Democratizing Forecasting and Analytics

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Common questions in public health where machine learning (ML) can help drive more informed decisions

Where do I need to redirect vaccine to address the increase in cases across the country?

What population has the highest risk factors for a disease?

When will this outbreak peak in my at-risk population??

Which risk groups to target given limited resources?

What is the likelihood of severe illness or death among vulnerable populations?

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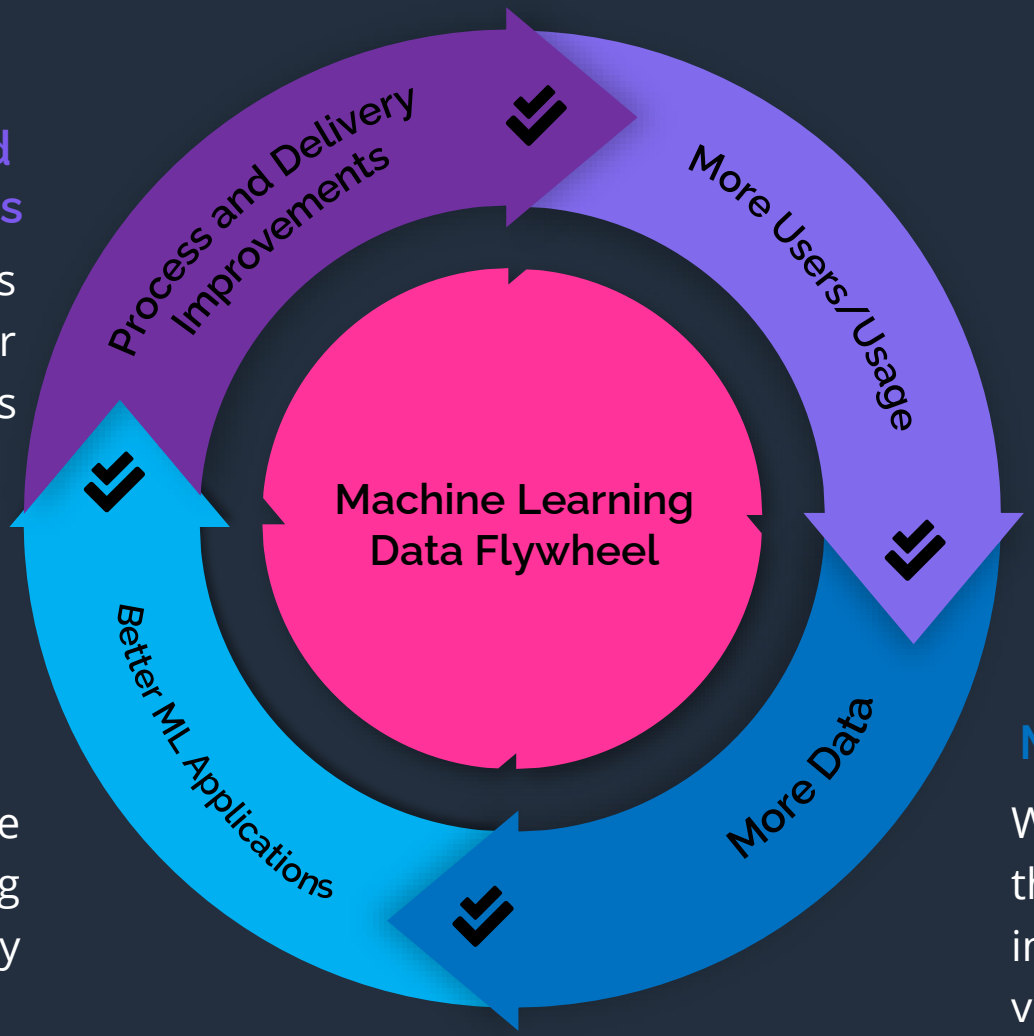
ML provides repeatable value

Process and Delivery Improvements

ML powered insights and applications improve decisions and lead to better public health outcomes



More Users/Usage

Having more users or more data for your current users to consume

Better ML Applications

Building more models to solve more use cases and improving the existing models accuracy

More Data

With more data available, there are more use cases and insights that ML can provide valuable impact

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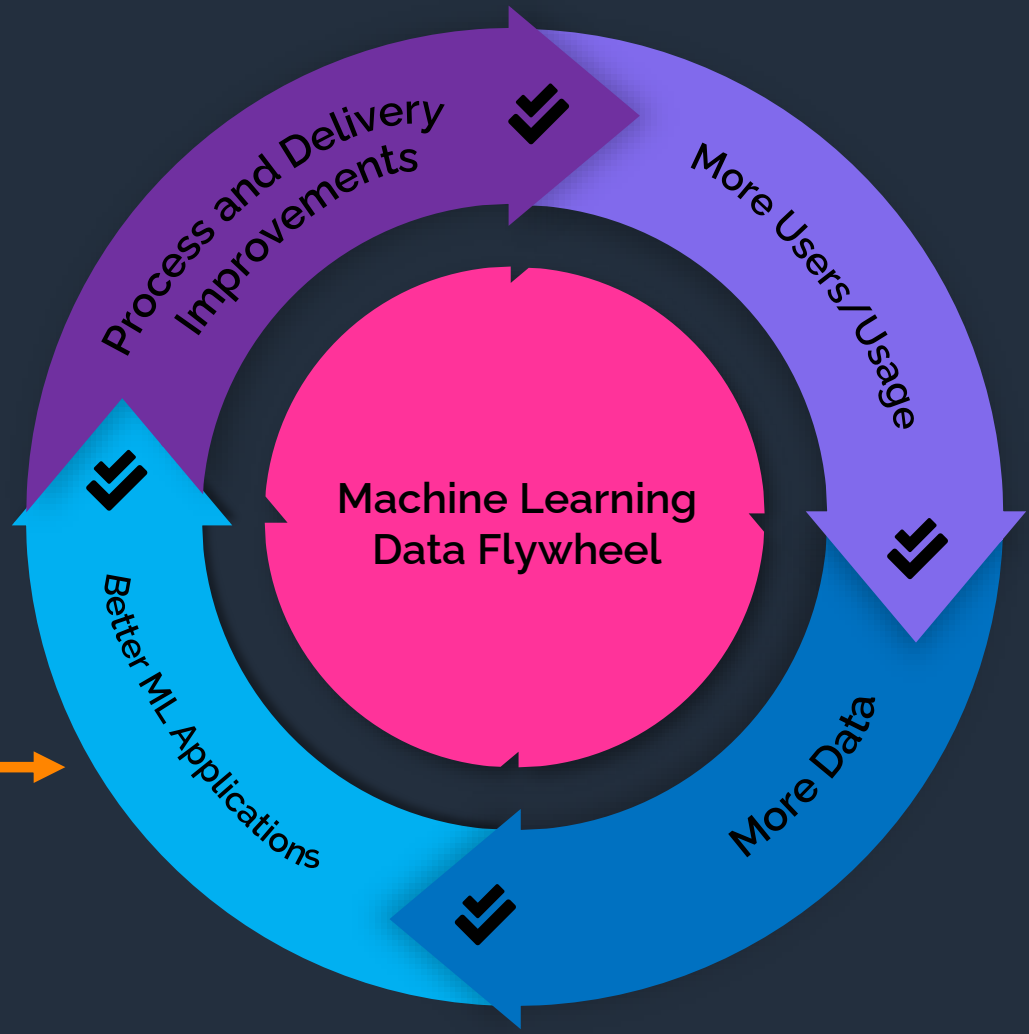
Data science resources are a limiting factor

The Bottleneck

Building better ML applications can be the bottleneck because:

- Data Science talent is expensive to scale
- Friction points in the Machine Learning journey
- Robust data is not available



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How ML drives value creation today

Step	**Organizational Requirements**	**Data Preparation & Feature Engineering**	**Model Development, Training, and Tuning**	**Model Deployment, Inference & Monitoring**
Owner	Epidemiologists, Biostatisticians, Domain Experts, and Data Analysts	Biostatisticians, Data Analysts and Data Scientists	Biostatisticians, Data Scientists, ML Engineers	ML Engineers, Biostatisticians, Epidemiologists

Usually takes from weeks to months primarily solving for the prioritized use cases

