Real-time Meatspace Data Science

Data Intelligence Conference

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6/24/2017

Penn Medicine

Data Scientist or Data Janitor?

Amplitude

A blog about building better products

Stop Treating Your Data Scientist Like a Janitor

By Archana Madhavan | July 19 | 0 Comments

63 12

So you just hired someone to fill an opening for the sexiest job of 2016, a data scientist at your up-and-coming Silicon Valley startup. What if, a few months down the line, you realize your data scientists are actually spending the majority of their time working on something decidedly... unsexy?

Stop Treating Your #DataScientist Like a Janitor

CLICK TO TWEET

Data cleanups aren't fun

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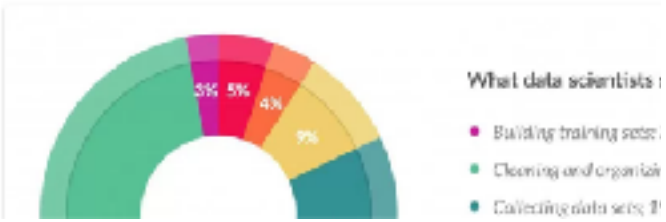

MAR 23, 2016 @ 09:33 AM 19,156

The Little Black Book of Billionaire Secrets

Cleaning Big Data: Most Time-Consuming, Least Enjoyable Data Science Task, Survey Says

Gil Press, CONTRIBUTOR

I write about technology, entrepreneurs and innovation. FULL BIO

Opinions expressed by Forbes Contributors are their own.

TWEET THIS

- data scientists found that they spend most of their time massaging rather than mining or modeling data.
- 76% of data scientists view data preparation as the least enjoyable part of their work

A new survey of data scientists found that they spend most of their time massaging rather than mining or modeling data. Still, most are happy with having the sexiest job of the 21st century. The survey of about 80 data

Data Scientist or Data Janitor?

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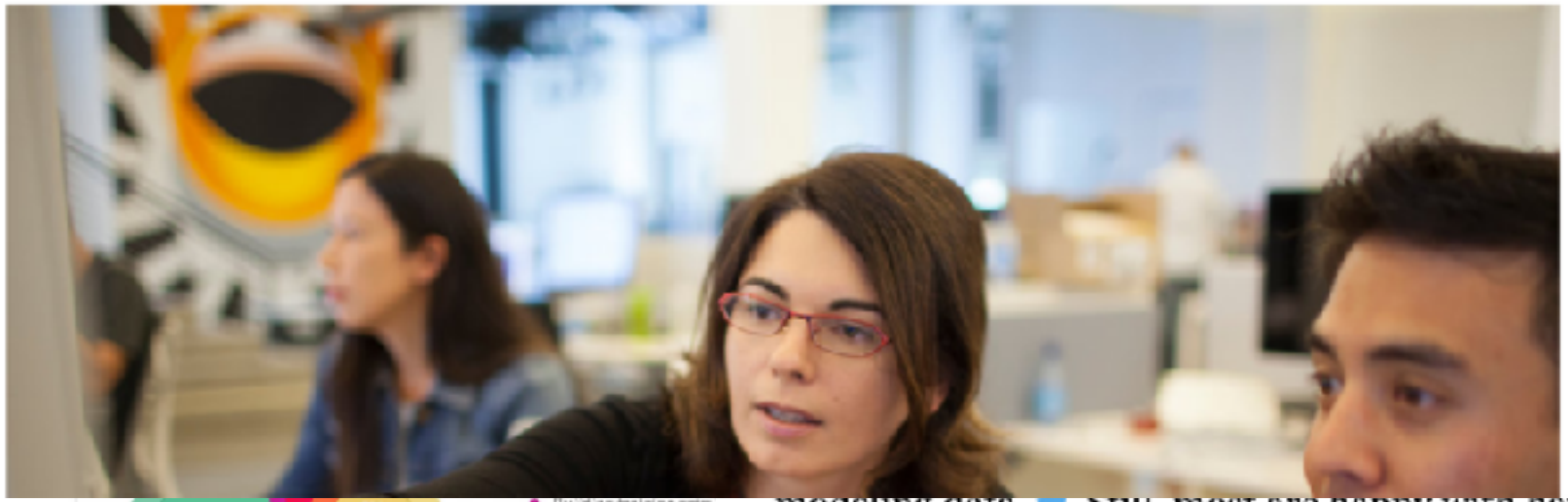
TECHNOLOGY

For Big-Data Scientists, 'Janitor Work' Is Key Hurdle to Insights

By STEVE LOHR AUG. 17, 2014



modeling data. Still, most are happy with having the sexiest job of the 21st century. The survey of about 80 data

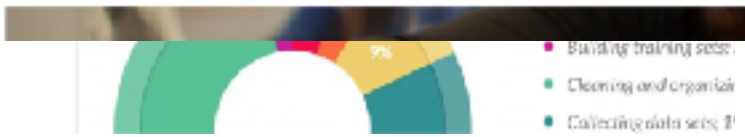
Data Scientist or Data Janitor?

Big Data Borat

@BigDataBorat

In Data Science, 80% of time spent prepare data, 20% of time spent complain about need for prepare data.

