



New Data Pathways: Mobile and Wearable Devices

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The difference is in the data.™

Overview

- Activity
- Need for new data pathways
- Application programming interfaces (APIs)
- Examples
- Programming Tools
- Wrap-up

Activity

- Requires smartphone
- Optional, but the more data the better
- Data and contact information will **not** be permanently stored
- Please text words that come to mind when you think about **data science** to
- **734-212-6960**

Need for New Data Pathways

- Number of IoT healthcare devices is skyrocketing
- Mobile and wearable devices are available to patients round-the-clock
- Streams of data can include many endpoints including heart and respiration rates, blood pressure, activity level, etc.
- Mobile devices can also collect user-entered data such as diary (medication compliance, pain scores, etc.) and safety reporting

Need for New Data Pathways (continued)

Many advantages including:

- More data points captured over time (won't "miss" a potentially informative event)
- Clinical researchers can obtain near real-time data and intervene earlier as necessary
- May reduce number of on-site visits

Need for New Data Pathways (continued)

Current challenges:

- Lack of clarity on mapping RWE for CDISC (FHIR and CDISC working towards submission standard)
- Many devices not formally approved for clinical measurement, data may be noisy or misleading
- Security and data privacy concerns
- Analysis adaptations due to frequency of data

Application Programming Interfaces (APIs)

- Set of protocols and definitions allowing user to authenticate, request and retrieve specific data in automated fashion.
- Major Components:
 - Authentication (token/key, encrypted username/password)
 - **NEVER send cleartext password over internet**
 - Request(s) (unique syntax to application)
 - Close session
 - **ALWAYS close session when done**

Application Programming Interfaces (APIs - continued)

- IBM Clinical EDC system:

- **Authentication**

<https://api.eclinicalos.com/XXX.jsp?studyid=STUDYID&login=USERID&password=PASSWORD&action=login>

- **Request** (AE table)

https://api.eclinicalos.com/XXX.jsp?action=infoattempt&type=data_datatable¶m1=AE

- **Logout**

<https://api.eclinicalos.com/XXX.jsp?action=logout>



Application Programming Interfaces (APIs - continued)

Request return format:

- JSON (javascript object notation)
- XML (extensible markup language)
- CSV (comma separated values)
- Custom format

Application Programming Interfaces (APIs - continued)

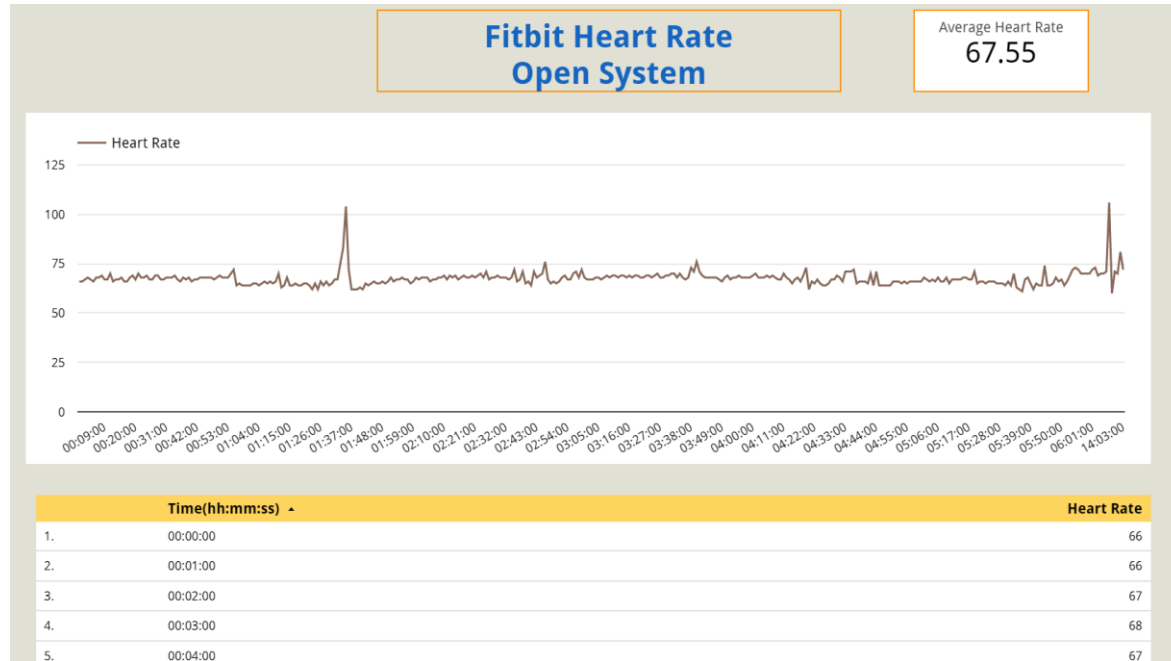
XML

```
<datarow>
  <value colname="SUBID">148231</value>
  <value colname="SUBNUM">10100001</value>
  <value colname="VISITID">20</value>
  <value colname="VISITSEQ">1</value>
  <value colname="PAGEID">20</value>
  <value colname="PAGESEQ">1</value>
  <value colname="STATUSID">5</value>
  <value colname="AESPID">01</value>
  <value colname="AETERM">AE01</value>
  <value colname="AESTDAT">2019-10-29</value>
  <value colname="AEONGO">Y</value>
  <value colname="AEENDAT"/>
  <value colname="AESEV">3</value>
  <value colname="AESER">Y</value>
  <value colname="AEREL">5</value>
  <value colname="AECONTRT">Y</value>
  <value colname="AECMNO">12</value>
  <value colname="AEACNOTH">HOSPITALIZATION</value>
  <value colname="AEAOTHSP"/>
  <value colname="AEOUT">NOTRECOV</value>
  <value colname="AEYN"/>
</datarow>
```

