



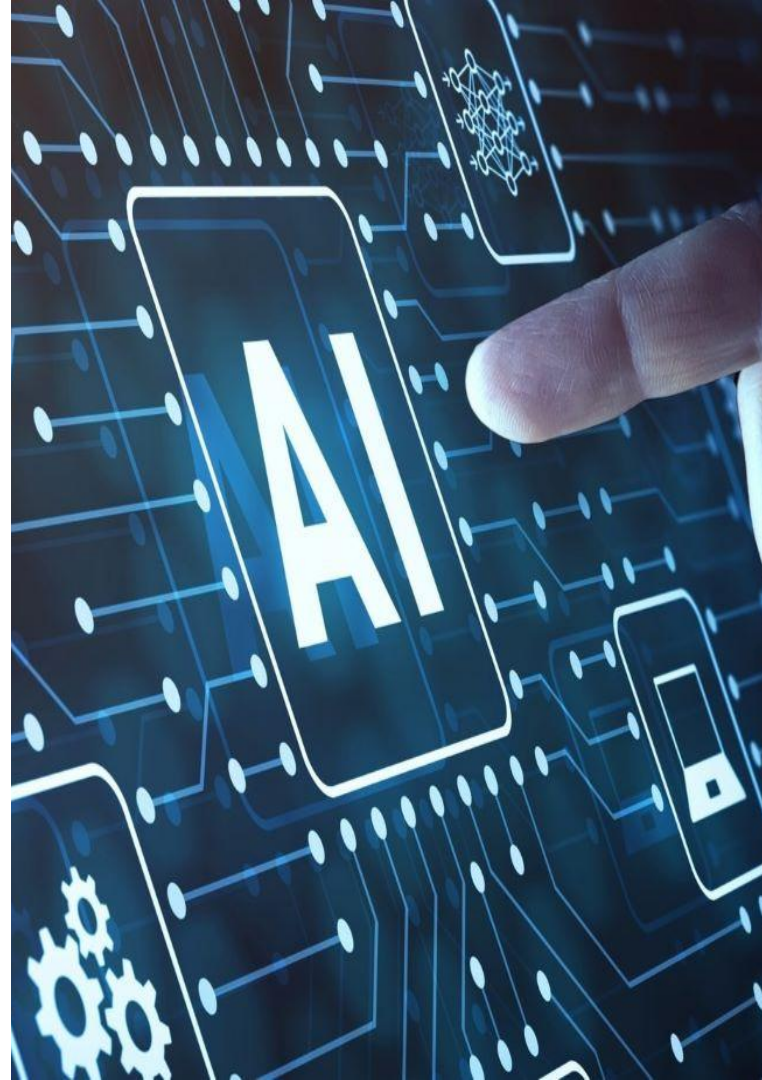
ETSI AI Conference 2024

Sustainable AI: Adding a Conscience

Presented by:



Dr Greg Ainslie-Malik, Splunk



Agenda

1. AI in the context of the UN Sustainable Develop Goals (SDGs)
2. Socioeconomic impacts
3. Environmental impacts
4. Hidden costs of ML initiatives





SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

SUSTAINABLE DEVELOPMENT GOALS

“The role of artificial intelligence in achieving the Sustainable Development Goals”

<https://www.nature.com/articles/s41467-019-14108-y>

AI for Sustainability

79% of UN SDGs have the potential to benefit from AI

Sustainable AI

35% of UN SDGs have the potential to be negatively impacted by AI



NewYork-Presbyterian working on machine learning analytics to combat opioid crisis

The major academic health system is working with machine learning analytics vendor Splunk to create a new system to guard against misuse of controlled substances, including opioids.

By **Bill Siwicki** | February 06, 2019 | 01:42 PM



“At a time when overdose deaths are at crisis levels across the country and in New York City, largely due to the opioid epidemic, healthcare providers have a responsibility to safeguard against any potential diversion of drugs. NewYork-Presbyterian is taking a leading role in protecting the public by implementing highly effective controls to avoid the illegitimate use of controlled substances. Ultimately, we hope that other hospitals benefit from this new platform as well.”