Retweets	Likes
509	281



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Health Care Data “Standards”

HL7

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S. HAMILTON AVE^^MADISON^WI^53505^US^^DN |DN|(608)123-4567|
(608)123-5678||S|| 11480003|123-45-7890||||^^^WI^^ PD1|||
FACILITY(EAST)^^12345|1173^MATTHEWS^JAMES^A^^^ PV1|||^^^CARE
HEALTH SYSTEMS^^^^^||| |1173^MATTHEWS^JAMES^A^^^||||||||||||
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76543^EPC||Final||^^^20140418170014^^^^||20140418173314|
1148^PATTERSON^JAMES^^^^||1173^MATTHEWS^JAMES^A^^^|
1133^^^222^^^^^|(618)222-1122|| OBR|1|363463^EPC|1858^EPC|
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1173^MATTHEWS^JAMES^A^^^|(608)258- 8866|||||||Final||
^^^20140418170014^^^^||||6064^MANSFIELD^JEREMY^^^^||
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HL7

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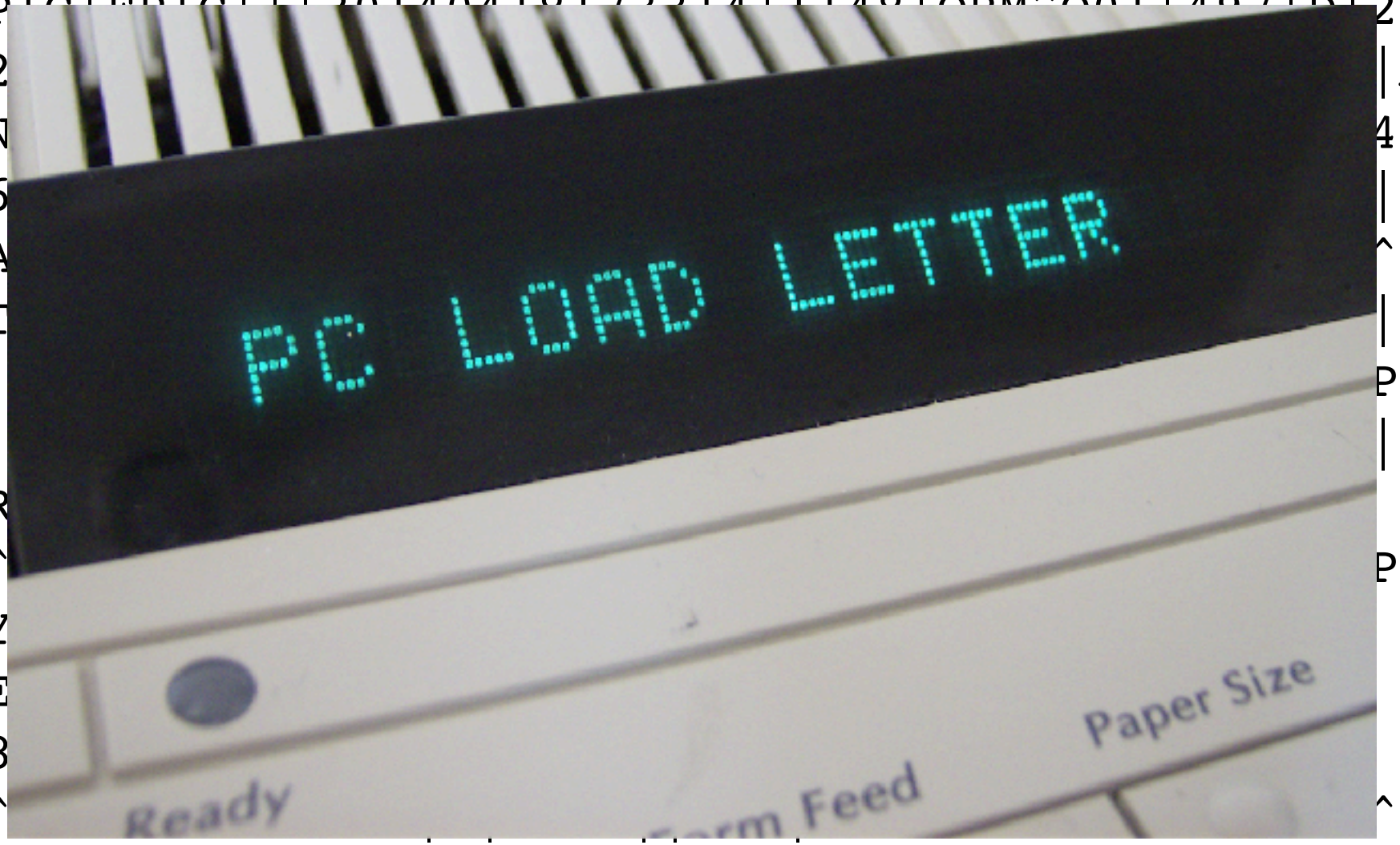
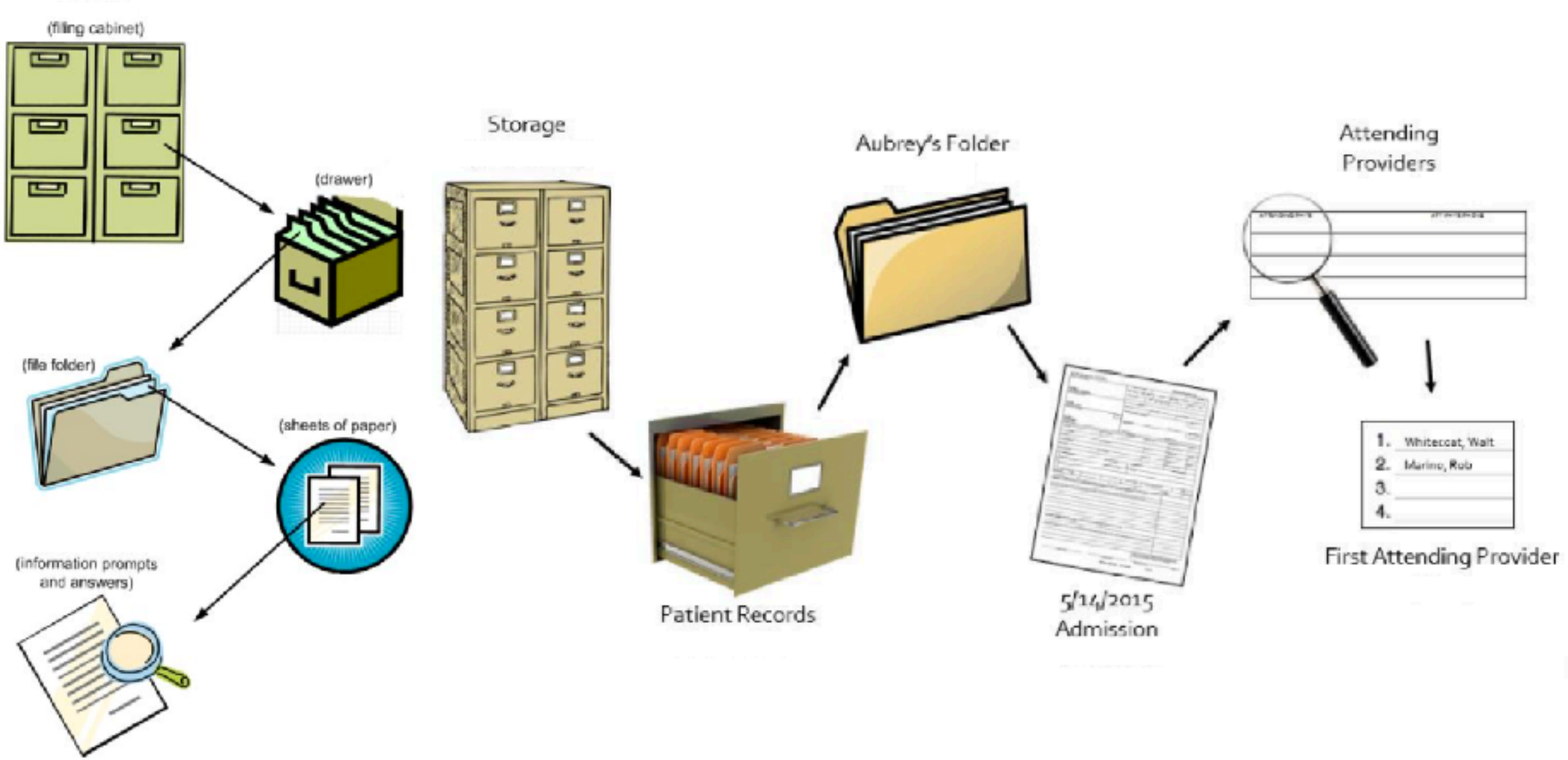
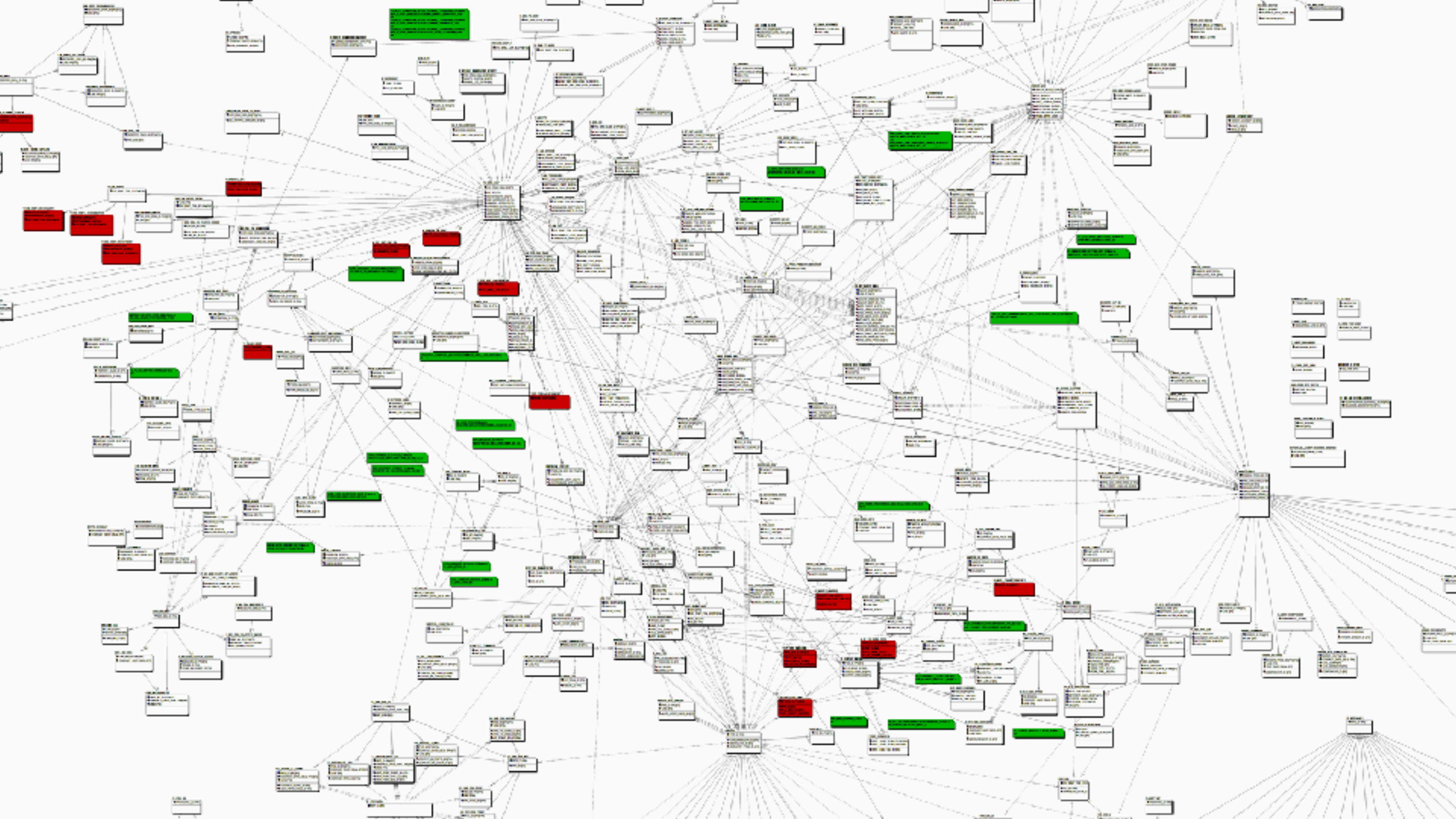