Examples - Fitbit

- Fitbit stores data on smartphone and Fitbit cloud
- API provided – each user must authorize access through personal Fitbit account
- Will generate unique CLIENT_ID, CLIENT_SECRET
- Used Python package FITBIT

Examples - Fitbit

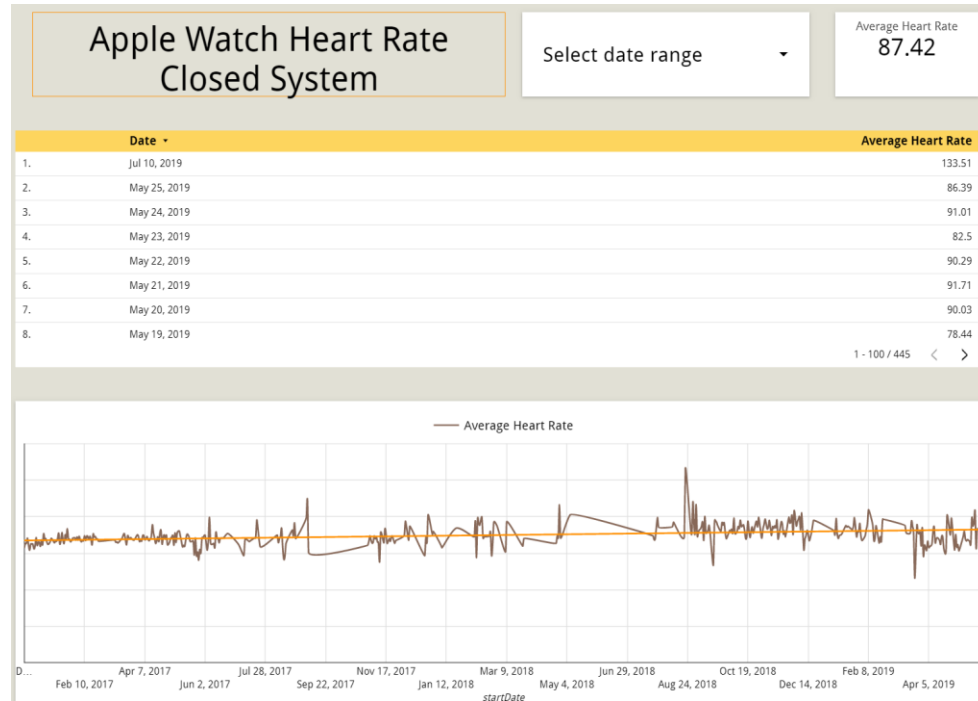


<https://datastudio.google.com/reporting/f673e40d-611d-4007-8599-8de136d553ba/page/Fgy6>