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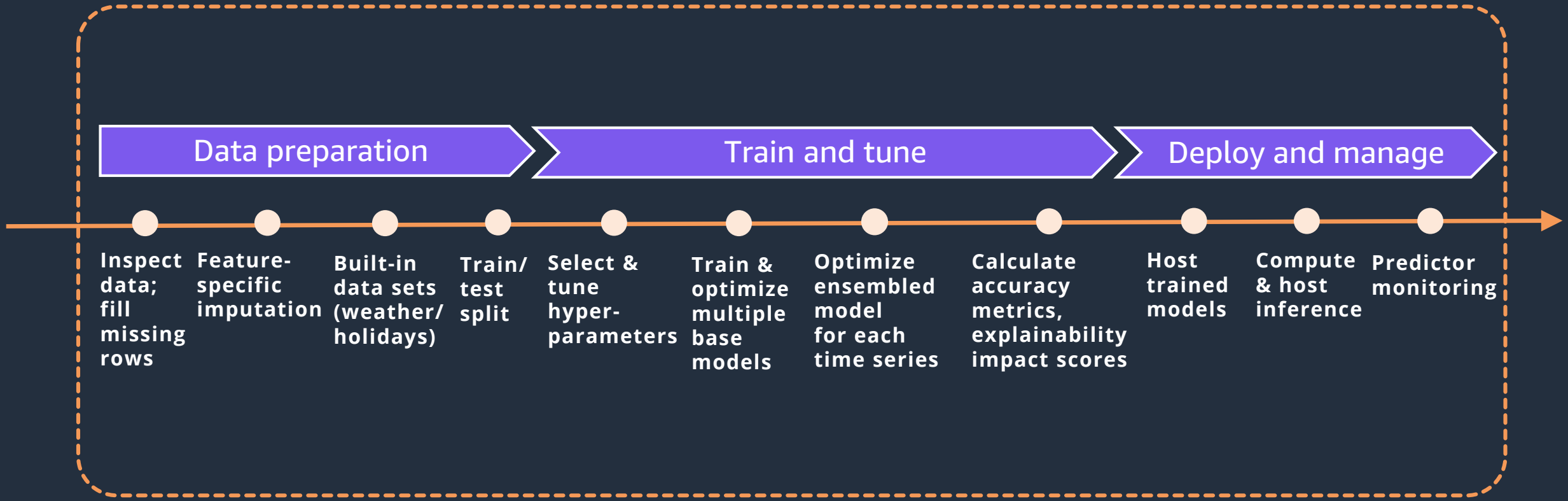
Typical steps in an ML process

Prepare, build, train, tune, deploy, and manage



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How can you scale ML value creation?

1

Expand Your ML Development Team

Grow your technical teams in proportion of your needs, **but** ML talent is in high demand

+74% **annual compound growth in past 4 years**

2x **the demand growth of any other emerging job role**

2

Enhance ML Team Productivity

Leverage low-code / no-code tools that make data science teams more productive

Enable data science teams to experiment faster with low-code / no-code Machine Learning capabilities

3

Democratize ML Innovation

Enable more groups of people, including data analysts to build ML models

Empower data analysts to make smarter decisions with no-code Machine Learning with a dedicated easy-to-use workspace

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Challenges analysts face in building ML solutions

Analysts lack deep ML expertise, and learning curve is steep

- Need to build understanding for ML concepts across data preparation, model development, and optimization
- Need expertise in choosing the right combination of feature engineering, type of model, and optimization technique
- Learning to write or decipher code is usually needed

Agencies need explainability and validation from experts

- Analysts prefer to partner with data scientists in order to learn and build trust in the process, but data scientists time is limited and typically devoted to a few key ML projects
- Analysts need to be able to explain ML model predictions to leadership

Available no-code ML tools tend to lack transparency and be cost prohibitive

- Many no-code ML options lack code-level transparency making it difficult to inspect and productionalize models
- The UX for analysts and data scientists tends to be the same, requiring analysts to know the ML concepts and jargon
- Frequently, no-code ML tools come with upfront costs, so even experimentation requires investment

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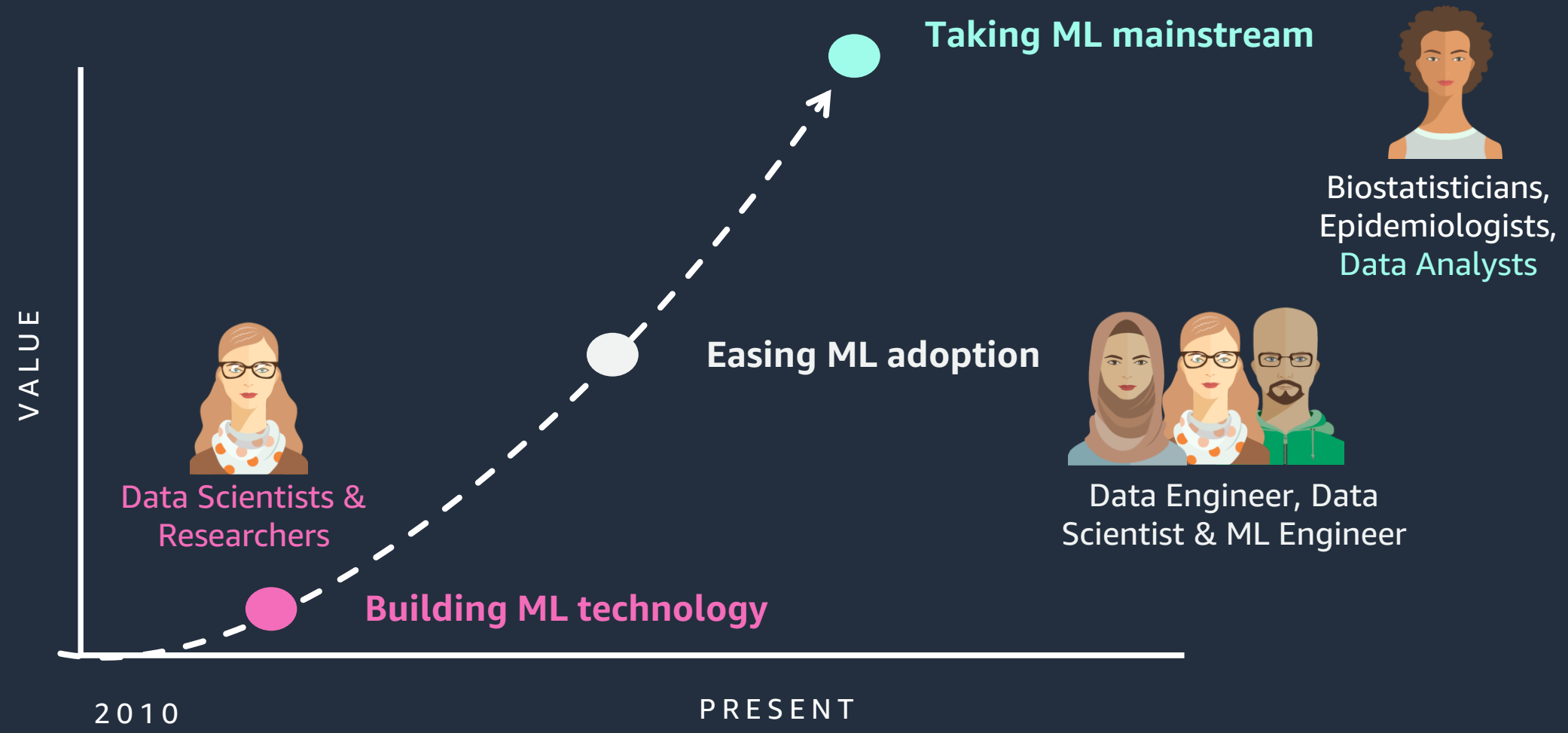
New technologies are helping to democratize ML



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Keys to unblocking the analyst

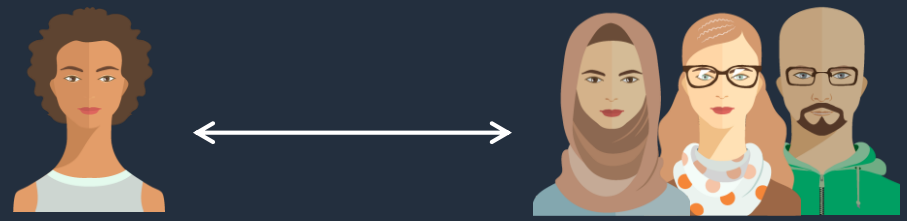
Analysts lack ML expertise, and upskilling is hard

Agencies need transparency and validation from experts

1 No-code is the future

In a June 2021 report, Gartner found that by 2024, 80% of tech products and services will be built by people who are not technology professionals
https://gtnr.it/3wOglym

