATION

VERSION 0

MOST COMMON WORKOUT

58% ACCURACY

VERSION 1

LAST WORKOUT

65% ACCURACY

VERSION 2

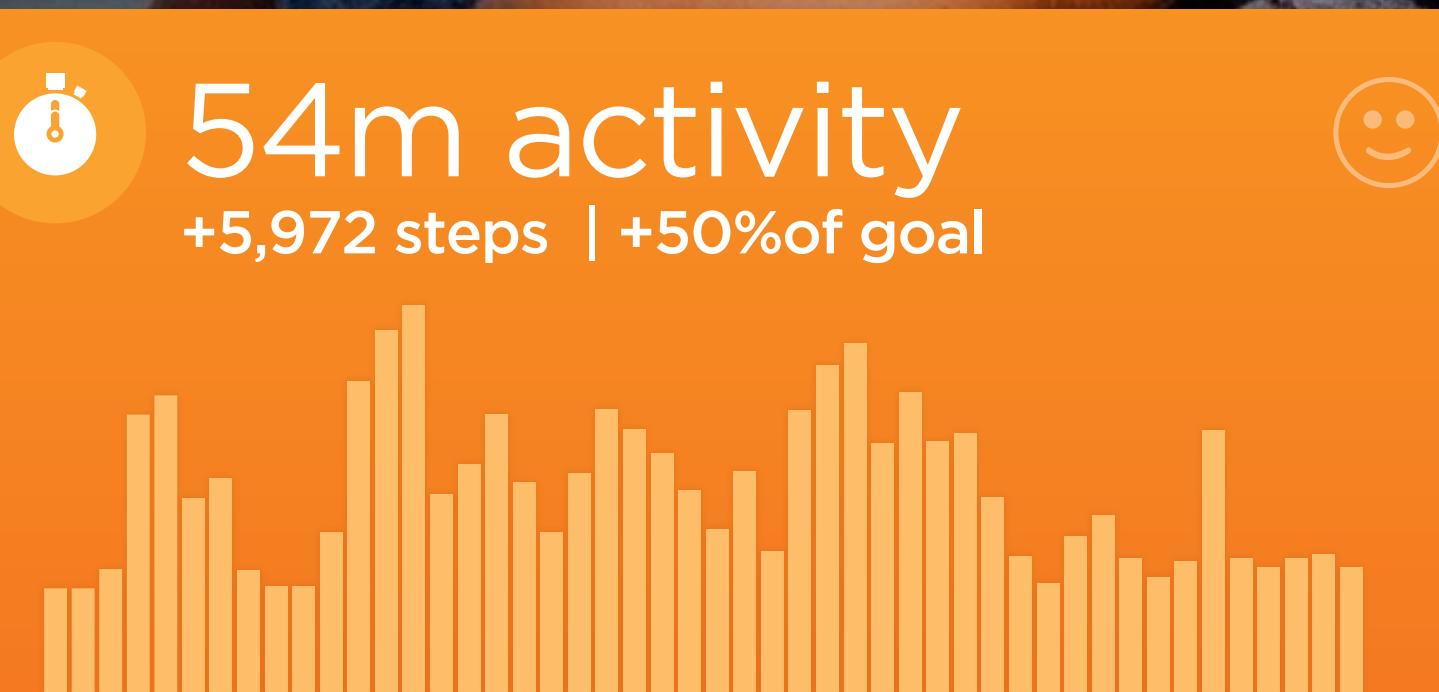
SERVER-SIDE MODEL

85% ACCURACY

VERSION 3

BAND-BASED MODEL

99% ACCURACY



Awesome! Looks like you racked up some steps. What were you up to?