Examples – Apple Watch

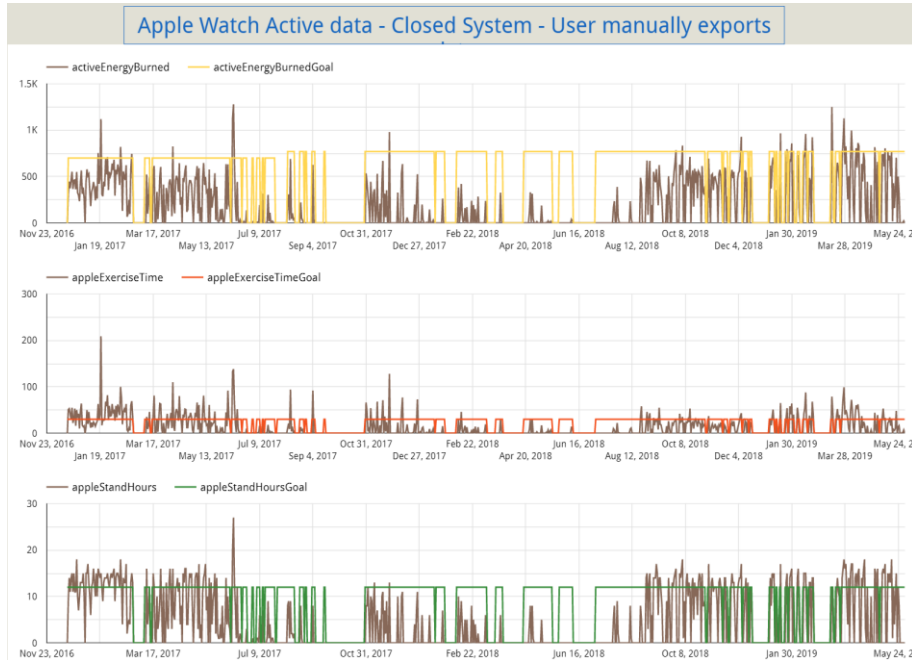
- Apple stores data on smartphone only
- Each user must export and provide their data (XML format)
- Used Python XML package

Examples – Apple Watch



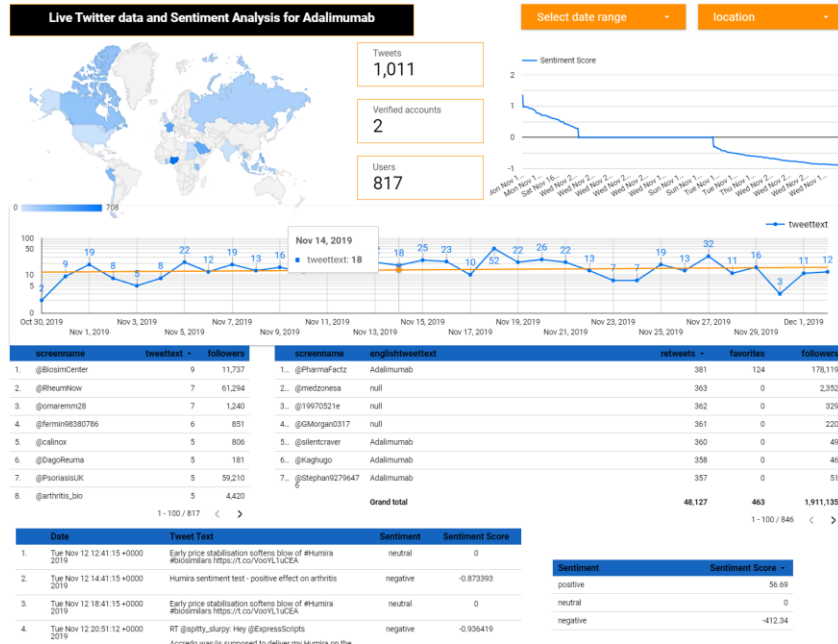
<https://datastudio.google.com/reporting/c01da167-3d24-43a4-84bb-ba70d71f2153/page/qRx6>

Examples – Apple Watch



<https://datastudio.google.com/reporting/076d633b-9bd5-4528-8809-5775d239ac87/page/Pwu6>

Examples – Social Media: Twitter API



Programming Tools



Wrap-up

- Data from nontraditional sources are informative (but may be noisy)
- APIs are increasingly easy to access and documentation level has improved greatly
- Devices now have sufficient storage capacity to turn them into useful sources of data
- Draft standards for RWE data are coming

Useful Links

SMS Text Messaging

<https://www.twilio.com>

<https://www.twilio.com/docs/sms>

Fitbit

<https://dev.fitbit.com/build/reference/web-api>

<https://towardsdatascience.com/collect-your-own-fitbit-data-with-python-ff145fa10873>

Apple Watch

<https://medium.com/better-programming/analyze-your-icloud-health-data-with-pandas-dd5e963e902f>

Python

<https://www.python.org/>

Microsoft PowerBI

<https://powerbi.microsoft.com/en-us/>



Thank you!
Any questions?



The difference is in the data.™

WordCloud for "big data"





Backup Slides