2 Seamless collaboration



Biostatisticians, Epidemiologists, Data Analysts

Data Engineer, Data Scientist & ML Engineers

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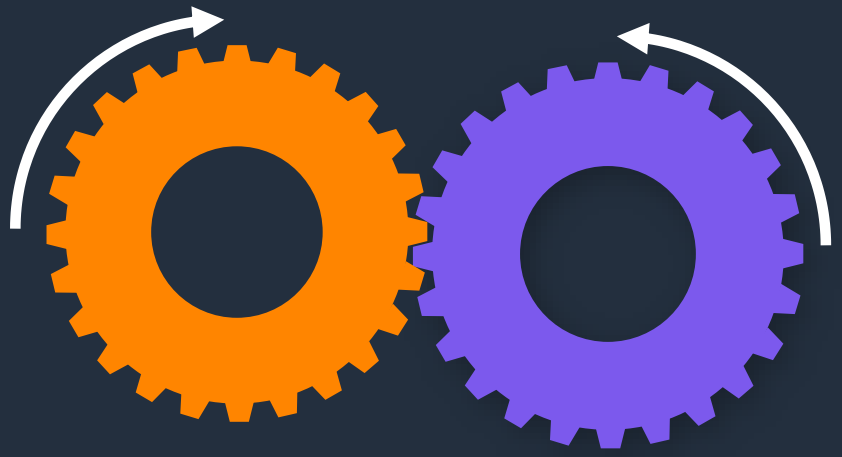
Our model for ML-driven forecasts and analyses

Accelerate Data Science Teams

Do more with your current team by using low-code machine learning tools in order to get to the desired outcomes faster



Enable Non-Technical Users

Give leaders and data analysts the ability to do ML without any code, scaling the number of people who can create ML powered insights, forecasts, and predictions

Collaborate together

Amazon SageMaker Low Code / No Code ML has several points of collaboration making it easy for analysts to use data scientist models or for data scientists to make changes on the models analysts build.

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Realizing ML vision using Amazon SageMaker

Epidemiologists, Data Scientists and Researchers

ML Engineers and Biostatisticians

Want to develop, deploy the best performing model, monitor performance and data governance

Data Engineers and Scientists

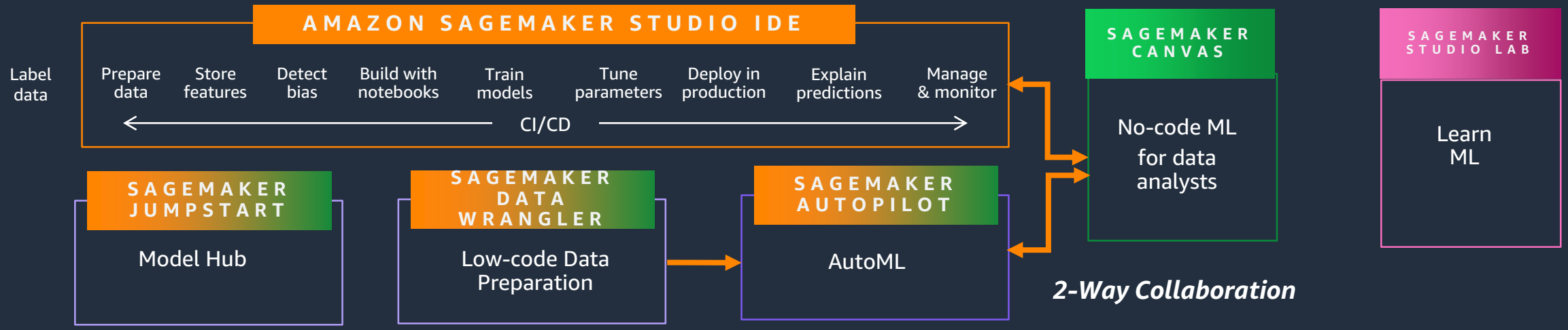
Need single pane of glass to manage data and ML

Data Analyst

Need easy way to translate domain knowledge to predictions and insights

New ML Developers

Need ready-to-use ML development environment



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AWS low code / no code (LCNC) ML ecosystem

Non-technical Users

Amazon SageMaker Canvas

A visual interface for **data analysts** to generate ML-powered predictions — without requiring any machine learning experience or having to write a single line of code.

Classifications | Regressions | Time-Series Forecasts

+

Data Scientists and Developers

Amazon SageMaker Studio

A dedicated workspace for **data scientists, developers, and data engineers** to collaborate and bring ML to market faster

Data Wrangler

A faster, visual way to aggregate and prepare data for machine learning

Autopilot

AutoML to automatically prepare your data, and build, train, and tune the best machine learning models for your tabular datasets

JumpStart

Pre-built solutions and a model zoo of pre-trained and easily tunable state-of-the-art models for Computer Vision, and Natural Language Processing

Deployment

Many deployment options in SageMaker

Model governance

Production workflows

Monitor & adjust

Integration with data layers and BI tools

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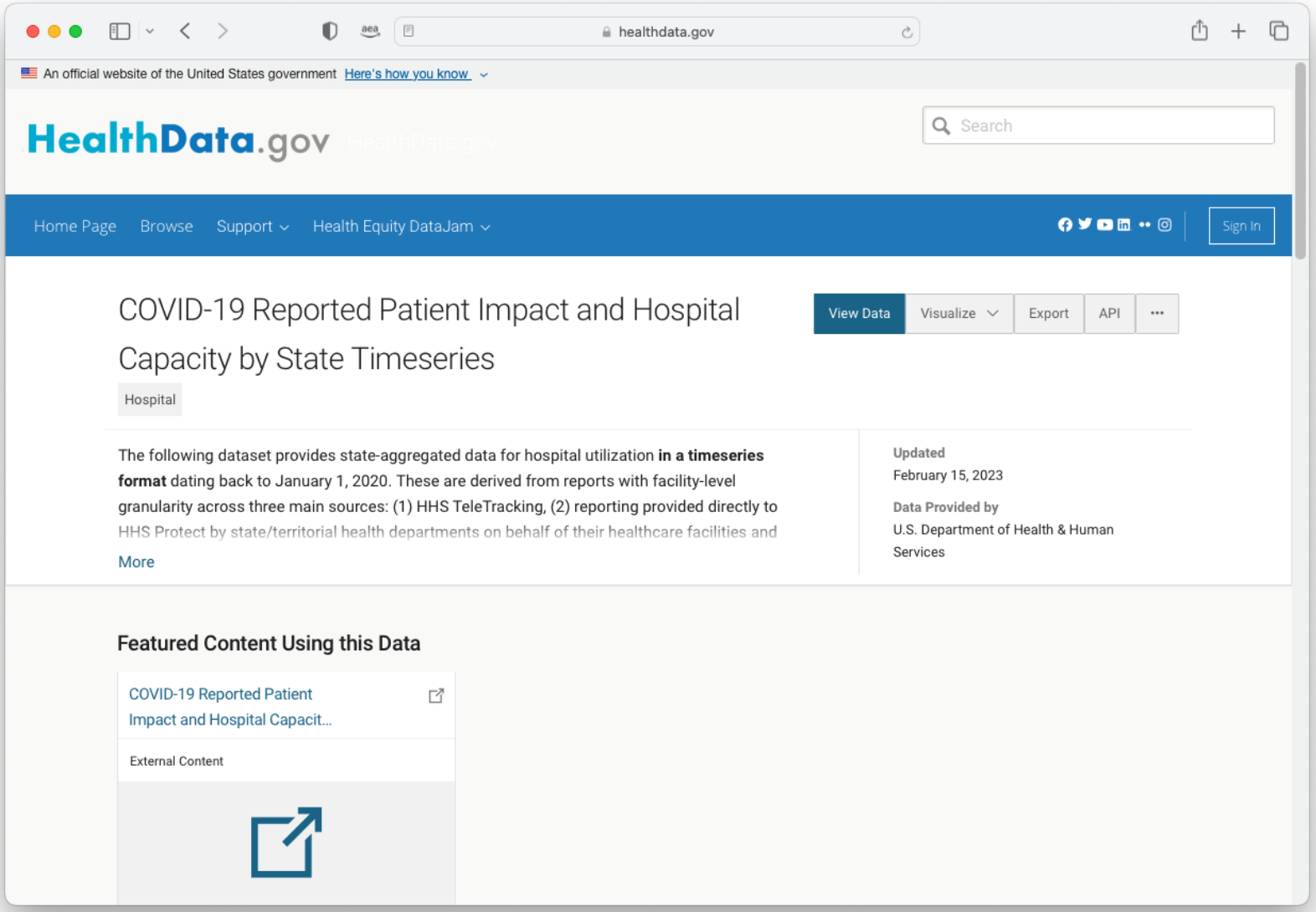
We’re going to forecast on-hand inventory of therapeutics for COVID-19