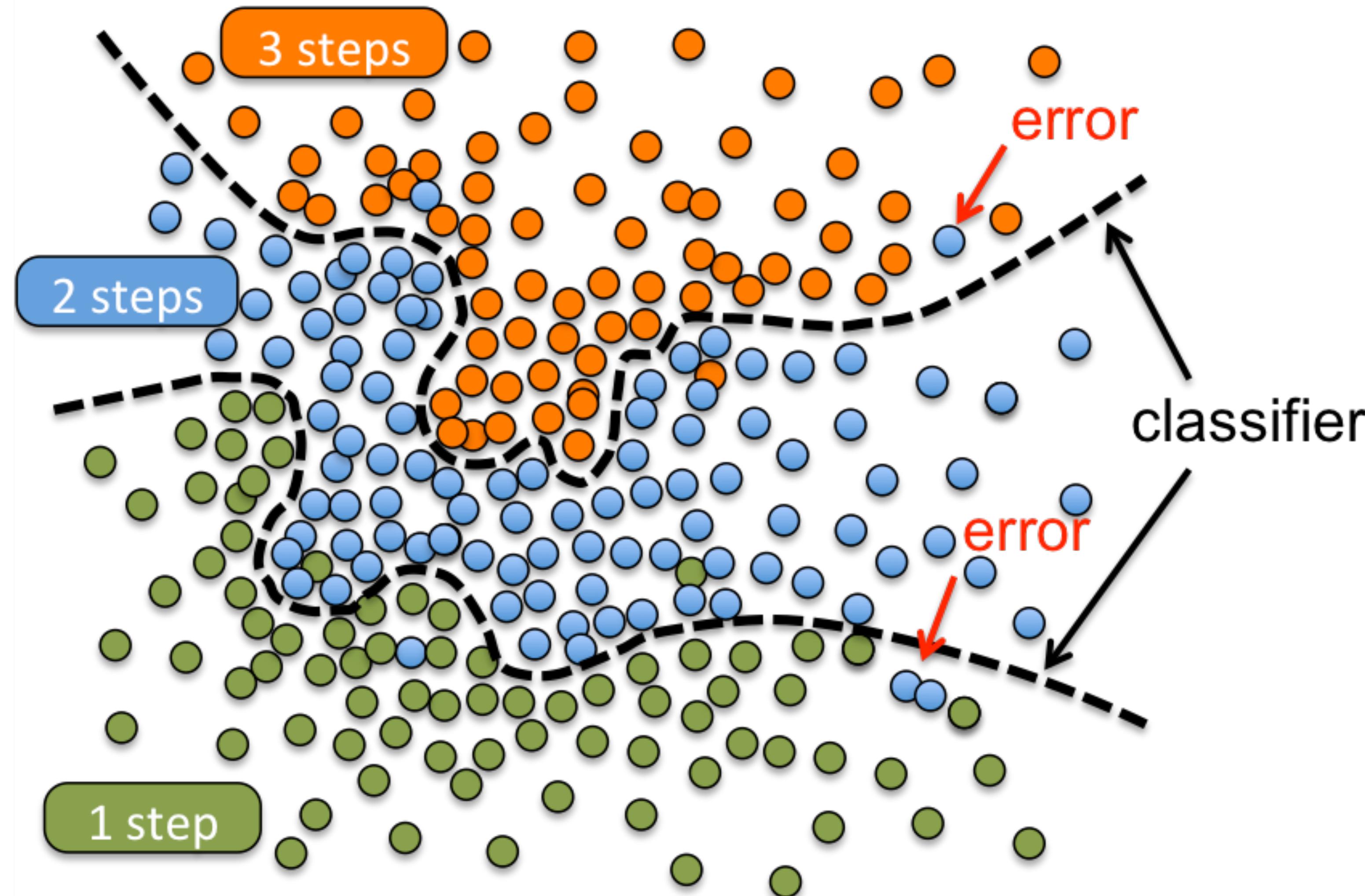
BASKETBALL

TENNIS

ZUMBA

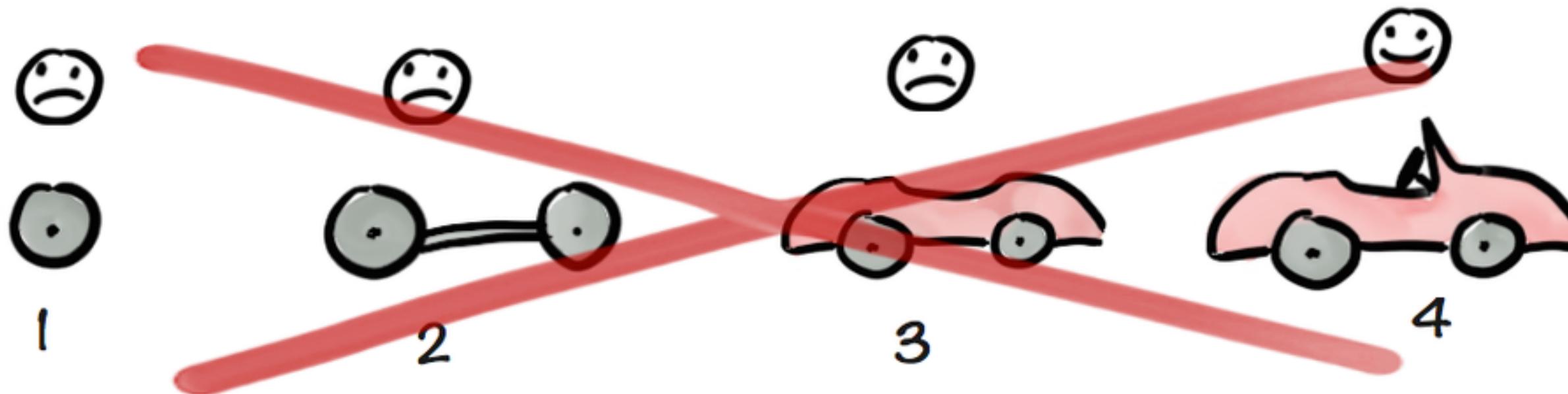
Edit

THE FIRMWARE HAS TO WORK THE FIRST TIME

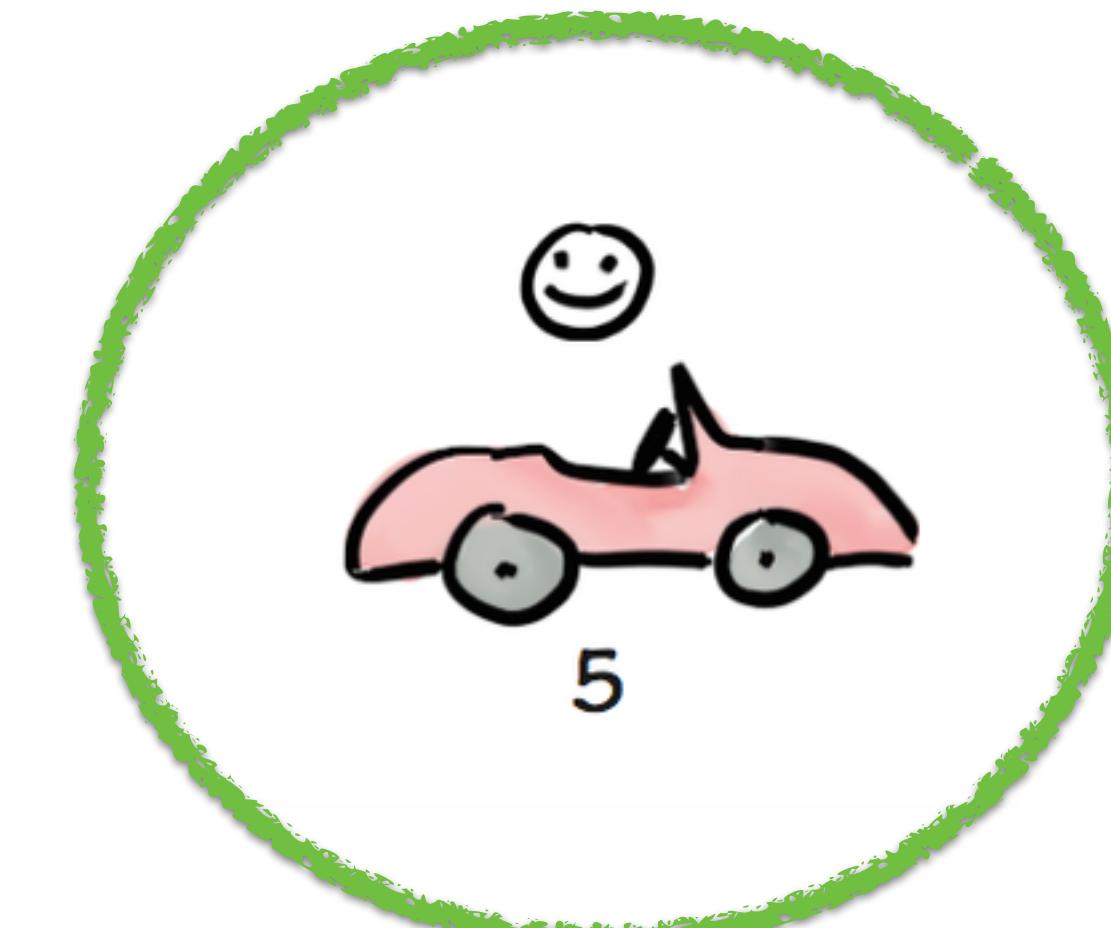
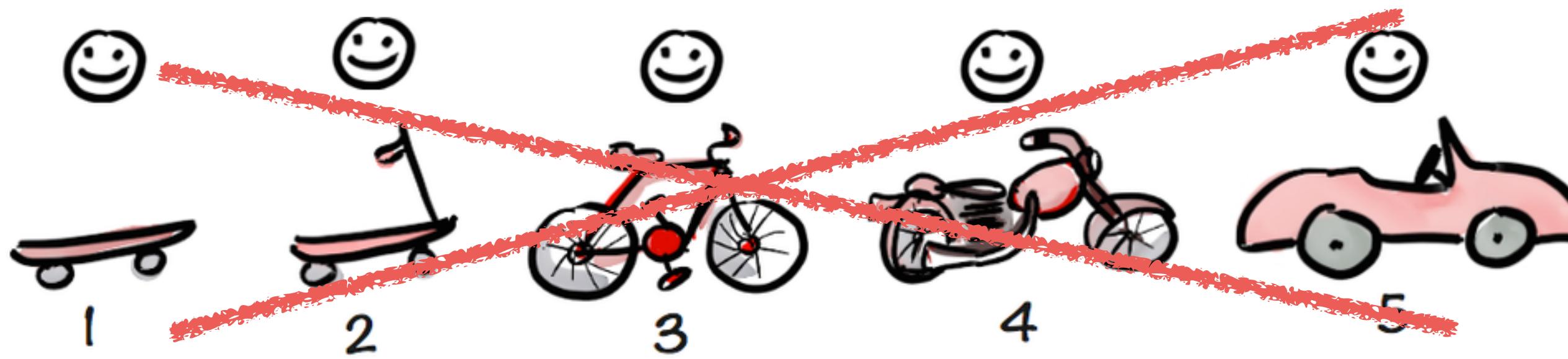


TESLA HAS TO DELIVER THE CAR FIRST

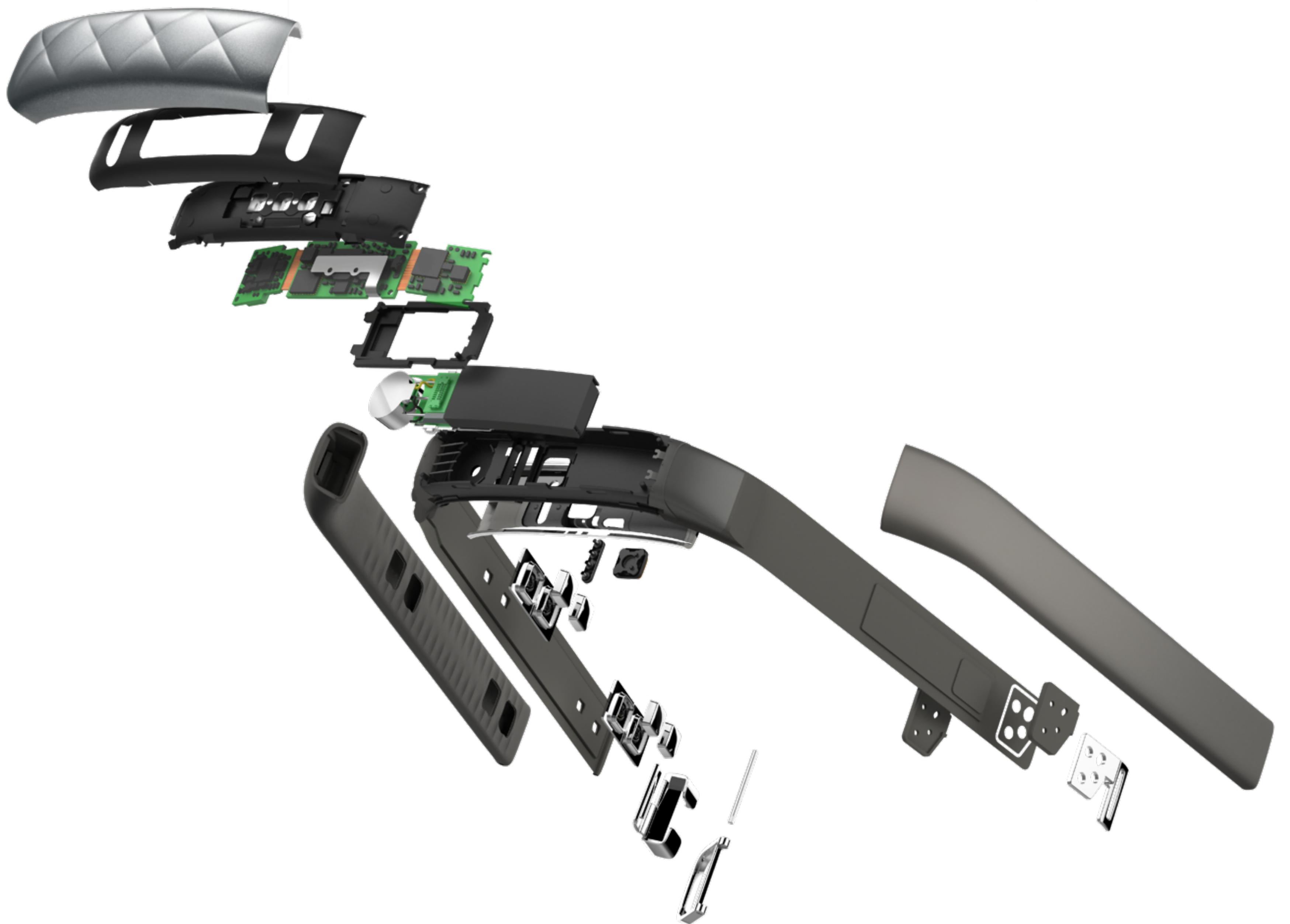
Not like this....



Not like this....