Jennings Aske, senior vice president and chief information security officer at NewYork-Presbyterian

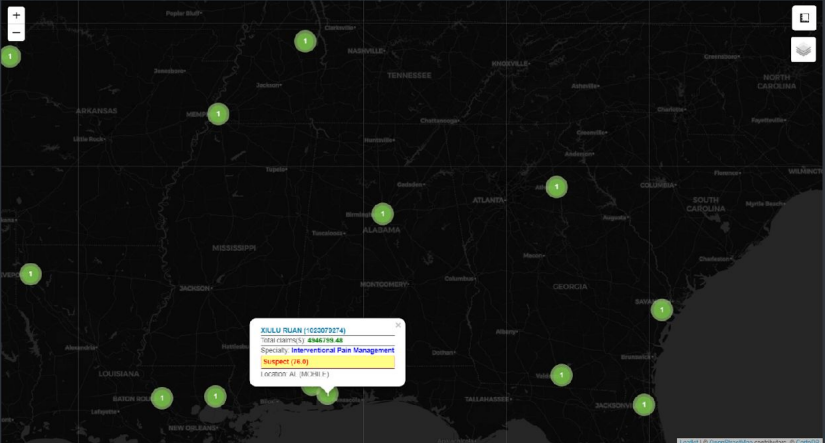
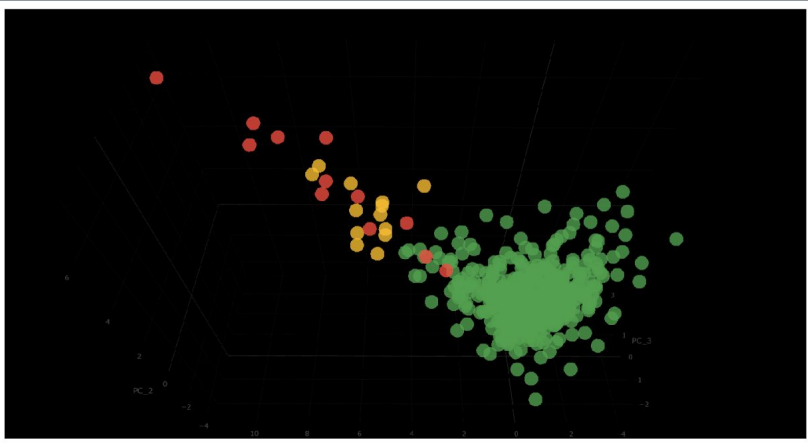
<https://medcitynews.com/2019/02/splunk-and-newyork-presbyterian/>

<https://www.healthcareitnews.com/news/newyork-presbyterian-working-machine-learning-analytics-combat-opioid-crisis>

Prescriptions Anomaly Analytics

Select Year: 2014 Select State (OR logic): All States (495079) x Provider specialty (OR logic): Interventional Pain Man... x Min Total Claims: Any Min Prescribed Opioids: >\$750,000 Suspects/Criminals: Hide Show View mode: Viz Map Both

Cluster Dashboard: Number of confirmed connections to analyze: 22



XULLU RUIAN (1022079274)
 TOTAL COST (YTD): 4948739.48
 Specialty: Interventional Pain Management
 Suspect (16.6)
 (LOC000 AI: 38.341.1)