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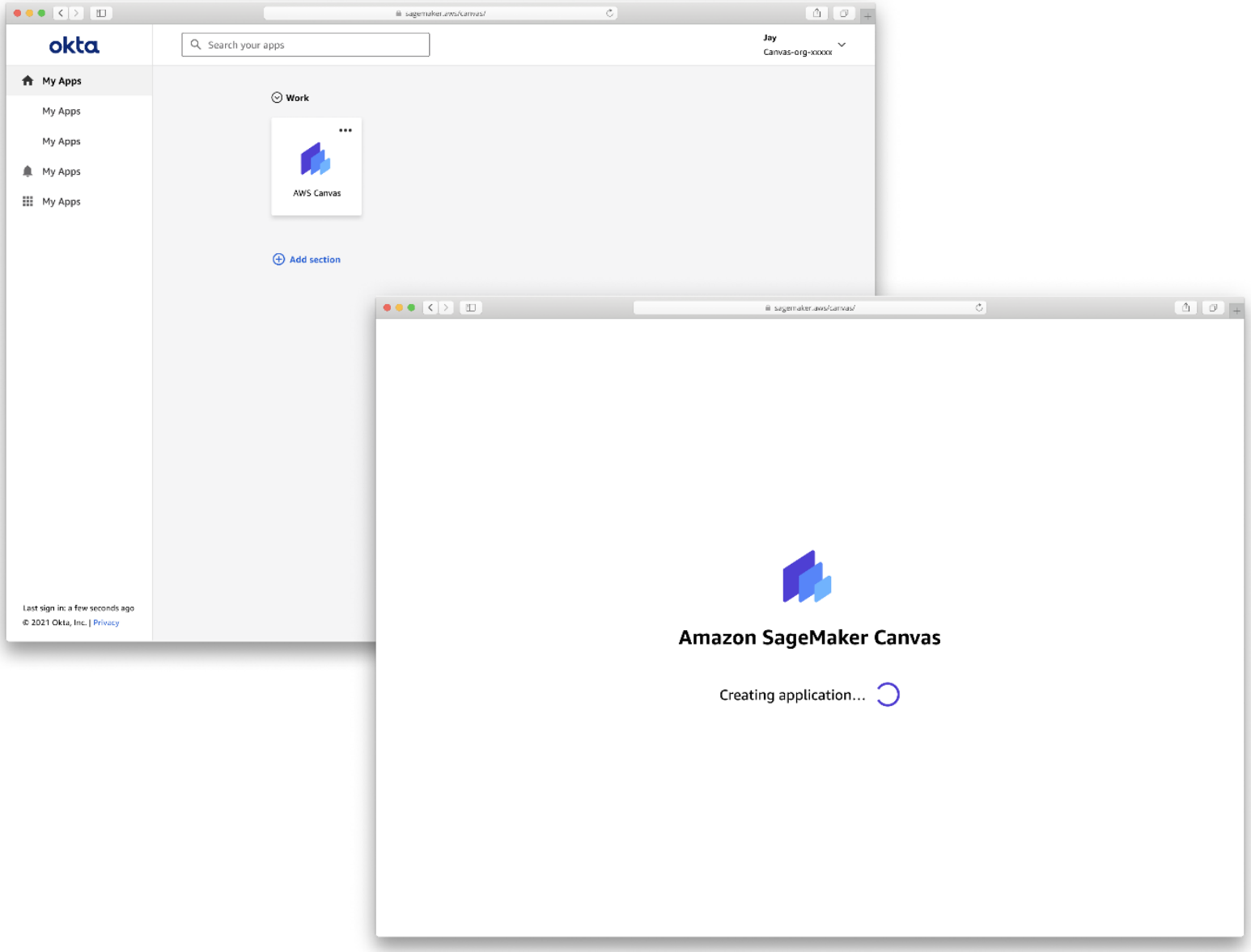
Self-service access to an analyst-friendly tool for Machine Learning, outside of the AWS console



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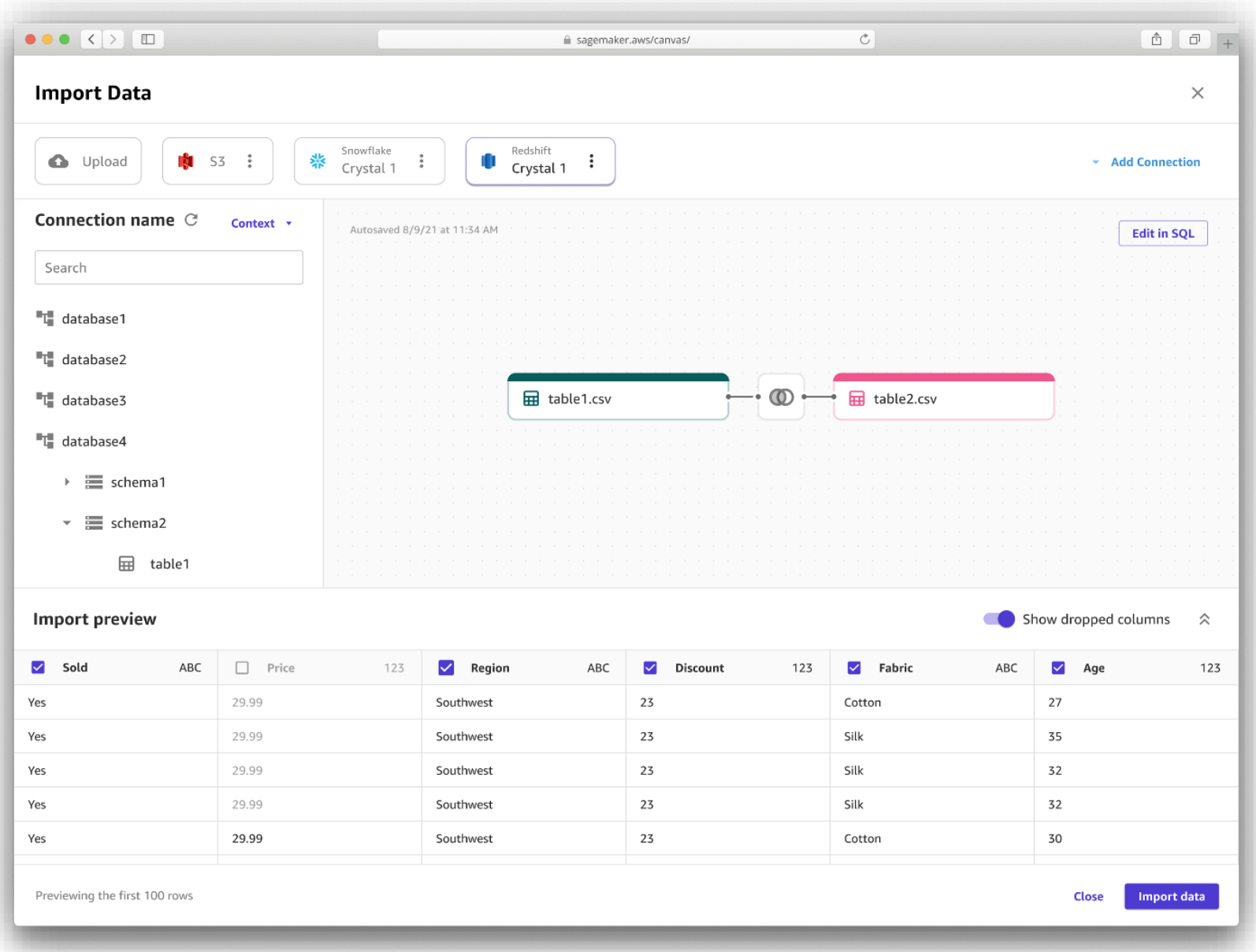
We could combine datasets from various sources like AWS storage, and databases, Snowflake, or your local drive