DATA SCIENCE FOR WEARABLES



WE CAN GET EXPONENTIALLY MORE FROM THE WRIST



UP
2011

Accelerometer



UP3
2015

Accelerometer
Temperature
GSR
Heart Rate

WE CAN GET EXPONENTIALLY MORE FROM THE WRIST



**GERMAN
PEDOMETER**
1590



UP
2011

Accelerometer



UP3
2015

Accelerometer
Temperature
GSR
Heart Rate

RADIO SHACK
AMERICA'S TECHNOLOGY STORE™

PRESIDENTS' BIRTHDAY SALE!

DON'T DELAY!

3-DAY SPECIALS ABOVE GOOD SATURDAY THRU MONDAY ONLY!

0% INTEREST!
NO PAYMENTS UNTIL MAY!
NO DOWN PAYMENT!

HURRY! OFFER ENDS TUESDAY FEBRUARY 19

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\$1599

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- 286-Based PC Compatible
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Save \$100
\$799

3-Way Speaker With Massive 15" Woofer
Save \$110
149.95

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THE IPHONE MOMENT IS COMING



STEPS 4.1T

SLEEP 330M

MEALS 270M

WORKOUTS 100M

HEALTH DATA IS WIDE

●●○○○ Verizon 8:52 PM ⚡ 65%

< Health Data All ⌂

-  Active Energy >
-  Basal Body Temperature >
-  Biotin >
-  Blood Alcohol Content >
-  Blood Glucose >
-  Blood Pressure >
-  Blood Type >
-  Body Fat Percentage >