“Enterprise” Clinical Databases






My eyes! The goggles do nothing!

Health Care Data Issues

Inconsistent Data Types

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- unable to take temperature, patient just ate ice

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An urge to eat non-nutritive substances, a condition called pica, **can** occur in **pregnant** women with low iron levels. On the other hand, **ice cravings**, known medically as pagophagia, don't necessarily **mean you** have a nutrient deficiency, which a blood test **can** diagnose. Apr 15, 2015

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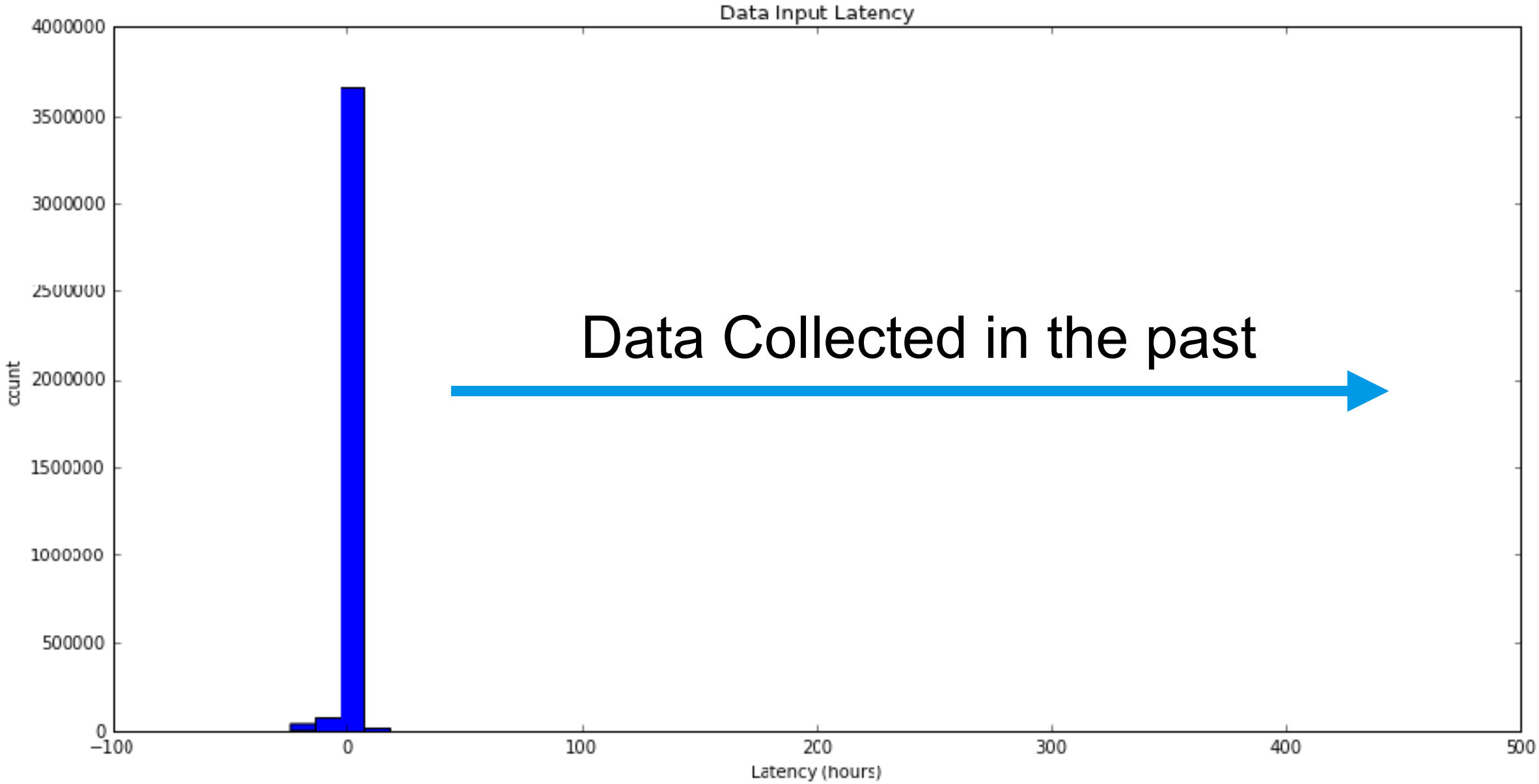
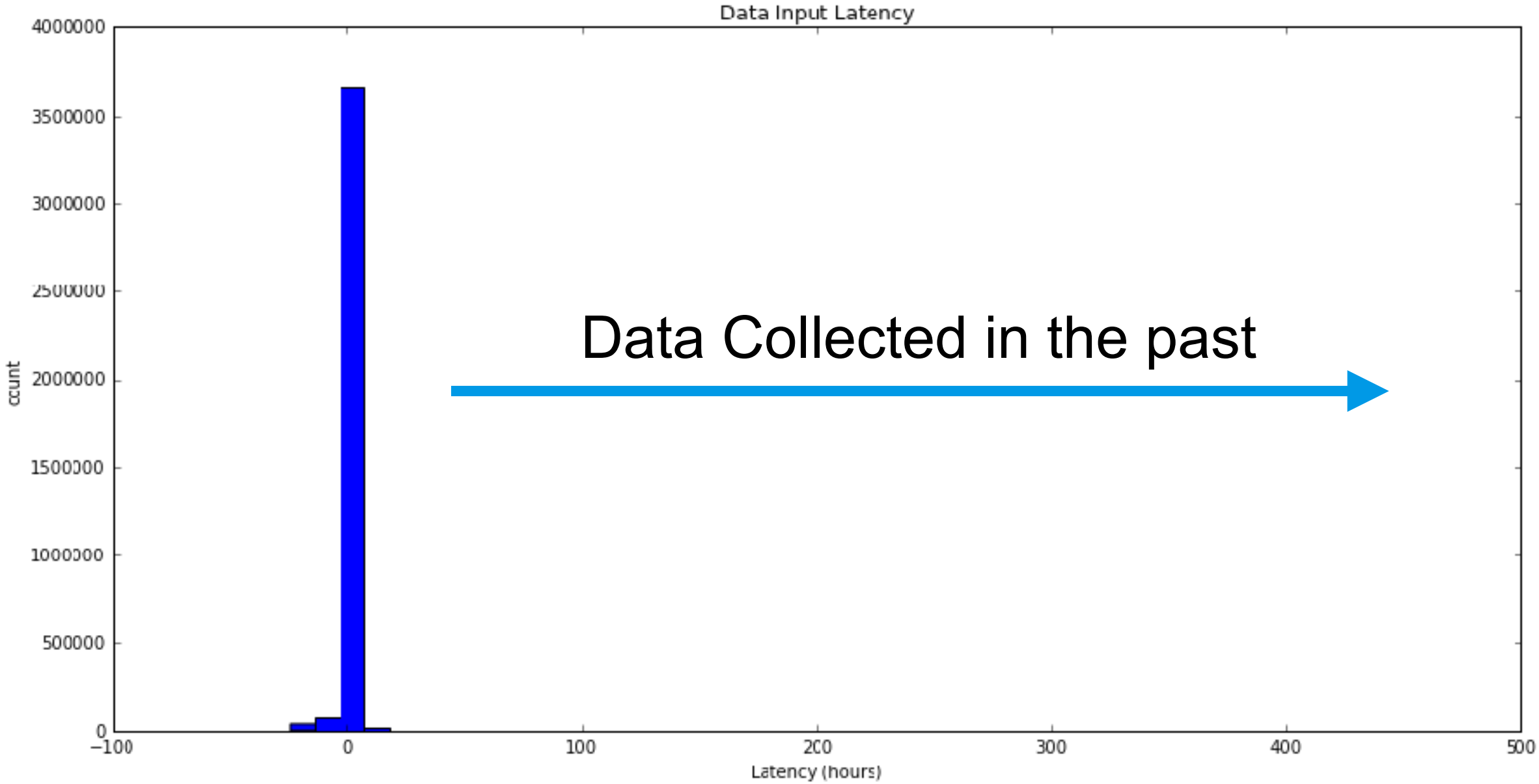
Future Data


Data Input Latency
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
count
−100
0
100
200
300
400
500
Latency (hours)
Data Collected in the past