	anomaly_ratio 0	cluster 0	x 0	y 0	z 0	diag_cost_total 0	op_cost_total 0	op_pct 0	npi 0	suspect 0	fullname 0	rippers_provider_city 0	rippers_provider_fst_name 0	rippers_provider_last_org_name 0	rippers_provider_state 0	specialty_description 0
1	184.8	0	11.19	6.58	2.81	8,763,849.37	7,751,671.91	88.9	185337291	1	JOHN COUCH	MOBILE	ZYNN	COUCH	AL	Interventional Pain Management
2	113.4	0	8.92	6.11	1.87	4,318,313.45	3,263,128.29	76.7	191309525	1	JOHN KILMER	MEMPHIS	ZYNN	KILMER	TN	Interventional Pain Management
3	105.9	0	8.68	5.89	1.55	7,110,883.69	5,534,441.59	78.5	155893879	1	ALEXANDER WENIGERTEN	SYOSSET	ALEXANDER	WENIGERTEN	NY	Interventional Pain Management
4	98.3	0	7.85	5.84	1.68	8,840,726.93	4,527,791.52	56.3	131807455	1	ANDREW BRYAN	LOS ANGELES	ANDREW	BRYAN	CA	Interventional Pain Management
5	76.8	0	6.79	4.58	2.88	4,945,799.48	3,427,819.19	69.7	1622892214	1	KELU RUIAN	MOBILE	XULLU	RUIAN	AL	Interventional Pain Management
6	72.1	0	7.88	4.42	1.55	6,511,622.75	4,482,498.17	68.2	154032369	0	JAMES IBB	RANDOLPH	JAMES	IBB	CA	Interventional Pain Management
7	71.5	0	6.67	4.65	1.67	7,671,226.34	3,623,886.73	54.5	1194633792	0	TERESA RATING	FORT WORTH	TERESA	GATZKO	TX	Interventional Pain Management
8	64.6	0	6.69	4.21	1.47	6,421,123.95	4,113,286.34	64.1	1788672543	1	MICHAEL FREY	FORT WEEKS	MICHAEL	FREY	FL	Interventional Pain Management
9	63.8	0	6.84	3.88	1.32	5,513,124.85	4,124,162.19	75.5	1215924154	1	JONATHAN GATCO	FORT WEEKS	JONATHAN	GATCO	FL	Interventional Pain Management
10	53.2	0	6.17	2.51	2.98	4,855,949.39	3,443,258.39	85.4	1447238410	0	MARK WORMAN	WICHITA FALLS	MARK	WORMAN	TX	Interventional Pain Management
11	51.5	0	5.68	4.32	8.76	5,936,767.32	3,348,919.91	56.9	1831214535	1	KURT HORN	SCRAWTON	KURT	HORN	PA	Interventional Pain Management
12	44.5	0	5.91	2.68	1.69	4,986,536.27	3,263,286.99	75.4	1275888942	0	DONALD EBB	SARASOTA	DONALD	EBB	FL	Interventional Pain Management
13	40.8	0	5.82	2.51	8.82	3,885,515.73	3,885,589.13	99.5	1114129418	0	BUNGARAL MANAWOU	RIDELAND	BUNGARAL	MANAWOU	WA	Interventional Pain Management
14	38.9	0	5.85	2.85	8.68	4,395,853.12	3,235,967.31	75.3	1124137888	0	STUART KAUFFMAN	PHI ADRI PRITA	STUART	KAUFFMAN	PA	Interventional Pain Management
15	38.4	0	5.85	1.41	8.75	3,111,588.99	2,451,586.15	78.4	152888881	0	PHI TIP FUMAN	SYOSSET	PHI TIP	FUMAN	NY	Interventional Pain Management
16	37.1	0	5.81	1.31	1.43	4,837,884.91	3,135,422.94	71.5	1788108144	0	MARK FITTS	ATHENS	MARK	FITTS	GA	Interventional Pain Management
17	34.7	0	5.82	1.27	1.32	4,848,565.97	3,181,397.25	76.5	1417964839	0	CATHY LUD	FAYETTEVILLE	CATHY	LUD	AR	Interventional Pain Management
18	36.8	0	5.46	2.12	1.28	2,938,287.52	2,455,198.41	84.2	1681882633	1	FRED LIEBOWITZ	FORT WEEKS	FRED	LIEBOWITZ	FL	Interventional Pain Management

Prescriptions Anomaly Analytics

Select Year:

2015

Select State (OR logic):

VA (11358)

Provider specialty (OR logic):

General Practice (6324)

Family Medicine (256)

Min Total Claims:

Any

Min Prescribed Opioids:

>\$250,000

Suspects/Criminals:

Hide Show

View mode:

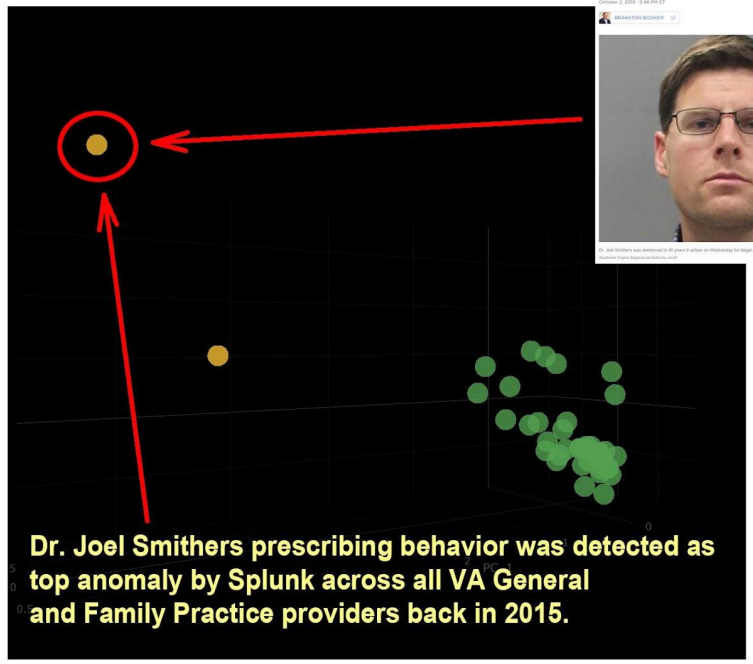
Viz Map Both

Edit Export ...

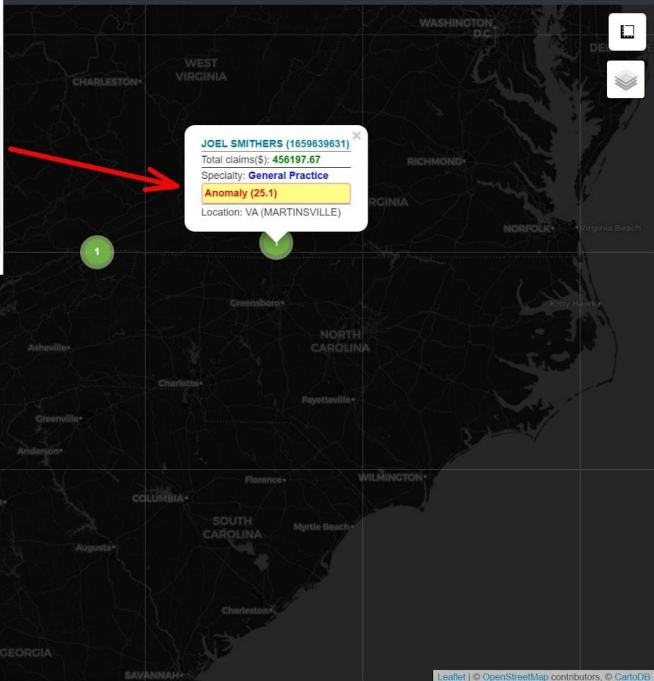
Reset Dashboard

Number of behavioral dimensions to analyze: 25

Doctor Gets 40 Years For Illegally Prescribing More Than Half A Million Opioid Doses



Dr. Joel Smithers prescribing behavior was detected as top anomaly by Splunk across all VA General and Family Practice providers back in 2015.



JOEL SMITHERS (1659639631)
Total claims(\$): 456197.67
Specialty: General Practice
Anomaly (25.1)
Location: VA (MARTINSVILLE)