Vitamin B12

HEALTH DATA IS WIDE



Vitamin C



Vitamin D



Vitamin E



Vitamin K



Walking + Running Distance



Water



Weight



Workouts



Zinc



Dashboard



Health Data



Sources



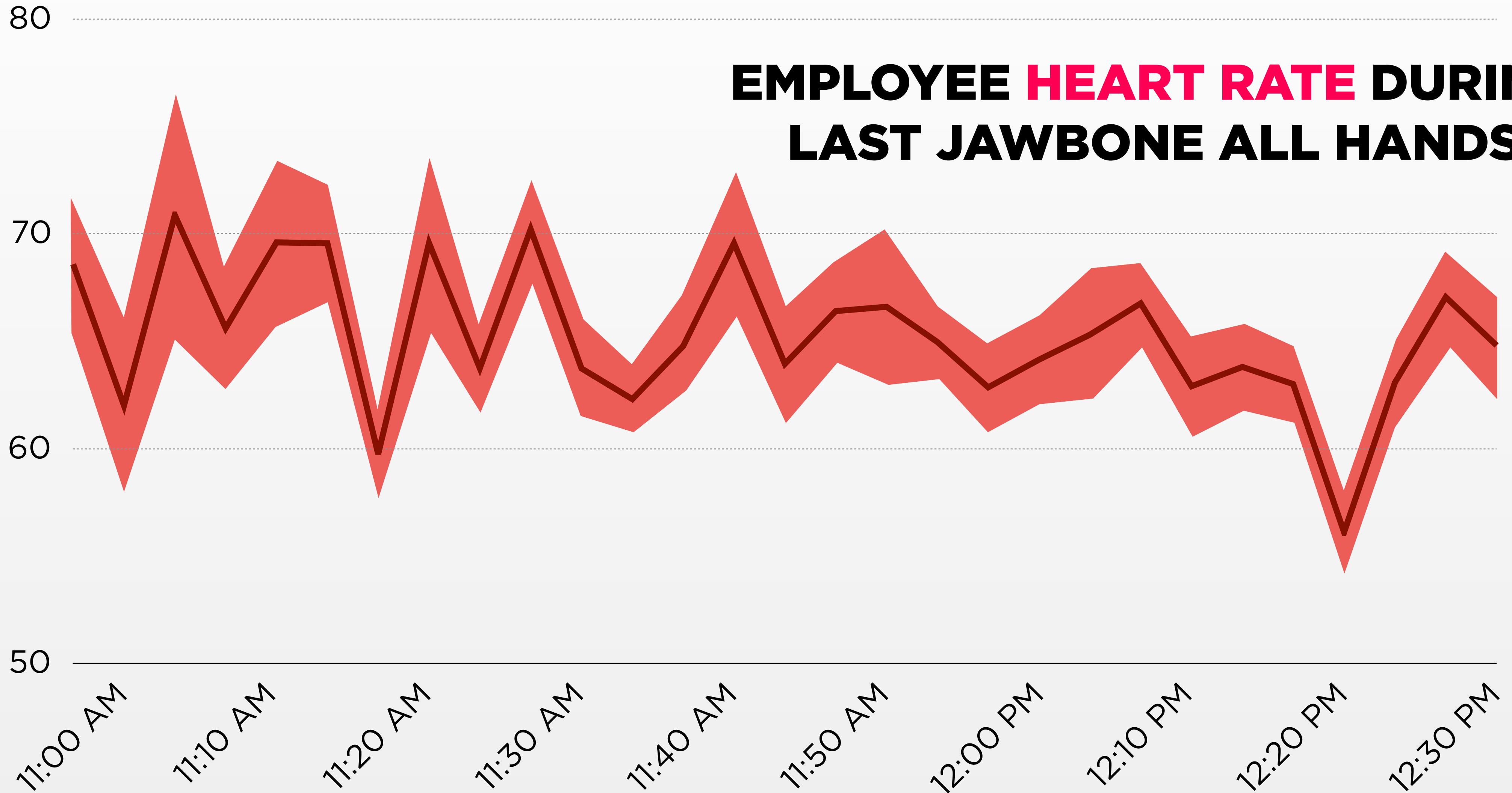
Medical ID

BUT WIDE DATA TAKES MORE CLEANING

- CLEAN EARLY AND OFTEN
- APIs ARE HARD
- BETTER TOOLS ARE NEEDED
- ML IS NAIIVE

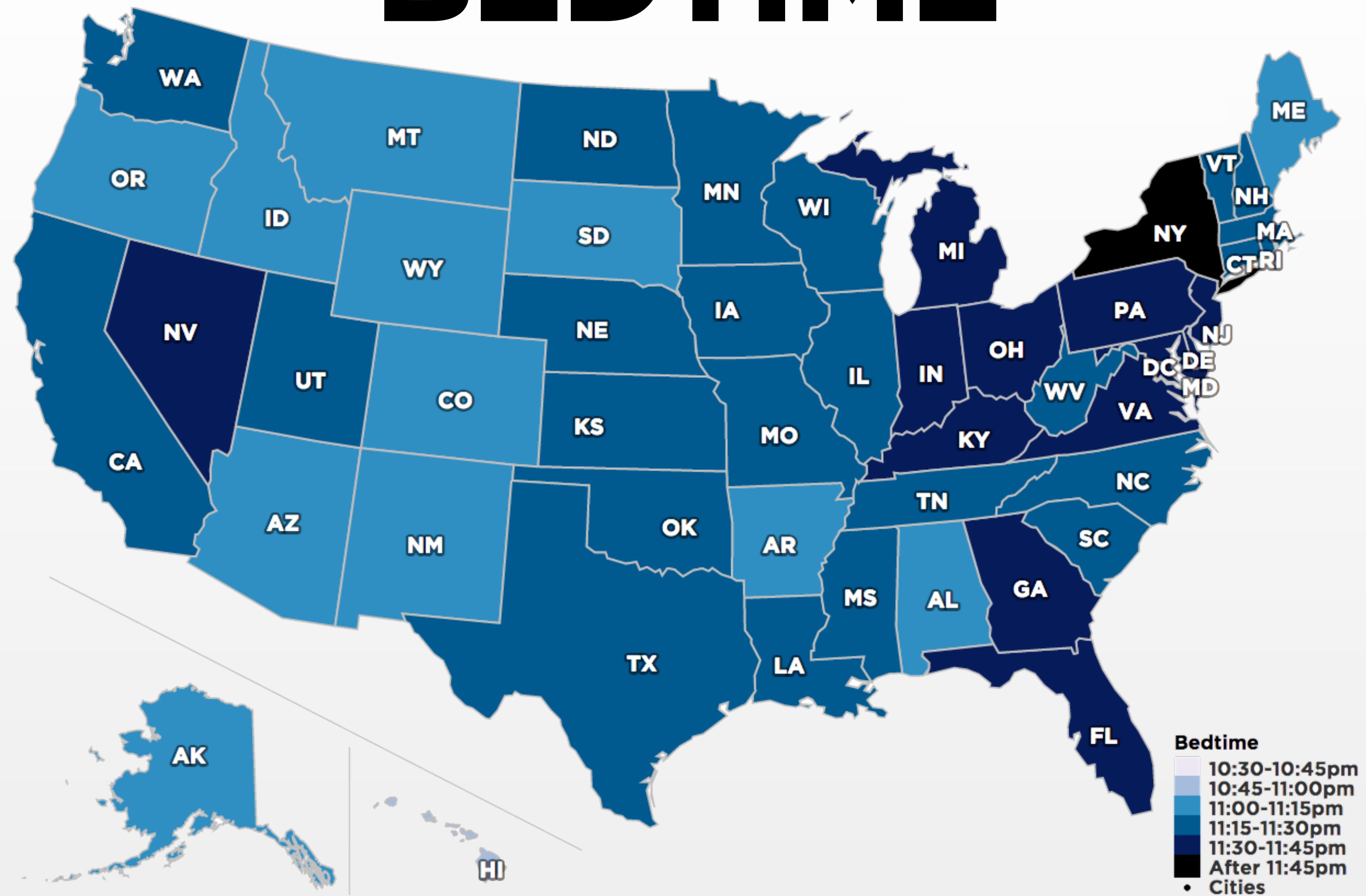
CONTEXT IS KING

EMPLOYEE HEART RATE DURING
LAST JAWBONE ALL HANDS

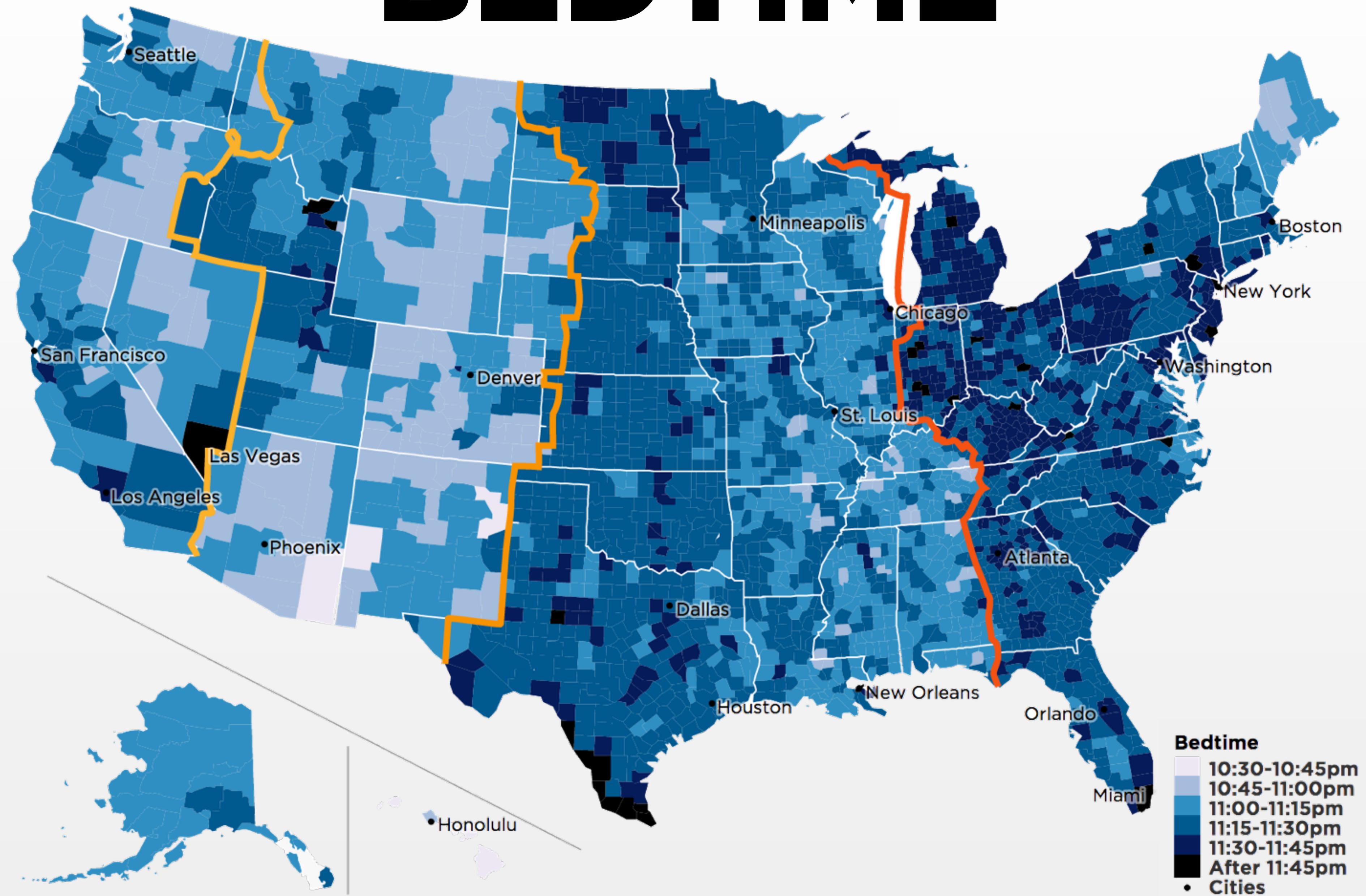


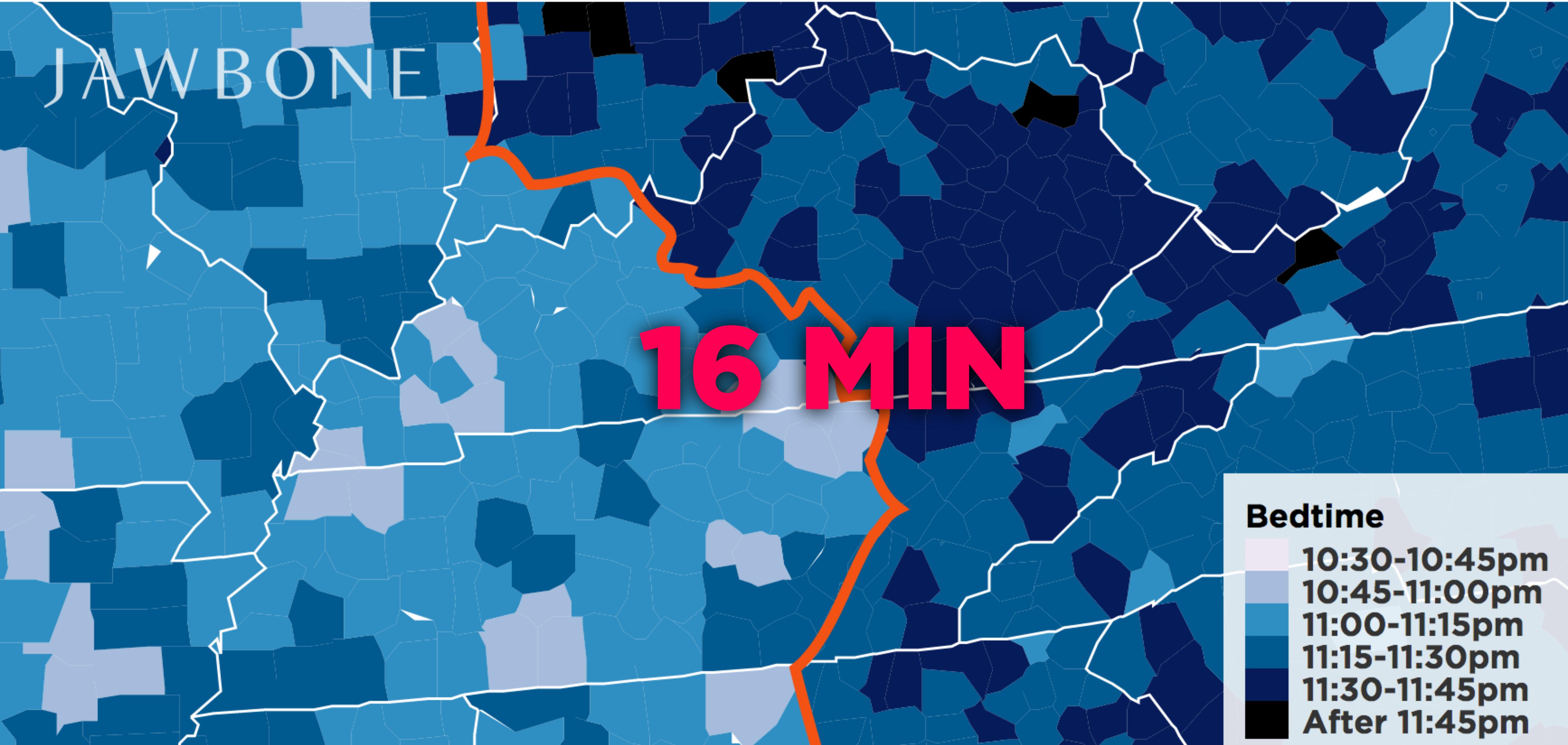
**SCALE
GRACEFULLY**

BEDTIME



BEDTIME





SLEEP RECOVERY

••••• Verizon WiFi 12:44 PM ↗ Bluetooth 60% Nov 9



Were you asleep?