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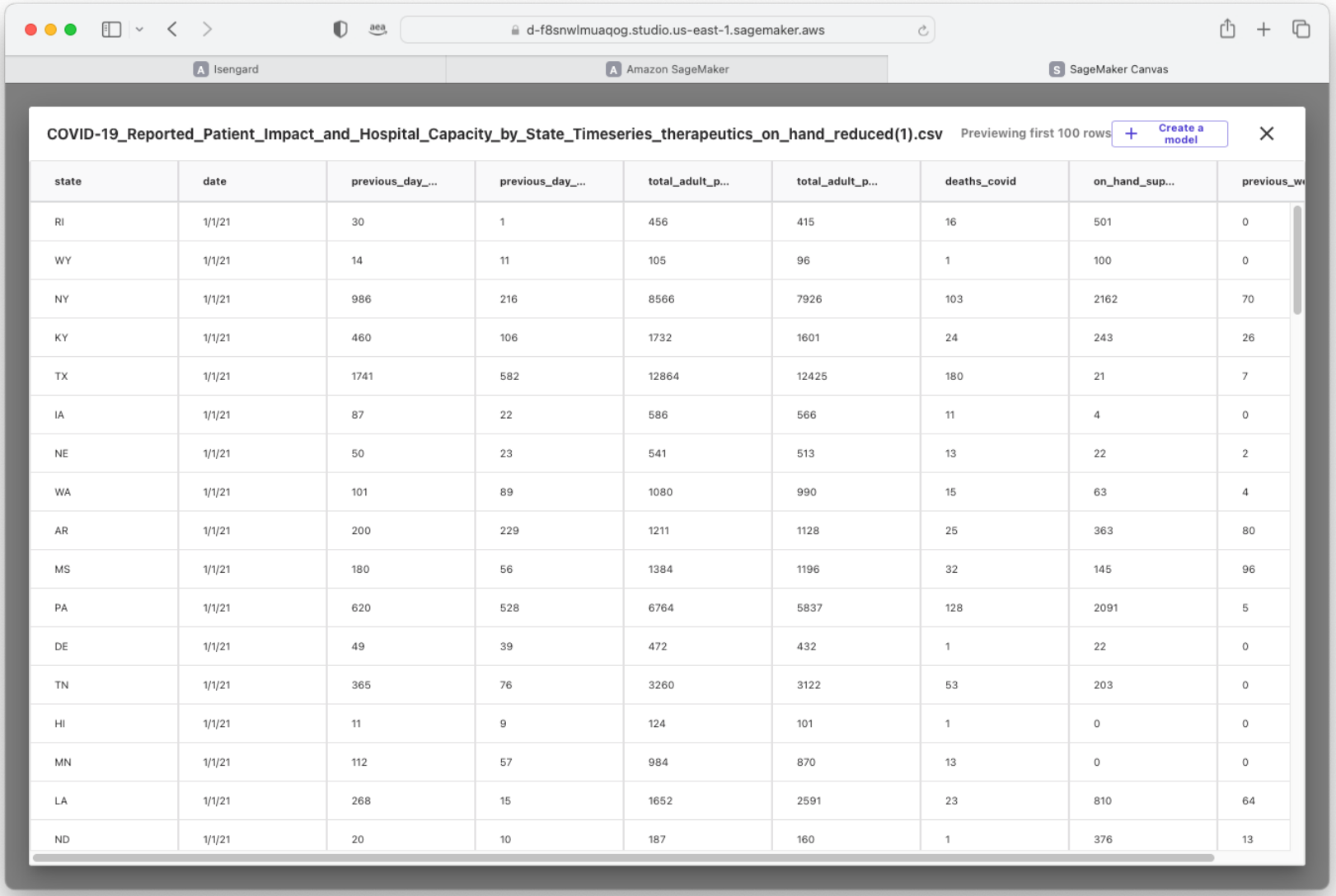
We are uploading the dataset as-is with a reduced set of features and rows



state	date	previous_day_...	previous_day_...	total_adult_p...	total_adult_p...	deaths_covid	on_hand_sup...	previous_w
RI	1/1/21	30	1	456	415	16	501	0
WY	1/1/21	14	11	105	96	1	100	0
NY	1/1/21	986	216	8566	7926	103	2162	70
KY	1/1/21	460	106	1732	1601	24	243	26
TX	1/1/21	1741	582	12864	12425	180	21	7
IA	1/1/21	87	22	586	566	11	4	0
NE	1/1/21	50	23	541	513	13	22	2
WA	1/1/21	101	89	1080	990	15	63	4
AR	1/1/21	200	229	1211	1128	25	363	80
MS	1/1/21	180	56	1384	1196	32	145	96
PA	1/1/21	620	528	6764	5837	128	2091	5
DE	1/1/21	49	39	472	432	1	22	0
TN	1/1/21	365	76	3260	3122	53	203	0
HI	1/1/21	11	9	124	101	1	0	0
MN	1/1/21	112	57	984	870	13	0	0
LA	1/1/21	268	15	1652	2591	23	810	64
ND	1/1/21	20	10	187	160	1	376	13

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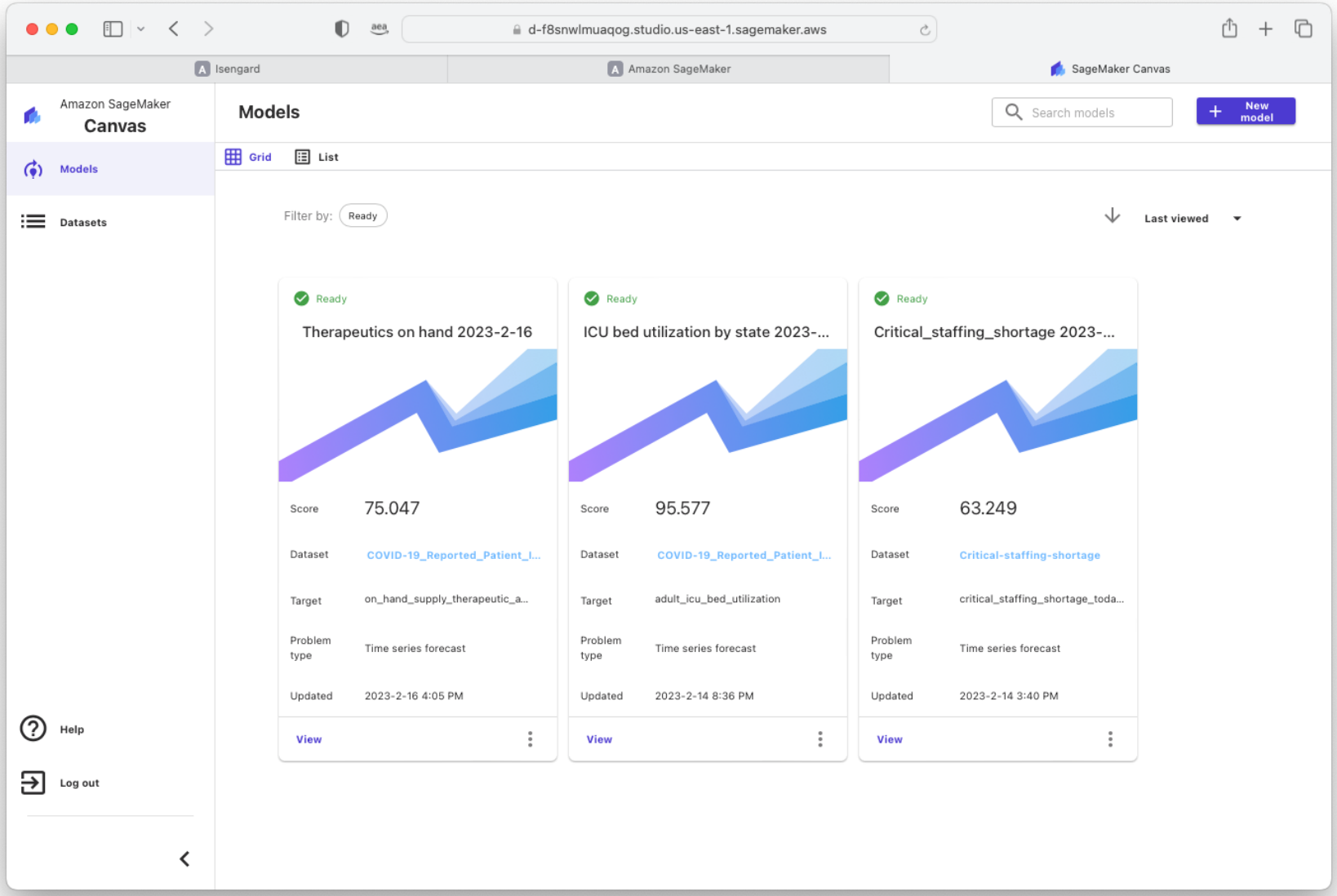
Create multiple models on the same dataset to compare accuracy scores