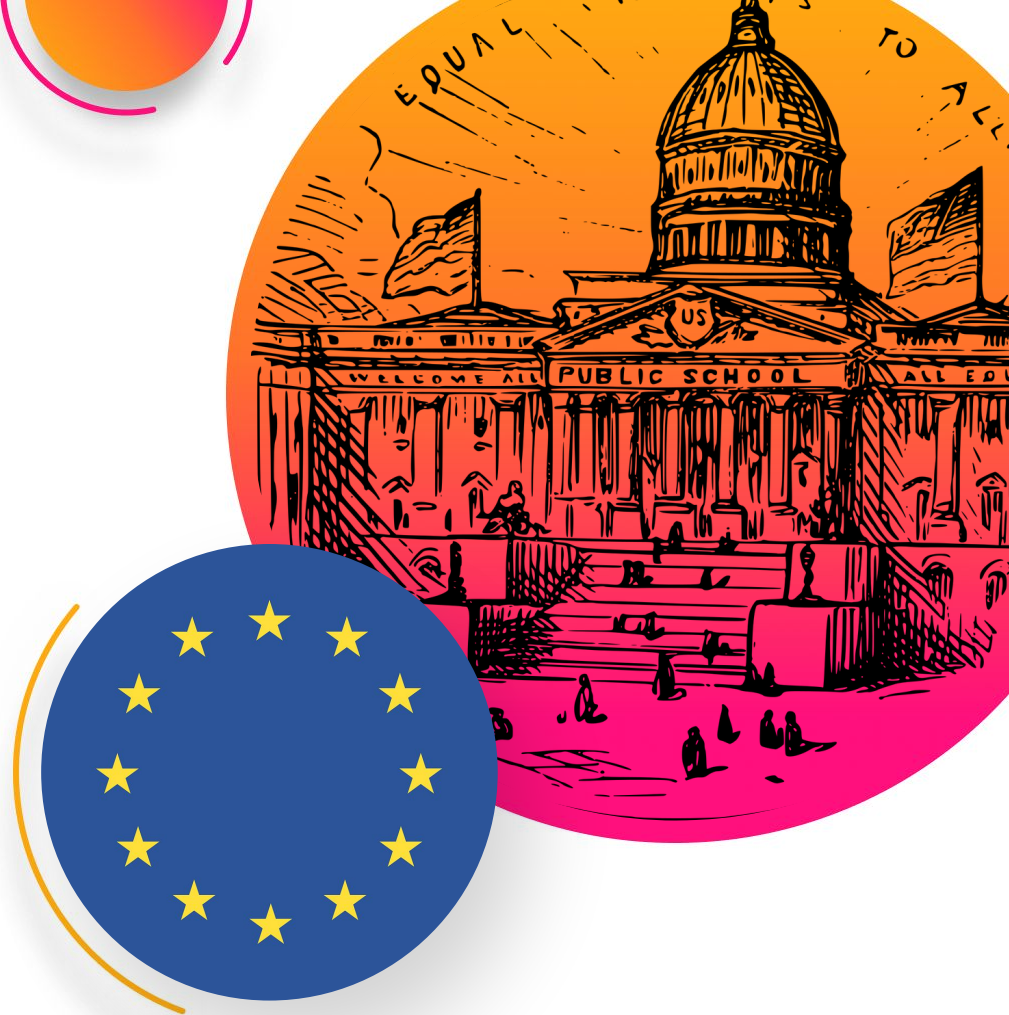
anomaly_ratio	cluster	x	y	z	drg_cost_total	op_cost_total	op_pct	npi	suspect	fullname	nppes_provider_city	nppes_provider_first_name	nppes_provider_last_org_name	nppes_provider_state	specialty_description
25.1	0	4.59	0.88	1.80	456,197.67	318,823.32	69.9	1659639631	0	JOEL SMITHERS	MARTINSVILLE	JOEL	SMITHERS	VA	General Practice

Socioeconomic Impacts

Regulation for the win!

<https://www.whitehouse.gov/briefing-room/presidential-actions/2023/10/30/executive-order-on-the-safe-secure-and-trustworthy-development-and-use-of-artificial-intelligence/>

[https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI\(2021\)698792_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI(2021)698792_EN.pdf)





Water Consumption

Microsoft's water consumption **grew by 34%** between 2021 and 2022

<https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RW15mqm>

Google's water consumption **increased by 20%** between 2021 and 2022

<https://sustainability.google/reports/google-2023-environmental-report/>

ChatGPT consumes **500ml of water** for every 5 - 50 questions

<https://apnews.com/article/chatgpt-gpt4-iowa-ai-water-consumption-microsoft-f551fde98083d17a7e8d904f8be822c4>