10:35pm - 6:30am

Nov 9



**BUT WHAT ABOUT DATA
WE CAN'T GET**

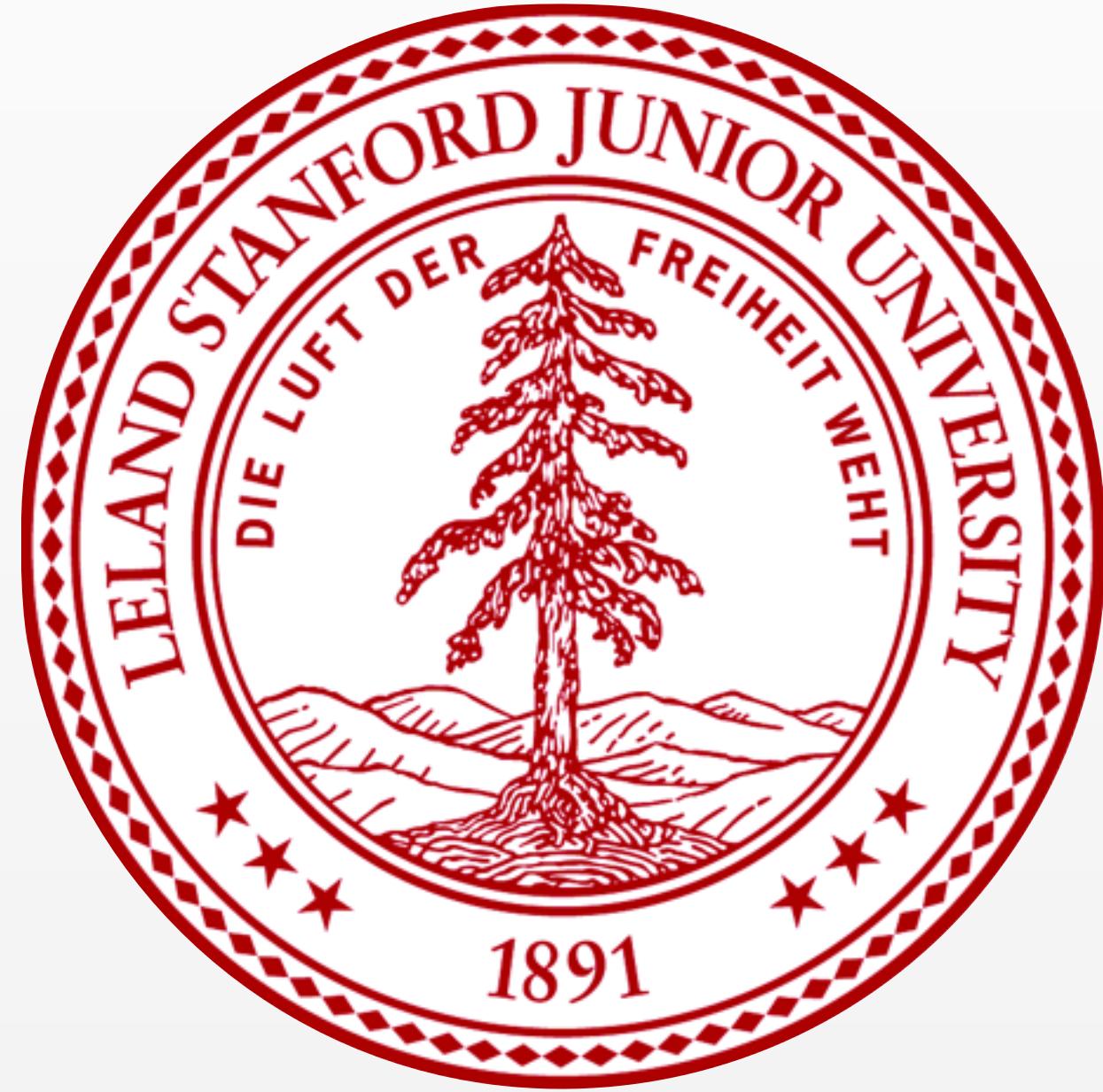
- API INTEGRATIONS
- BAYESIAN INFERENCE
 - PUBLIC WHO/CENSUS DATA
 - USER DATA
- UNSTRUCTURED TEXT
- CREATIVITY
- HIRING



DATA PRODUCTS SCALE
HUMAN JUDGMENT.

THEY ALSO SCALE AND
REINFORCE HUMAN BIAS.

@CLARECORTHELL



Bloomberg

TOKYO'S WORKERS GET LESS SLEEP THAN US, ASIAN COUNTERPARTS

KANOKO MATSUYAMA (2011)

Tokyo office workers slept at least 30 minutes less than their counterparts in New York, Paris, Shanghai and Stockholm each night, averaging six hours, or 14 percent less than the recommended minimum, a study said.

The study surveyed 180 men and women from each of the five cities.

DATA DEMOCRATIZATION

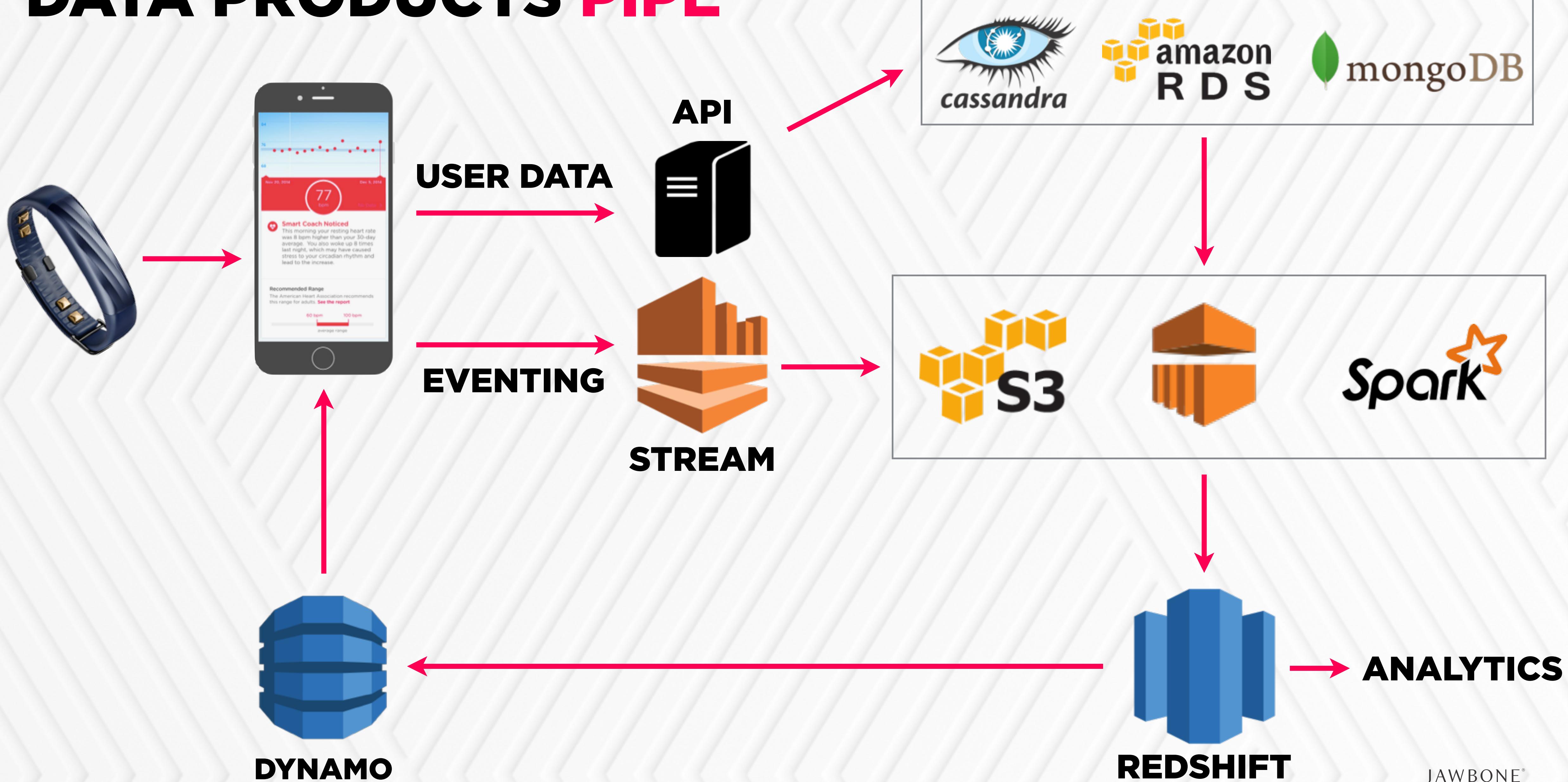
IS TABLE STAKES

```
datazoo=# SELECT gender, COUNT(*), AVG(total_hrs)
datazoo-# FROM up_mod.sleep_clean_night
datazoo-# WHERE gender IS NOT NULL GROUP BY gender;
```