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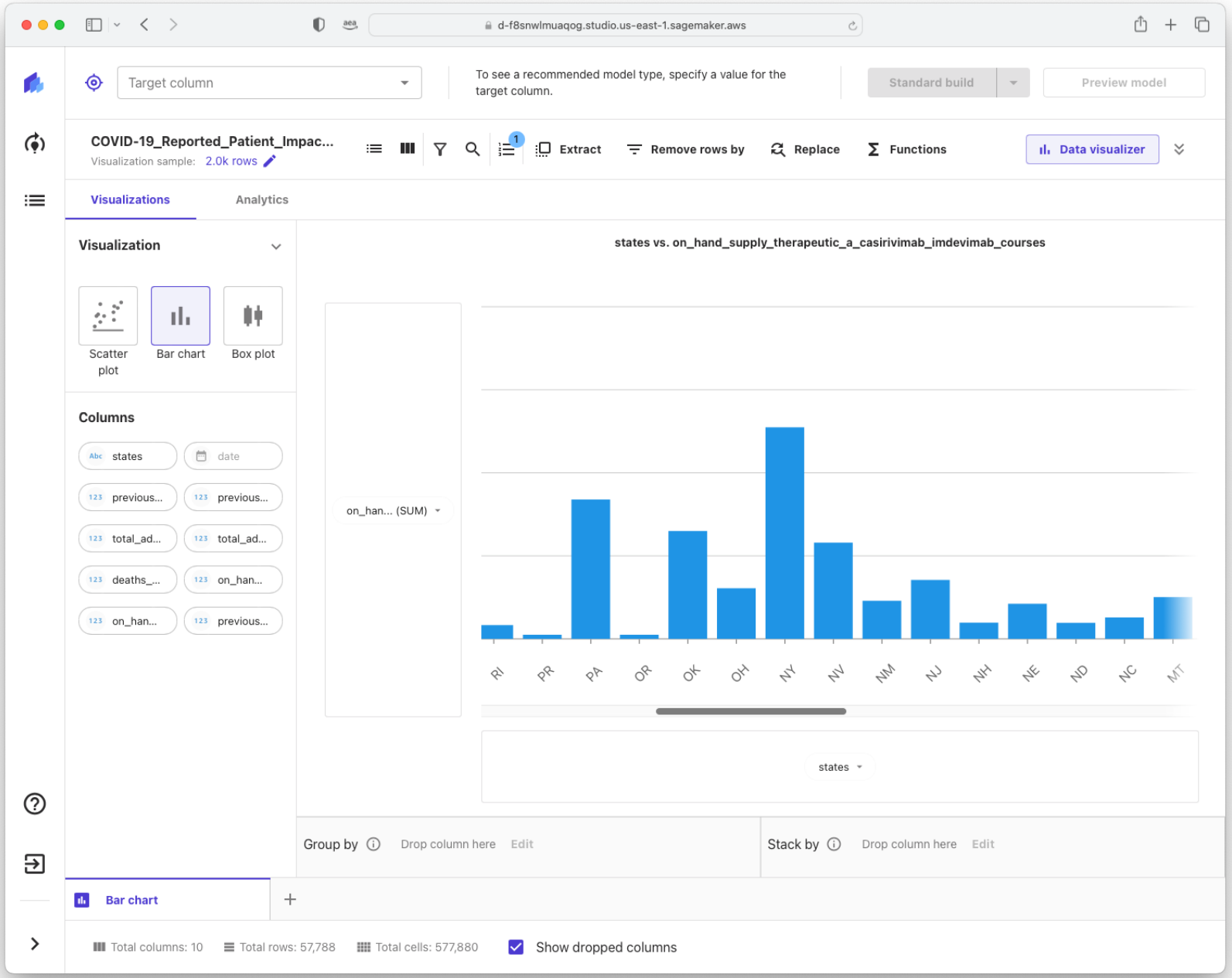
Explore and visualize your data to gain insights into your data before building ML models



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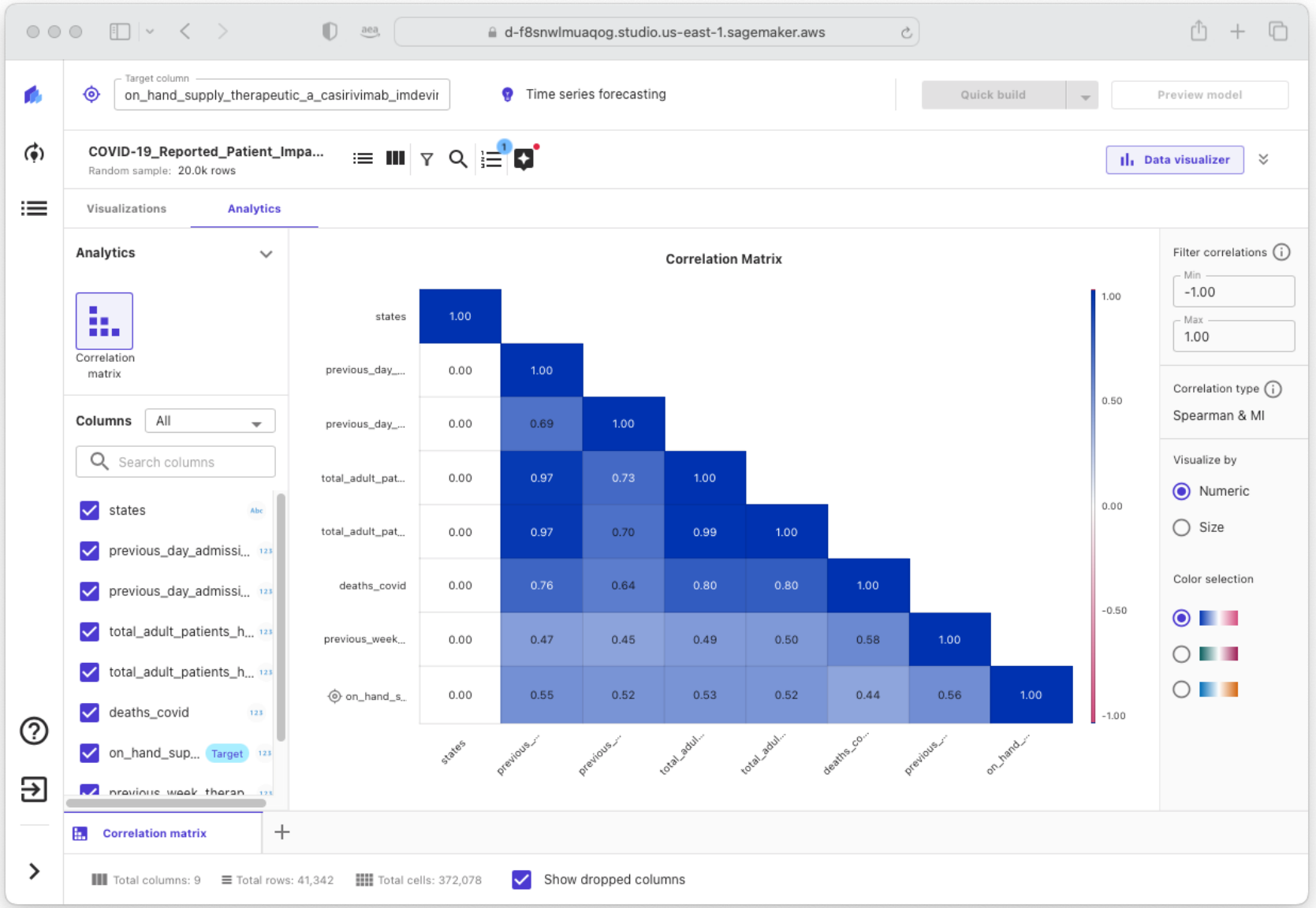

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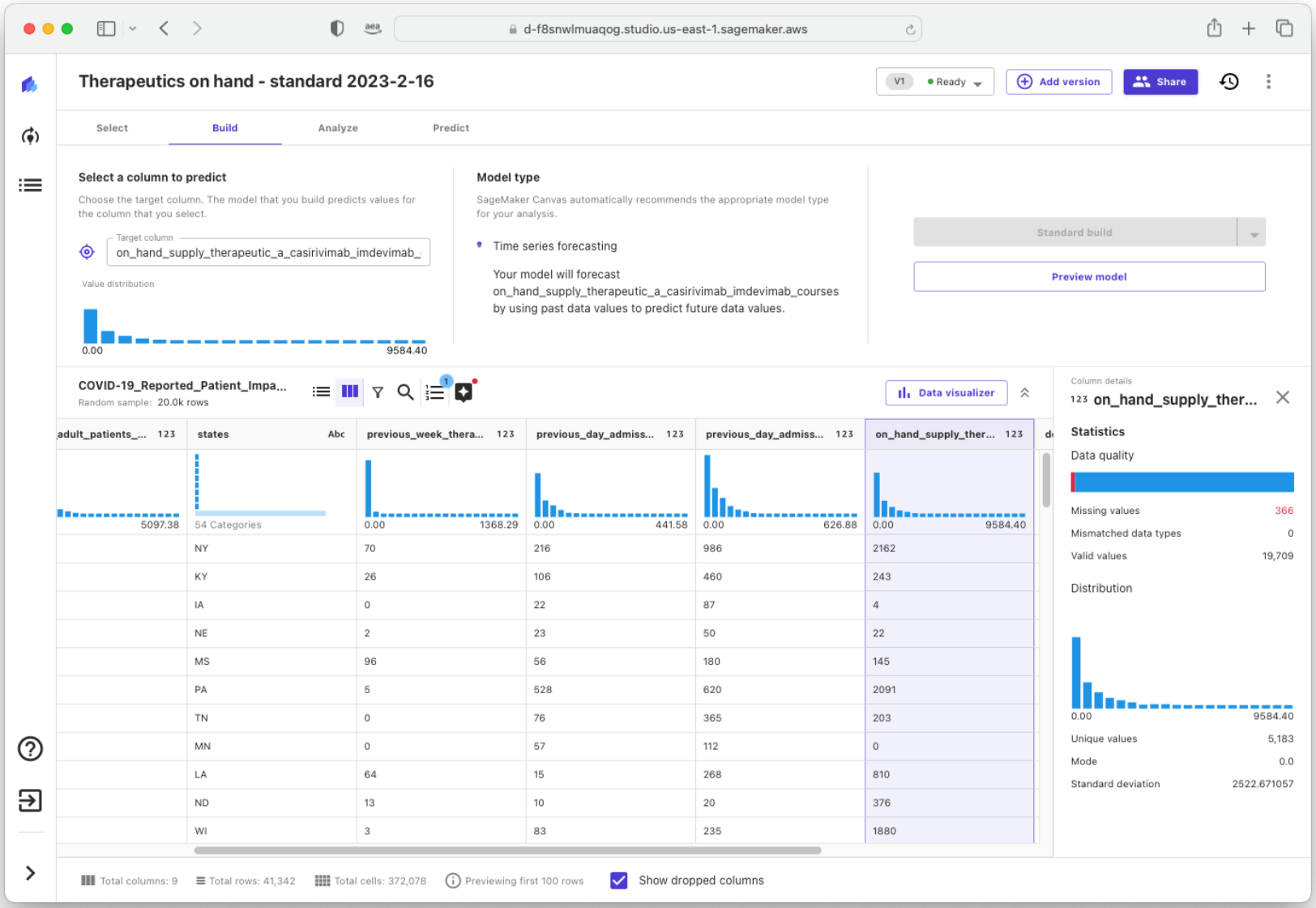
Get ready to build the model