Environmental Impacts

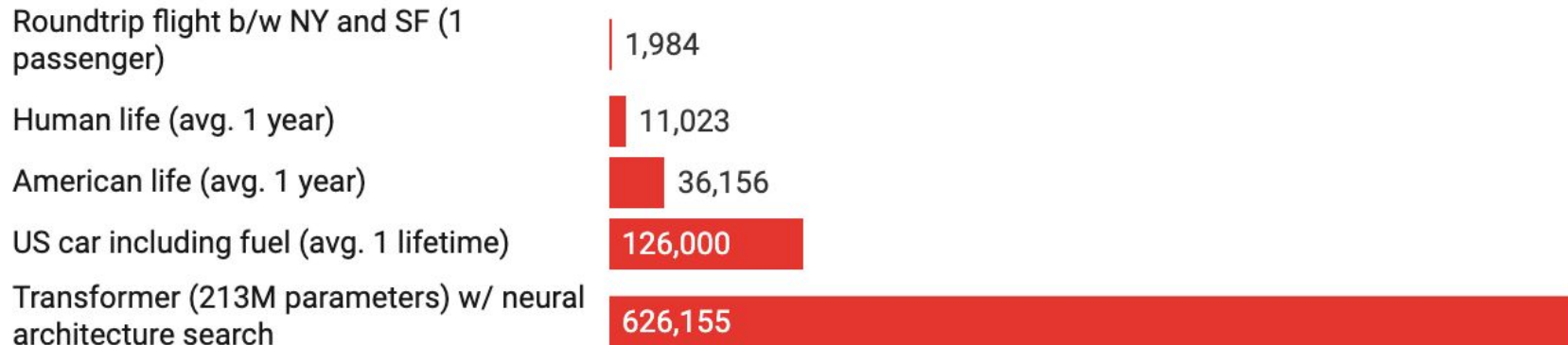


Chart: MIT Technology Review • Source: Strubell et al. • Created with Datawrapper

<https://www.technologyreview.com/2019/06/06/239031/training-a-single-ai-model-can-emit-as-much-carbon-as-five-cars-in-their-lifetimes/>

So what should I do about it?

**Calculate
CO₂e on prem**

<https://www.dmtf.org/standards/redfish>

**Get visibility
into cloud
CO₂e**

<https://aws.amazon.com/aws-cost-management/aws-customer-carbon-footprint-tool/>

<https://www.microsoft.com/en-gb/sustainability/emissions-impact-dashboard>

<https://cloud.google.com/carbon-footprint?hl=en>

**Assess ML
workload
impacts**

<https://mlco2.github.io/impact/#compute>

CO₂e From Electricity Use.