Future Data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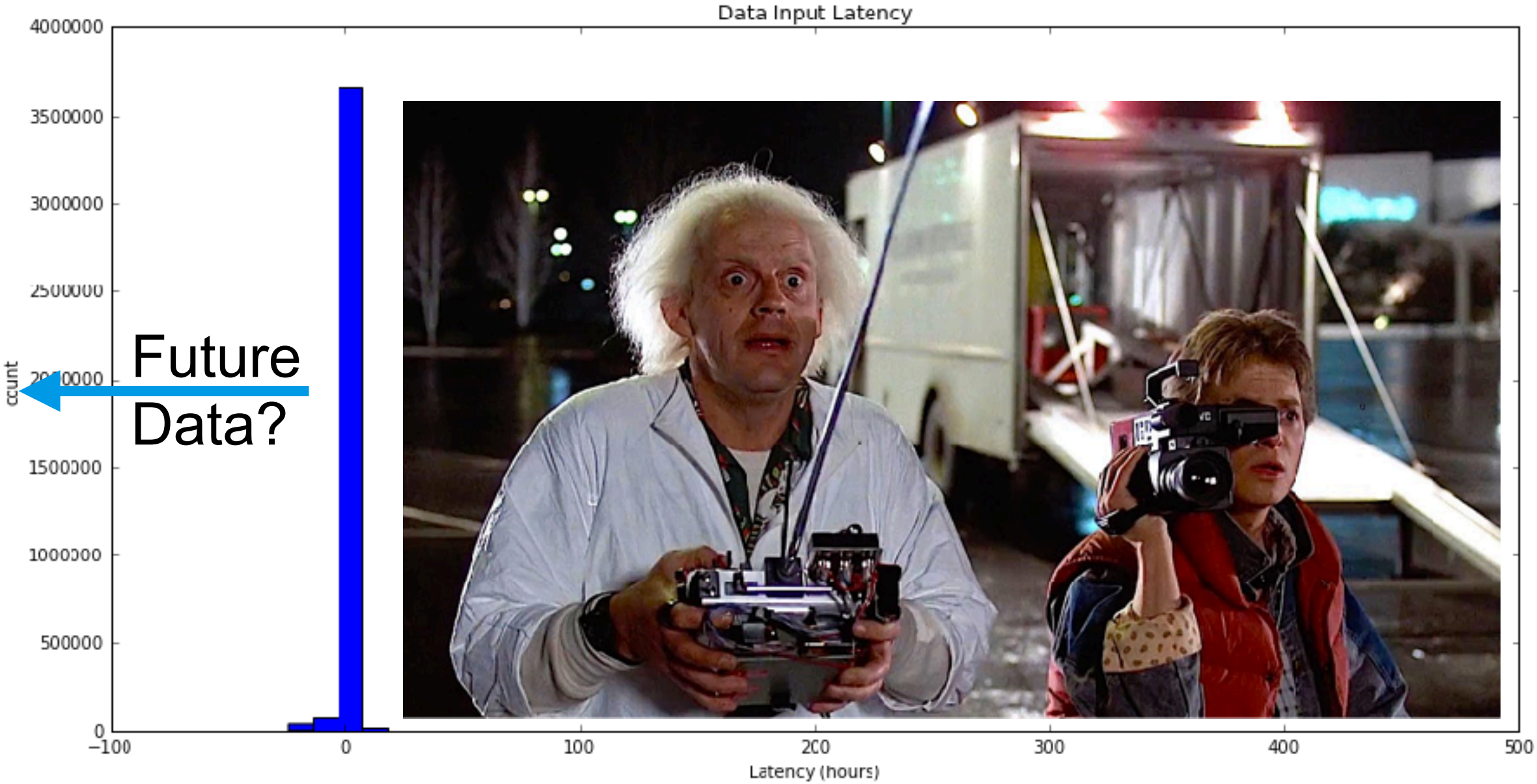
Latency (hours)
Future Data?
Data Collected in the past

Future Data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count
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400
500
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Future Data?

More Data Issues

- **Multiple identifiers for the same patient**

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- Throwing out historic data

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Little understanding of business impact

Penn Signals

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- A single data schema for data in stream and at rest

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  - Enables fast transition from modeling to applications

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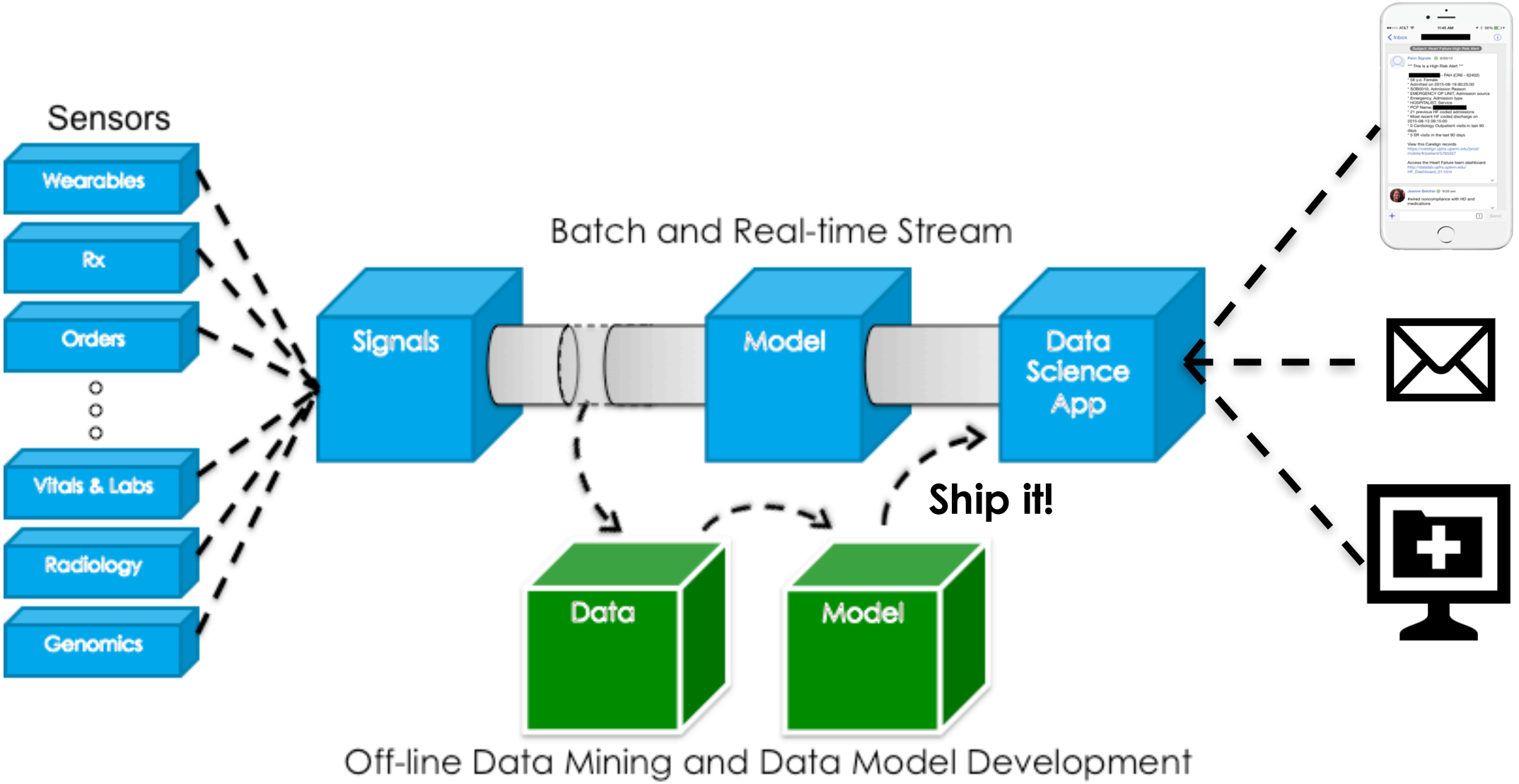
  - Allows for deterministic modeling
  - Crucial for real-time applications
- Type enforcement