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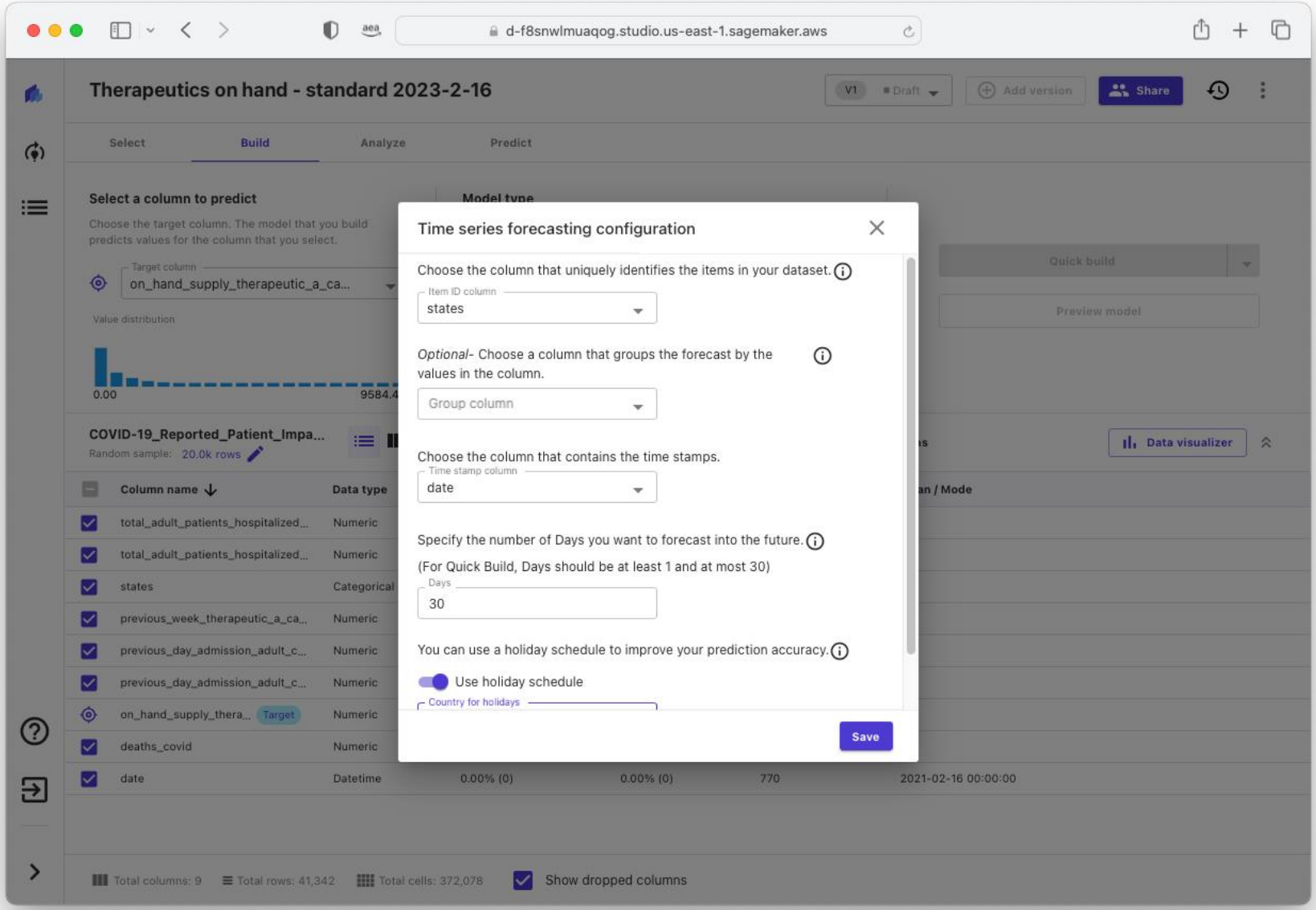
Automatically build an accurate ML model for your dataset



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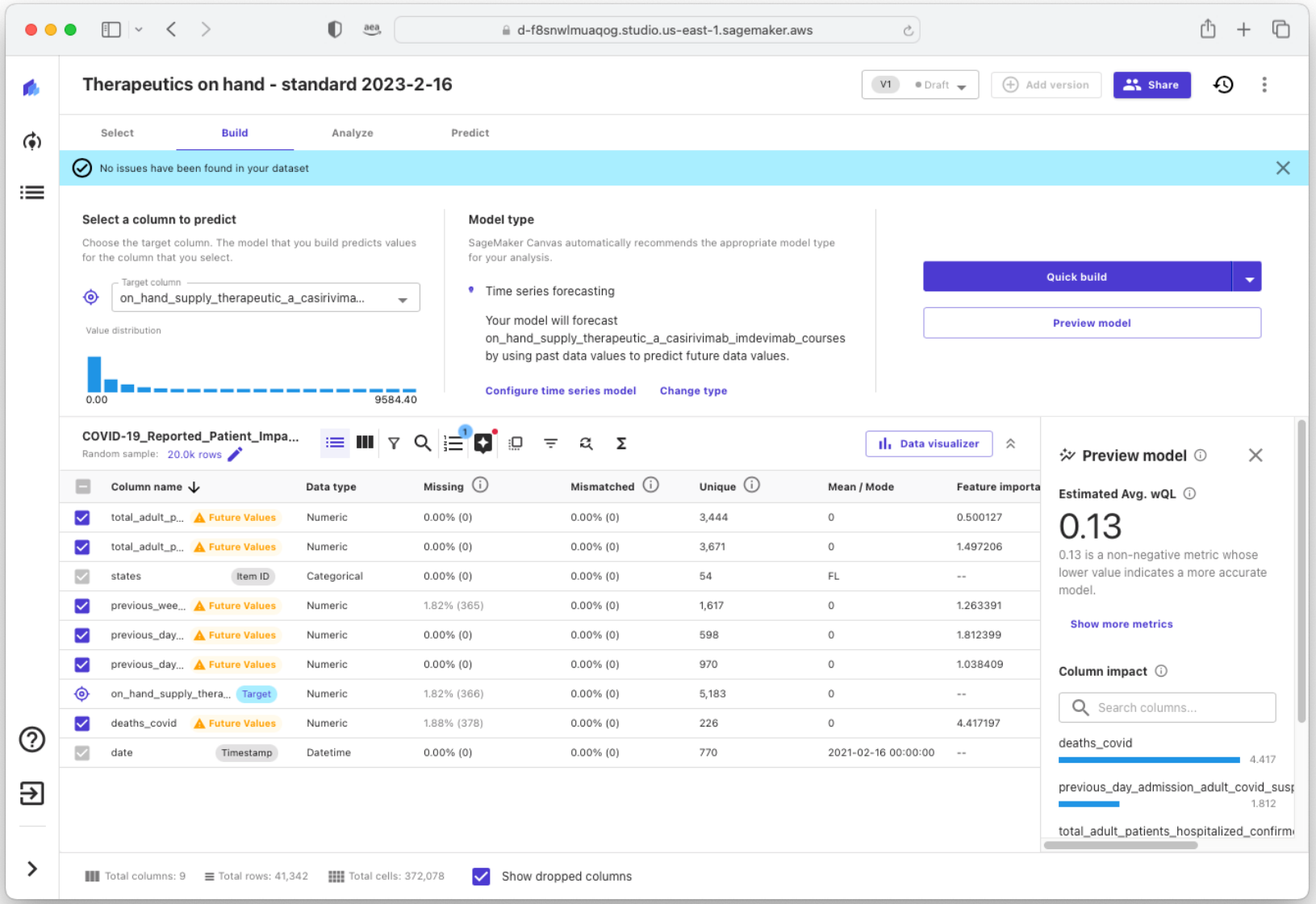
Get the first ML model in minutes. Review advanced metrics and feature importance to understand and explain predictions.