gender	count	avg
M	147284397	6.77170
F	165579431	7.11274

Time: 1333.536 ms

DATA PRODUCTS PIPE



JAWBONE®

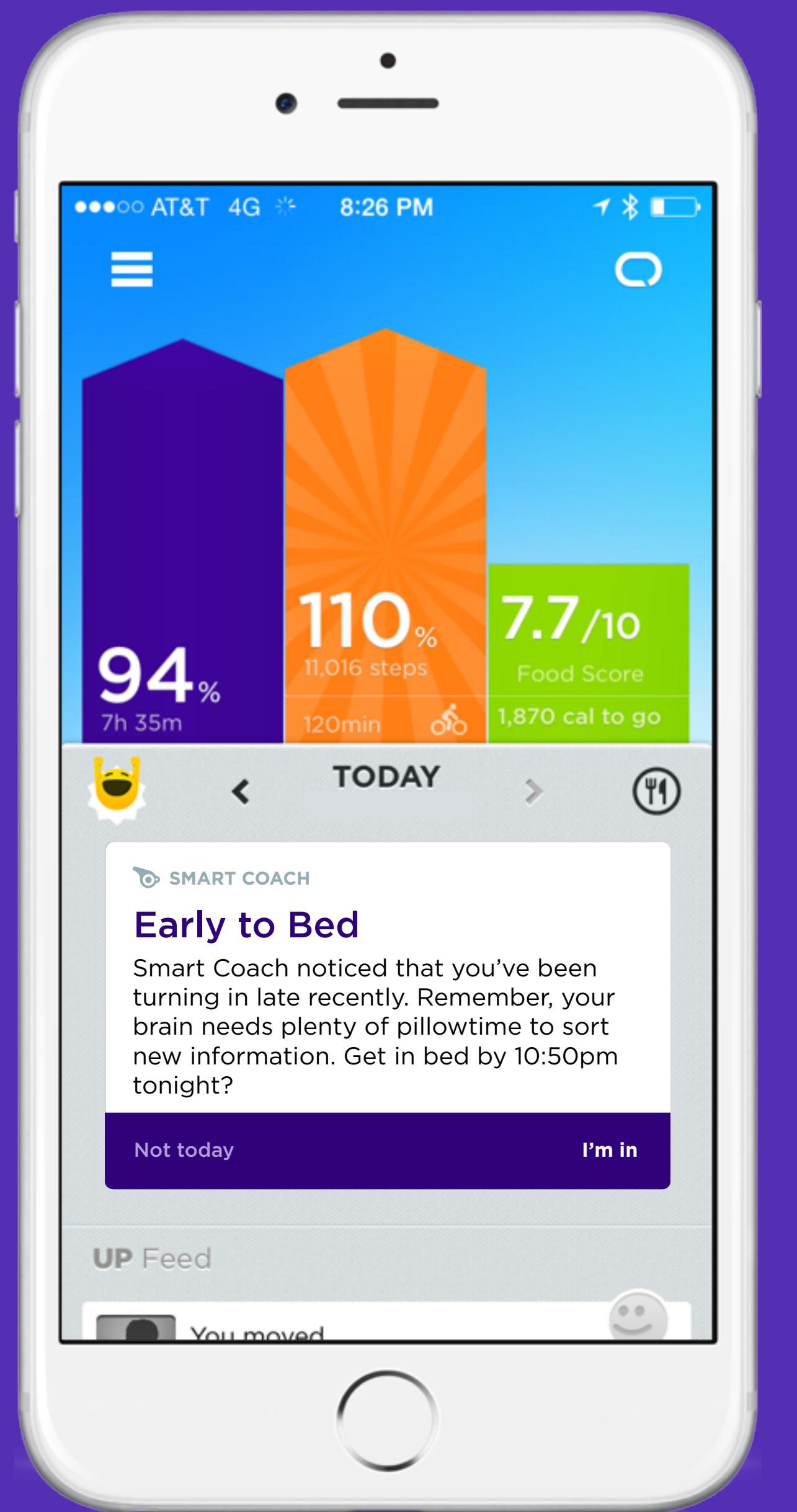
AS^{ed} EXPERIENCE FIRST, THEN TECH

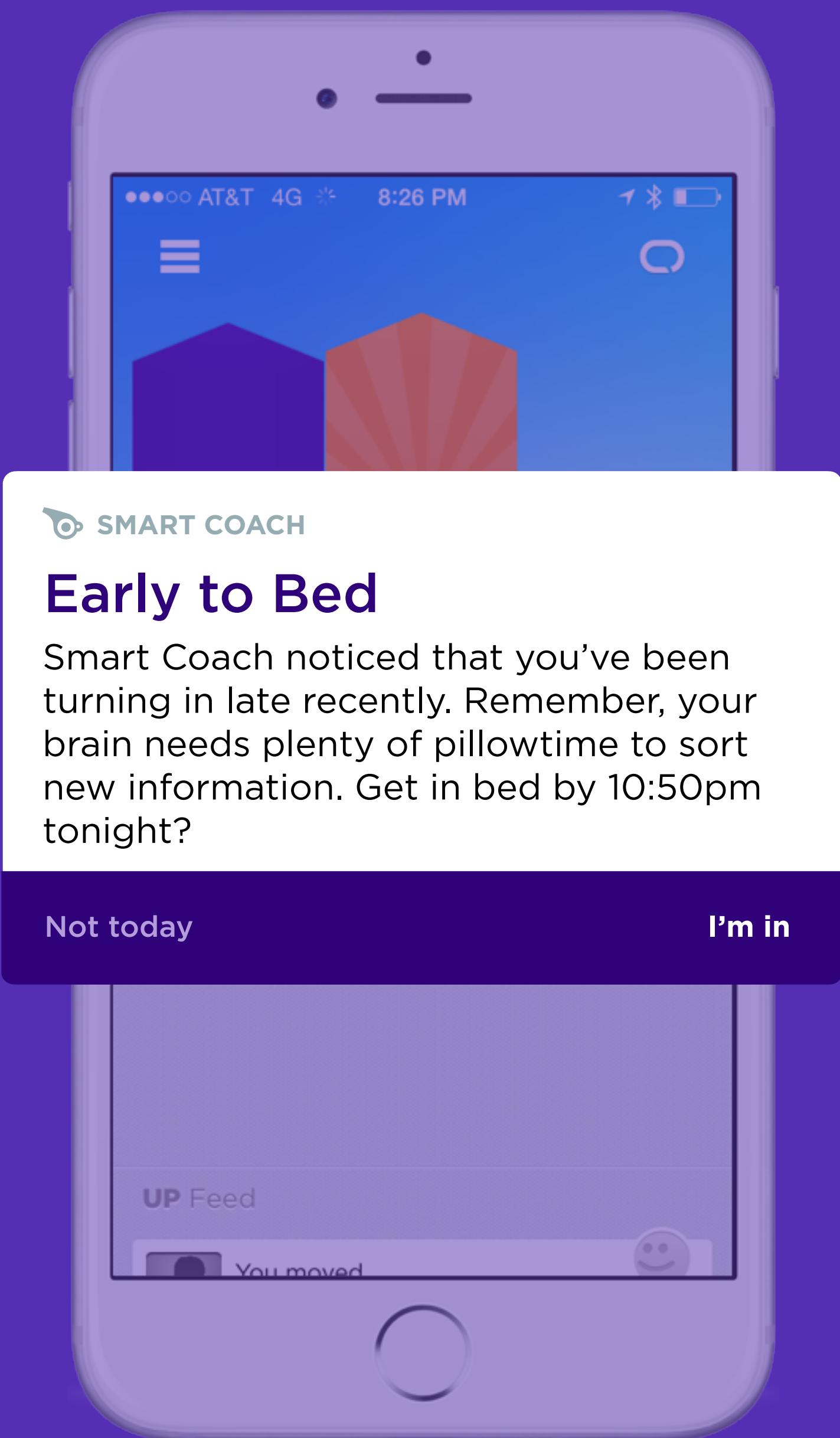
A woman with blonde hair, wearing a dark tank top, stands in a dimly lit room. In the background, a horse is being groomed by another person. The scene has a dramatic, cinematic feel.