Penn Signals Architecture



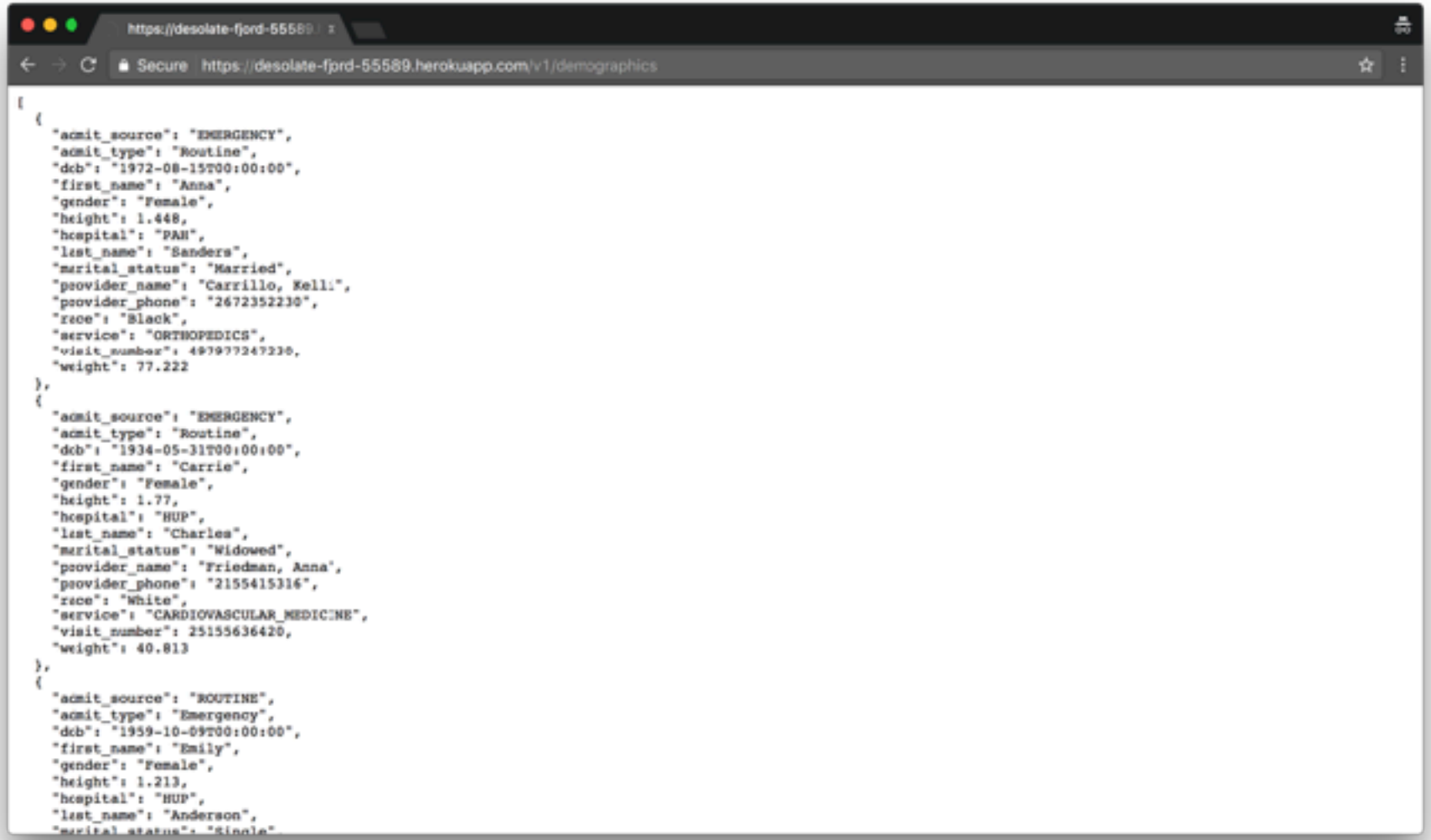
Penn Signals Stack

Upstream Resources

- Enterprise data warehouses
- Web services
- Streaming telemetry data

fuzzy-engine

- https://github.com/pennsignals/fuzzy-engine
- returns JSON formatted HTTP responses containing randomized patient data