Carbon emissions = Electricity consumed * Electricity carbon intensity

kgCO₂e = kWh * kgCO₂e/kWh

Memory Management

Project based garbage collection

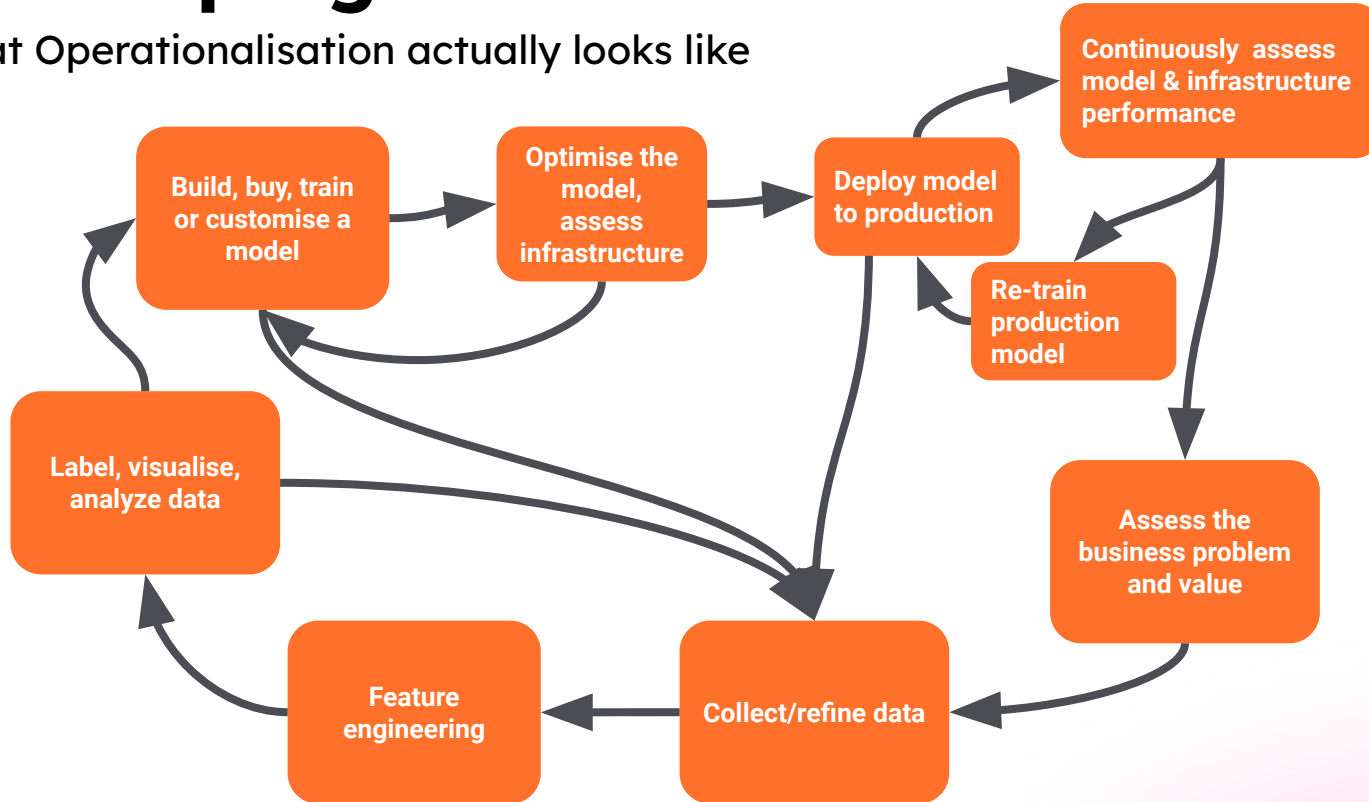


**87% of Machine
Learning
Projects:**



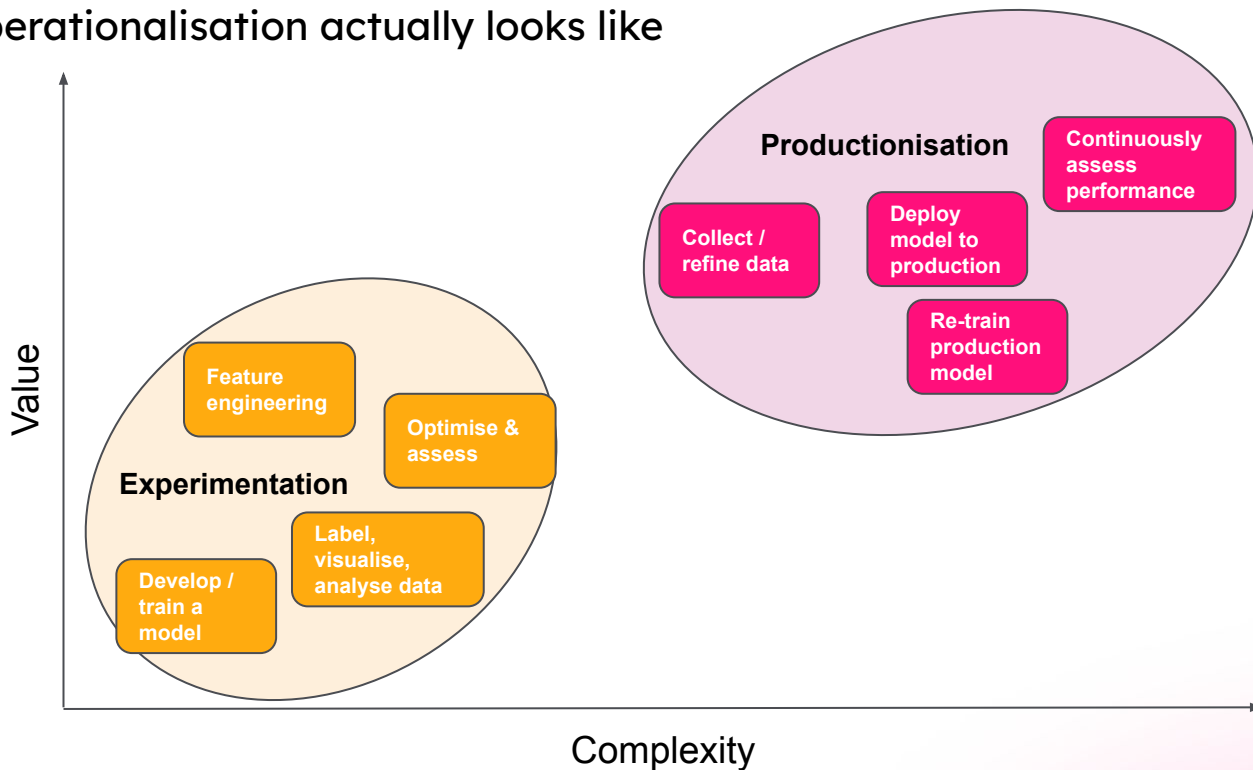
Developing a Model

What Operationalisation actually looks like



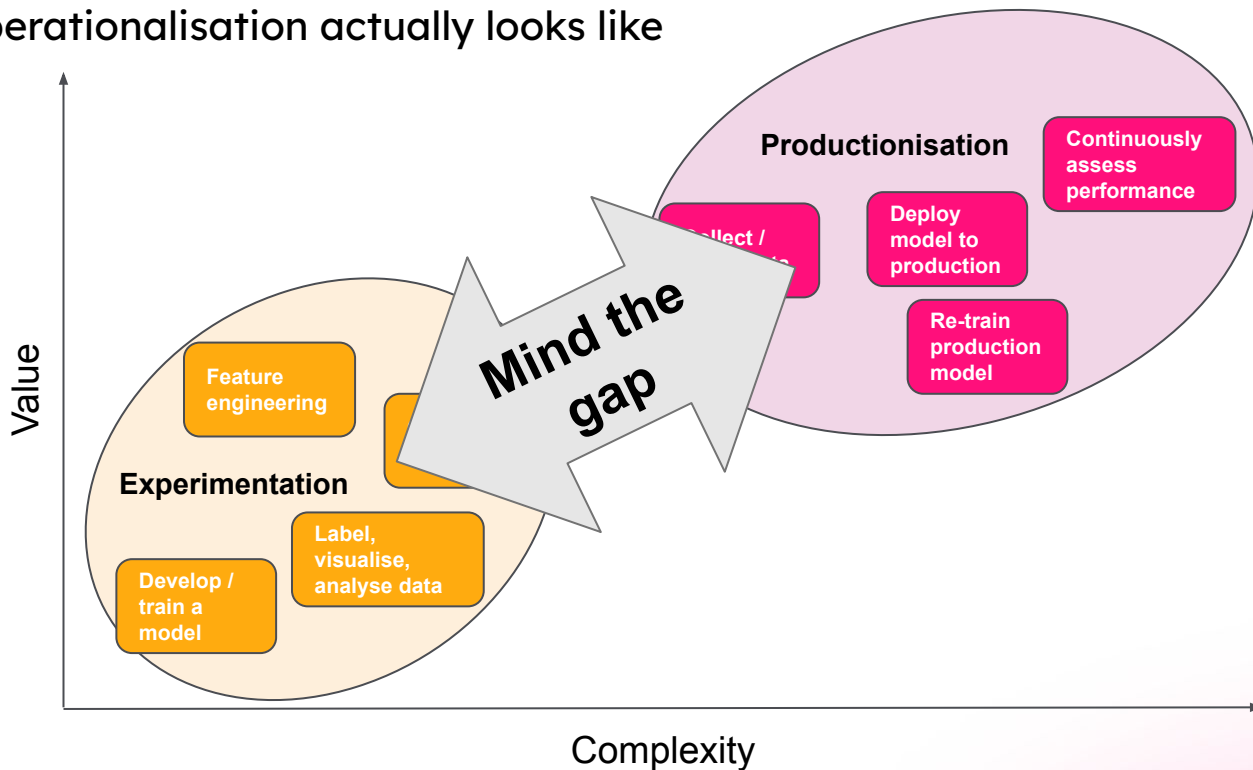
Developing a Model

What Operationalisation actually looks like



Developing a Model

What Operationalisation actually looks like



So what should I do about it?

Set clear objectives

What are the outcomes you are trying to achieve? Make sure you are adopting AI in places that benefit the business

Assess integration points

Make sure what you develop during an experiment will translate into production code

Keep it simple

Quite often simple statistics can provide approximations that are almost as good as an advanced deep learning algorithm

Thank you!

splunk>