**NOT JUST ANALYTICS –
DEMOCRATIZE
DATA PRODUCTS**

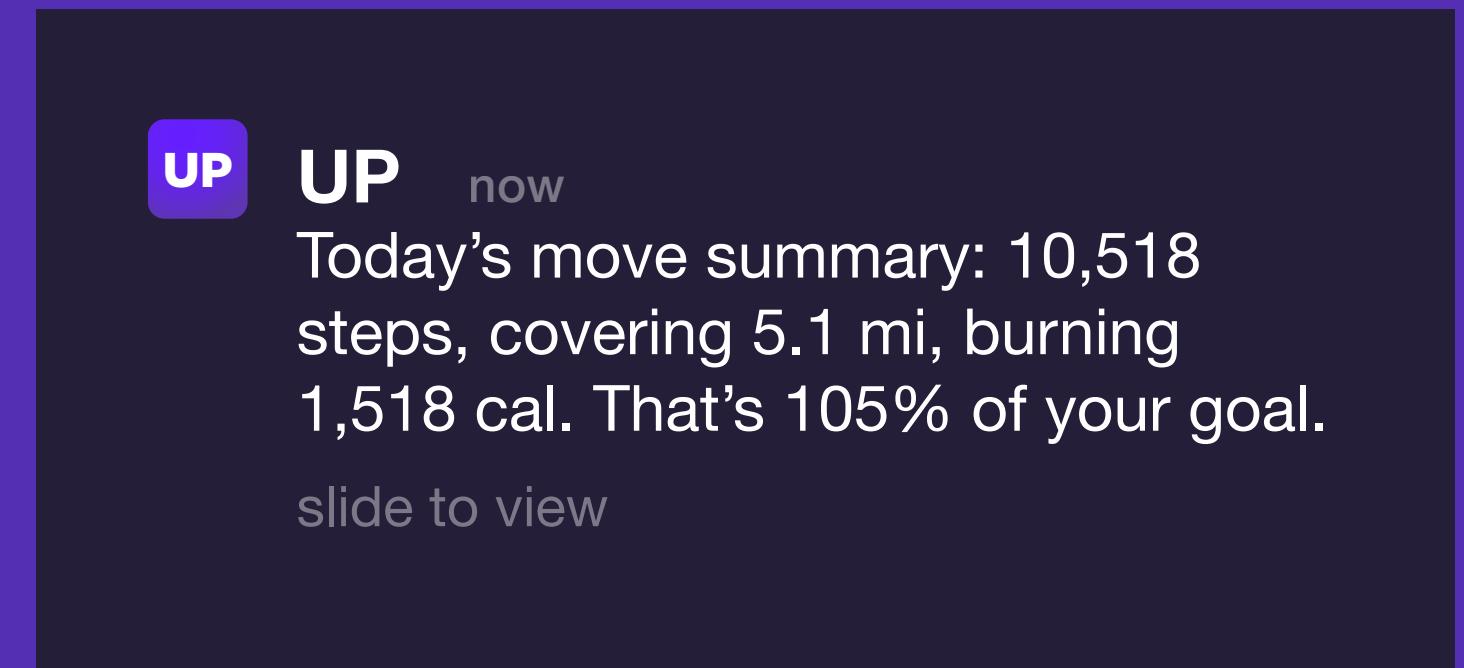
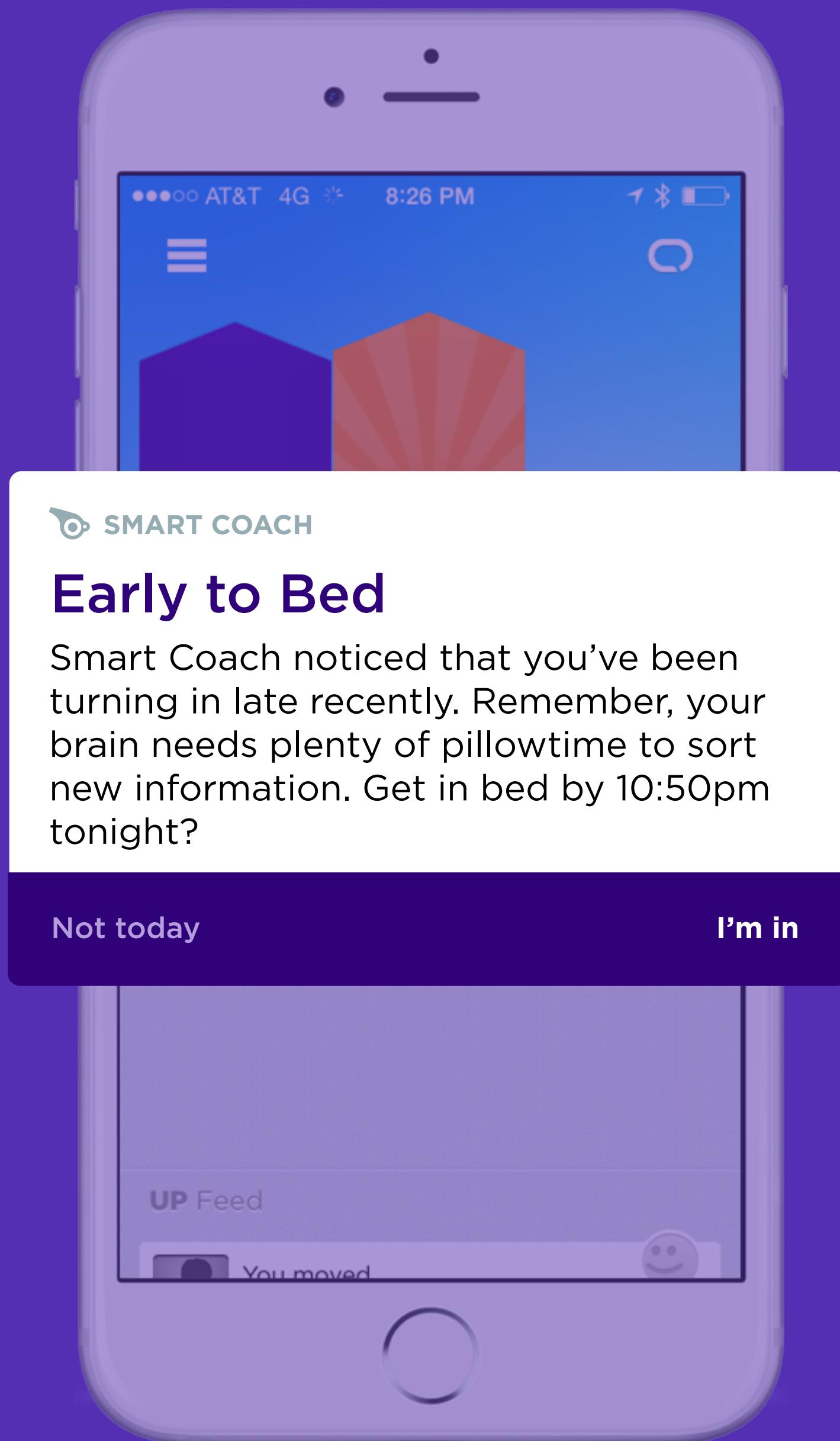