Can we validate upstream data?

```
{
    "id": 1,
    "name": "A green door",
    "price": 12.50,
    "tags": ["home", "green"]
}
```

🤔🤔🤔🤔

JSON Schema Vocabulary

```
{
    "$schema": "http://json-schema.org/draft-04/schema#",
    "title": "Product",
    "description": "A product from Acme's catalog",
    "type": "object",
    "properties": {
        "id": {
            "description": "The unique identifier for a product",
            "type": "integer"
        },
        "name": {
            "description": "Name of the product",
            "type": "string"
        },
        "price": {
            "type": "number",
            "minimum": 0,
            "exclusiveMinimum": true
        },
        "tags": {
            "type": "array",
            "items": {
                "type": "string"
            },
            "minItems": 1,
            "uniqueItems": true
        }
    },
    "required": ["id", "name", "price"]
}
```

JSON Schema Validation Keywords

strings

- `maxLength`
- `minLength`
- `pattern`

arrays

- `items`
- `additionalItems`
- `maxItems`
- `minItems`
- `uniqueItems`

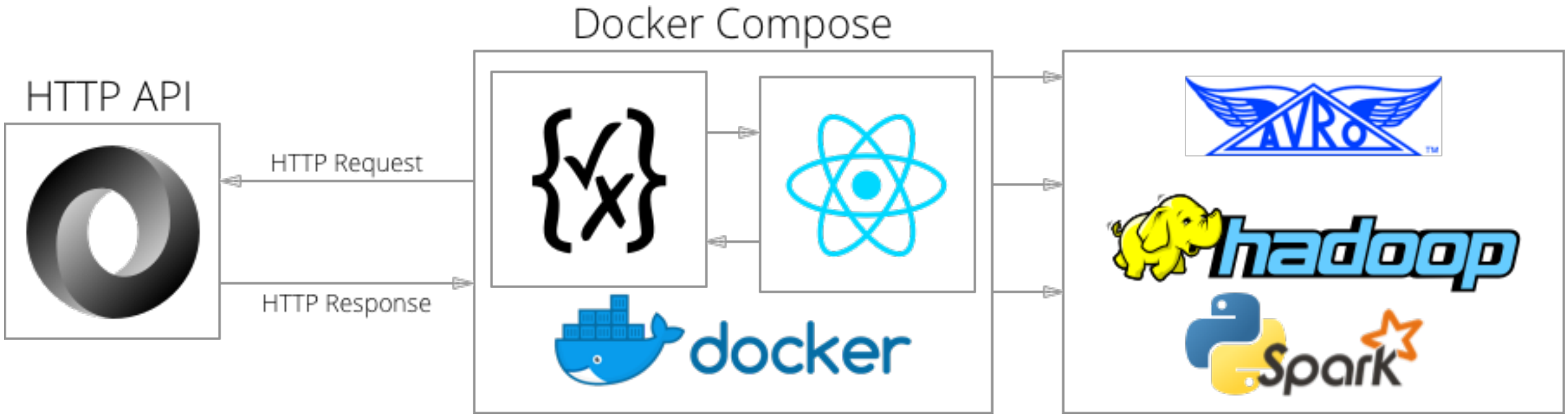
That’s cool, but are there documents that describe web services?

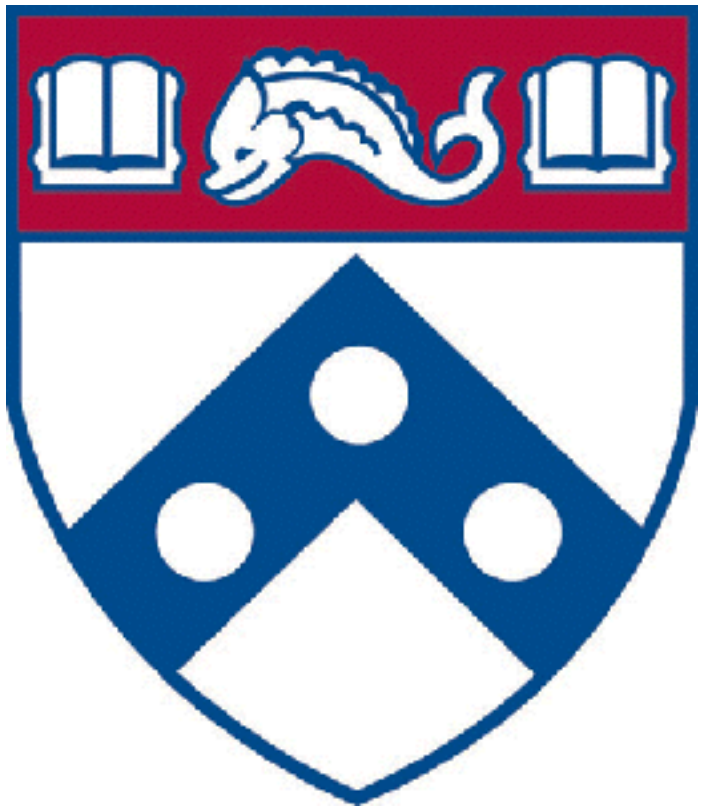
YES!

http://swagger.io/

Putting it all together

Process


Docker Compose
HTTP API
HTTP Request
HTTP Response
docker
AVRO
hadoop
Spark



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Retweets	Likes
509	281

About us

- Twitter @beckerfuffle & @rightlag
- Follow our team @PennDataScience
- Updates on Penn Signals can be found at predictivehealthcare.pennmedicine.org