**NOT TRACKING,
BUT COACHING**





SMART COACH GUIDES YOUR SLEEP



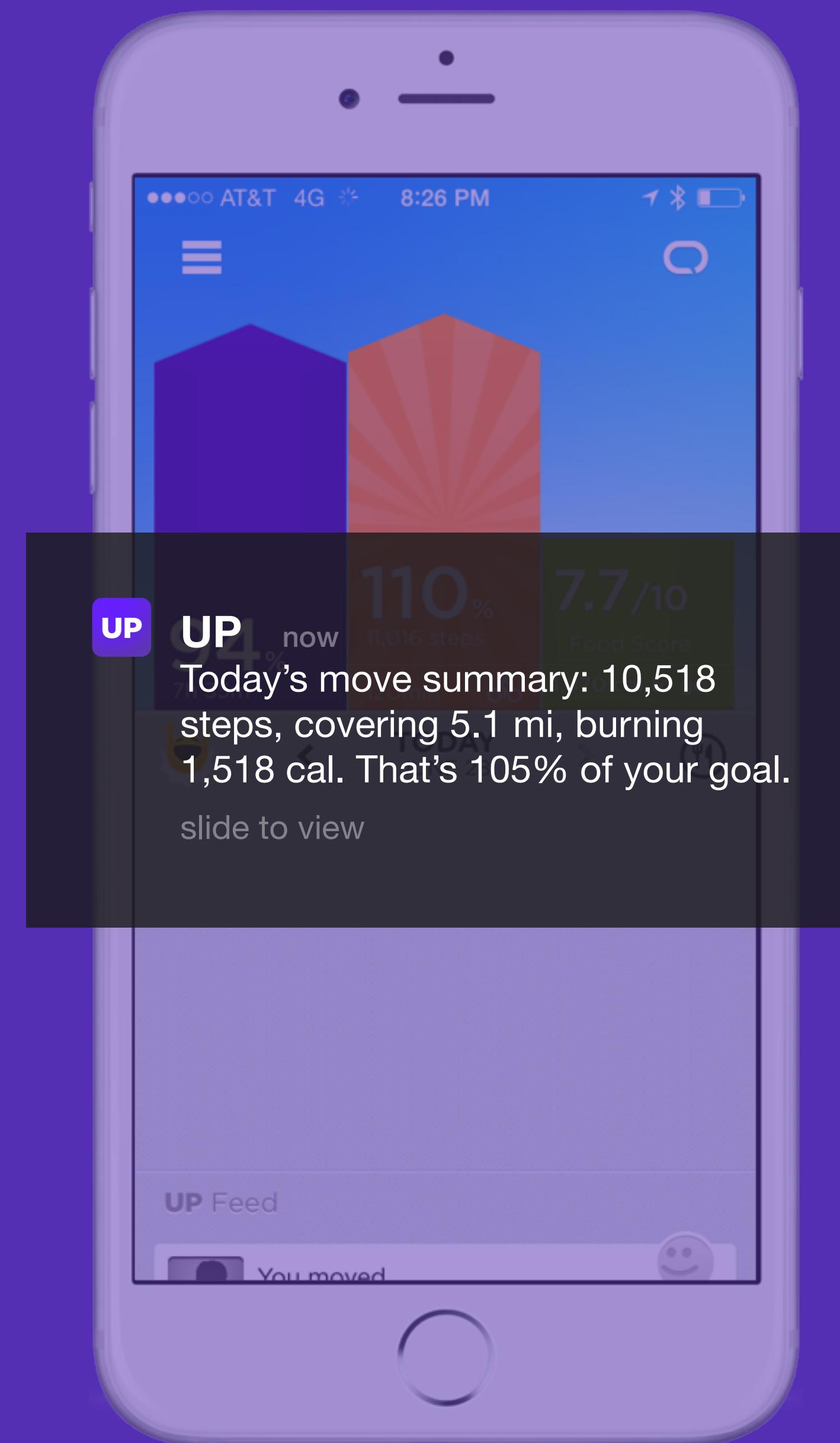
SMART COACH GUIDES YOUR SLEEP

 SMART COACH

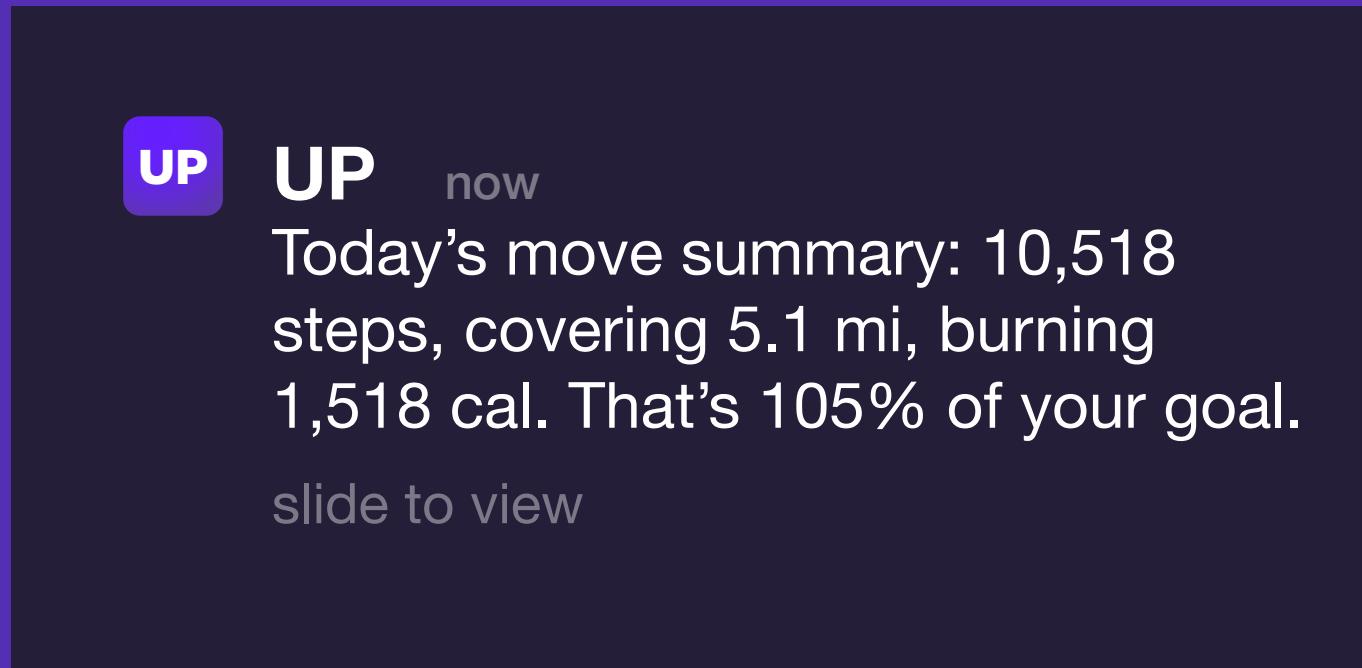
Early to Bed

Smart Coach noticed that you've been turning in late recently. Remember, your brain needs plenty of pillowtime to sort new information. Get in bed by 10:50pm tonight?

[Not today](#) [I'm in](#)

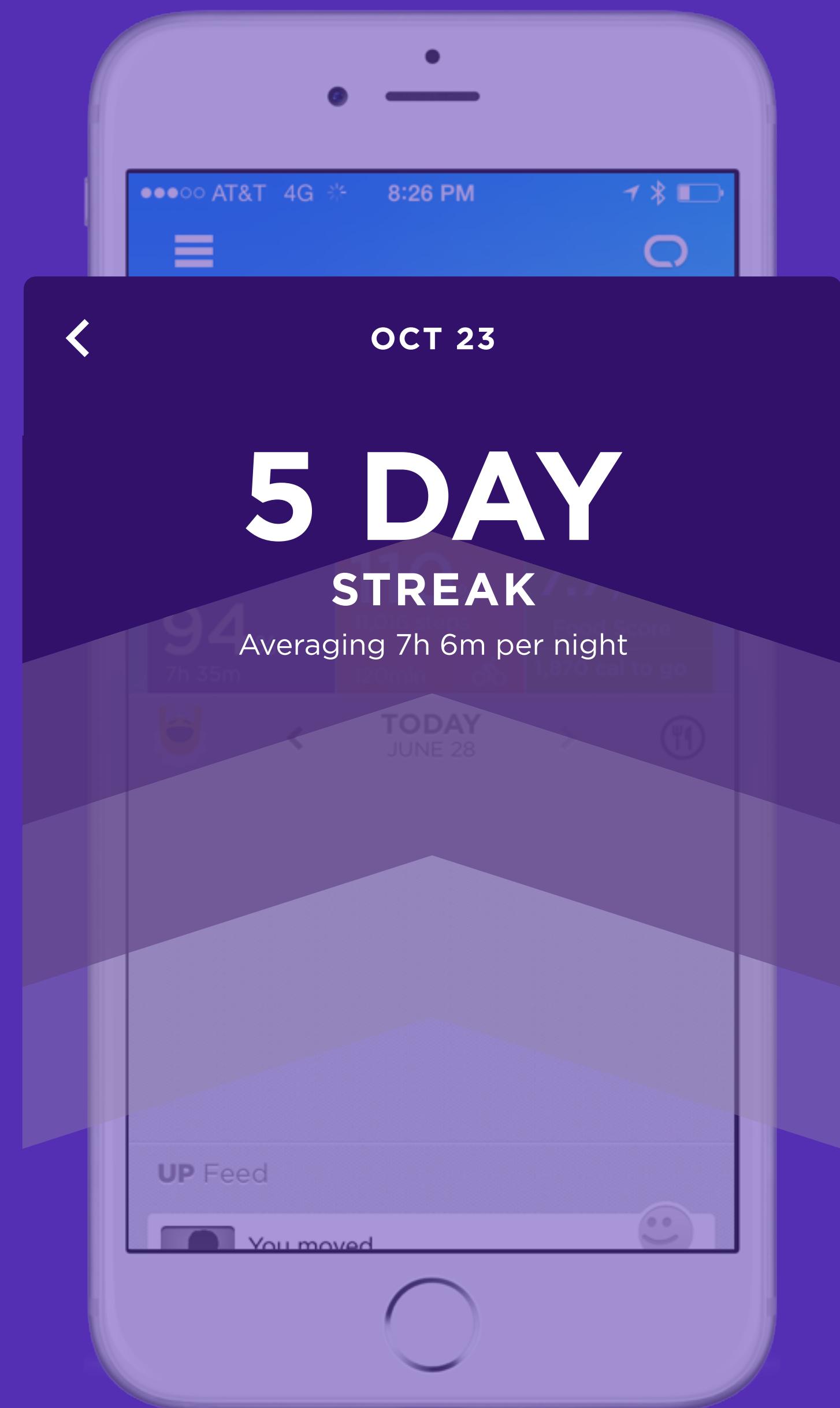


SMART COACH GUIDES YOUR SLEEP



n
our
ort
pm

I'm in



UP HELPS USERS SLEEP MORE



Early to Bed

Smart Coach noticed that you've been turning in late recently. Remember, your brain needs plenty of pillowtime to sort new information. Get in bed by 10:50pm tonight?

Not today

I'm in

23M

MORE SLEEP, COMPARED TO THE CONTROL GROUP

72%

INCREASED LIKELIHOOD OF BEATING THEIR SLEEP GOAL

ANDRE IGOUHALA

FINALS MVP

SLEEP PROFILE

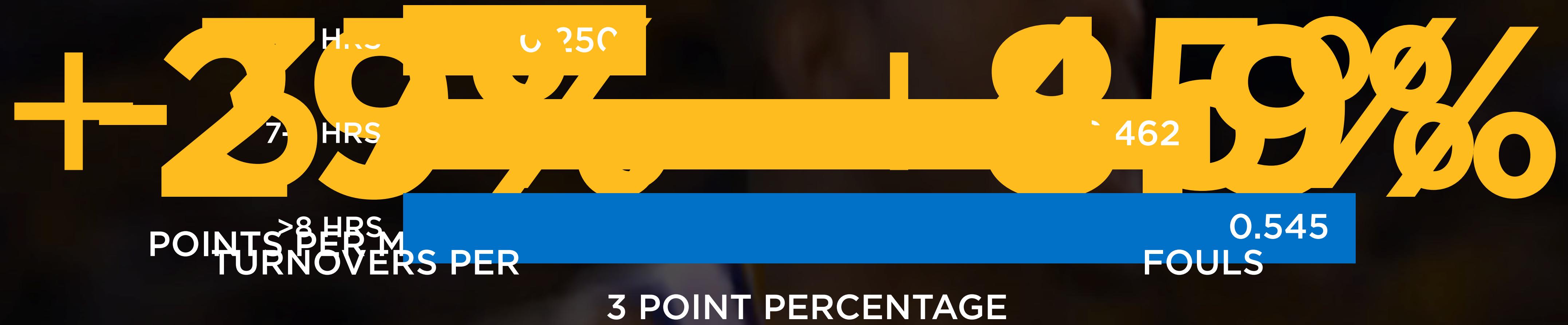
- HOME: SLEEPS 5H 48M
- AWAY: SLEEPS 6H 15M
- DIFFICULTIES
 - FALLING ASLEEP AFTER GAME
 - STAYING ASLEEP
- NAPS SOMETIMES
- DRINKS CAFFEINE BEFORE AND DURING GAMES

SLEEP COACHING

- CONSISTENT BEDTIME
- PUSH FOR LONGER SLEEP DURATION
- TOOLS TO HELP FALL ASLEEP
- STRATEGIC CAFFEINE USAGE
- NAPPING RECOMMENDATIONS



SEASIDE PINEAPPLE AND BIRDS SPAINES 2018X



CONCLUSIONS

- WE DO **BIG THINGS AT SMALL COMPANIES**
- MORE IMPORTANT TO FIGURE OUT WHAT TO DO THAN DO IT
- DATA SCIENCE FOR “**GOOD**”
- **IMPROVE HEALTH WITH BIG DATA TOOLS**
- **USER EXPERIENCE COMES FIRST**
- THE FIRST ML MODEL **ISN'T A MODEL**
- **DEMOCRATIZE DATA PRODUCTS**

BINGO! DINO DNA!

HEALTH IDENTITY FROM THE WRIST

BRIAN WILT HEAD OF DATA SCIENCE AND ANALYTICS



@BRIANWILT