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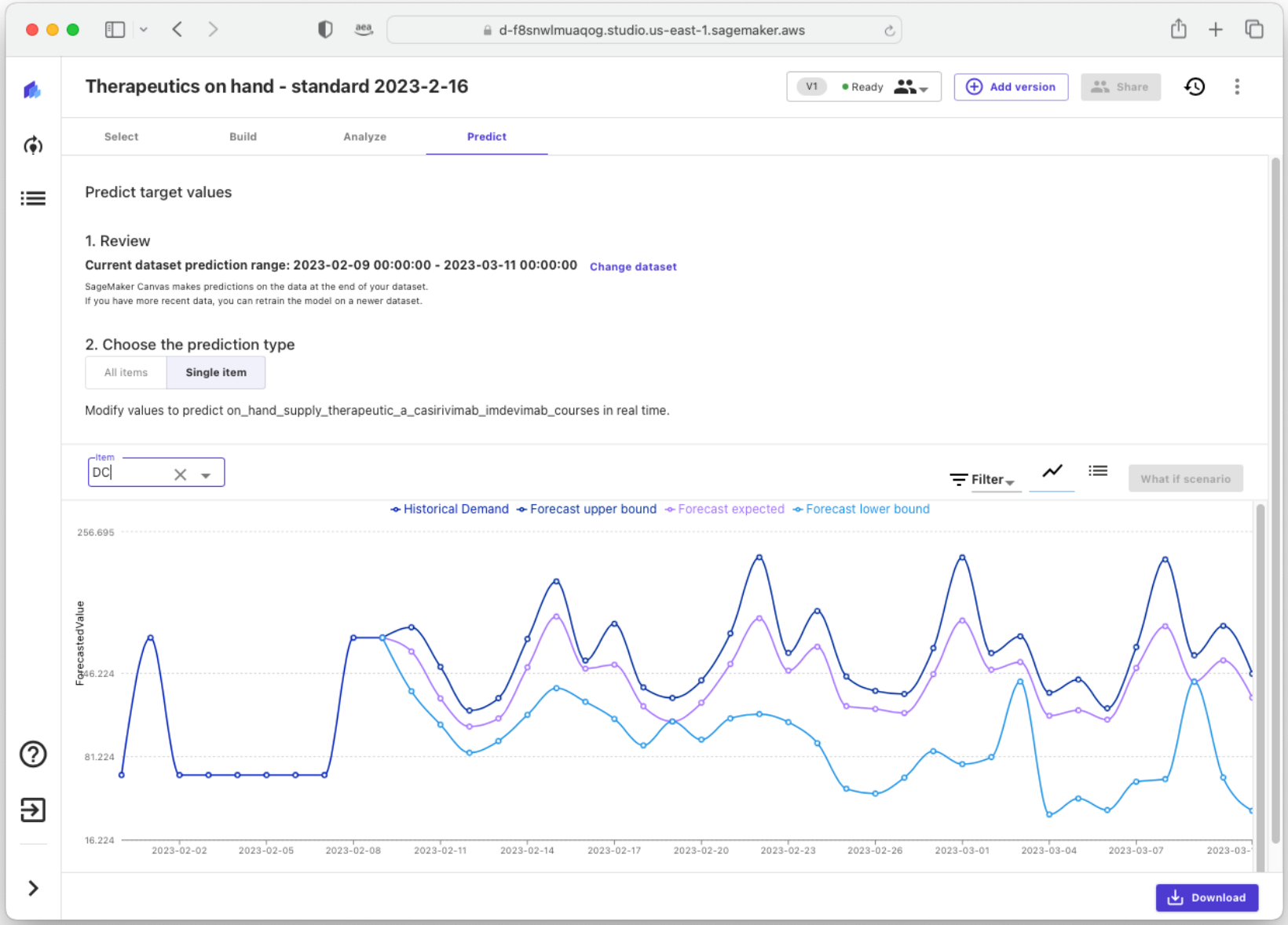
Let’s look at some results



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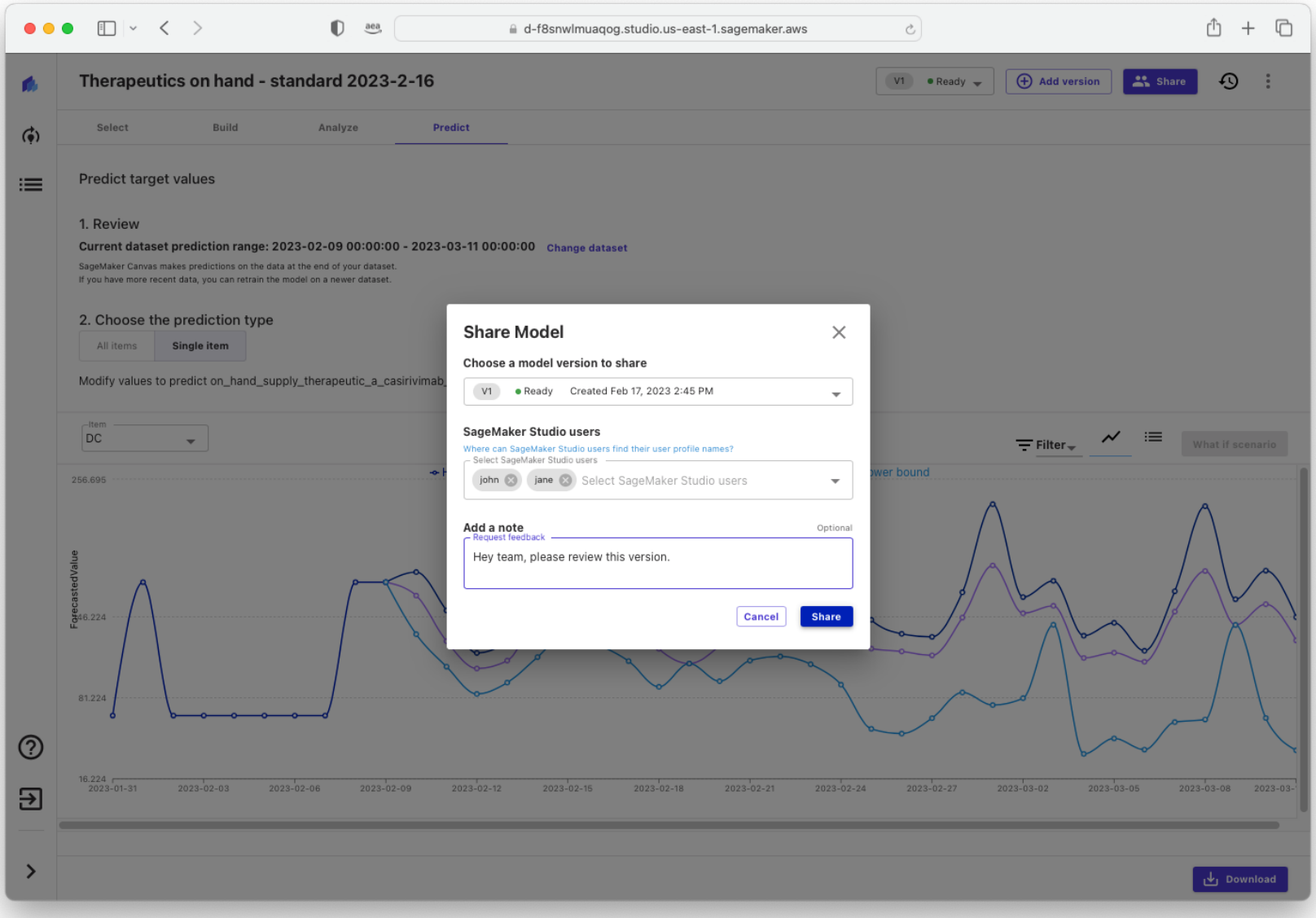
Share ML models with data scientists for review and update so you can generate predictions on new model versions



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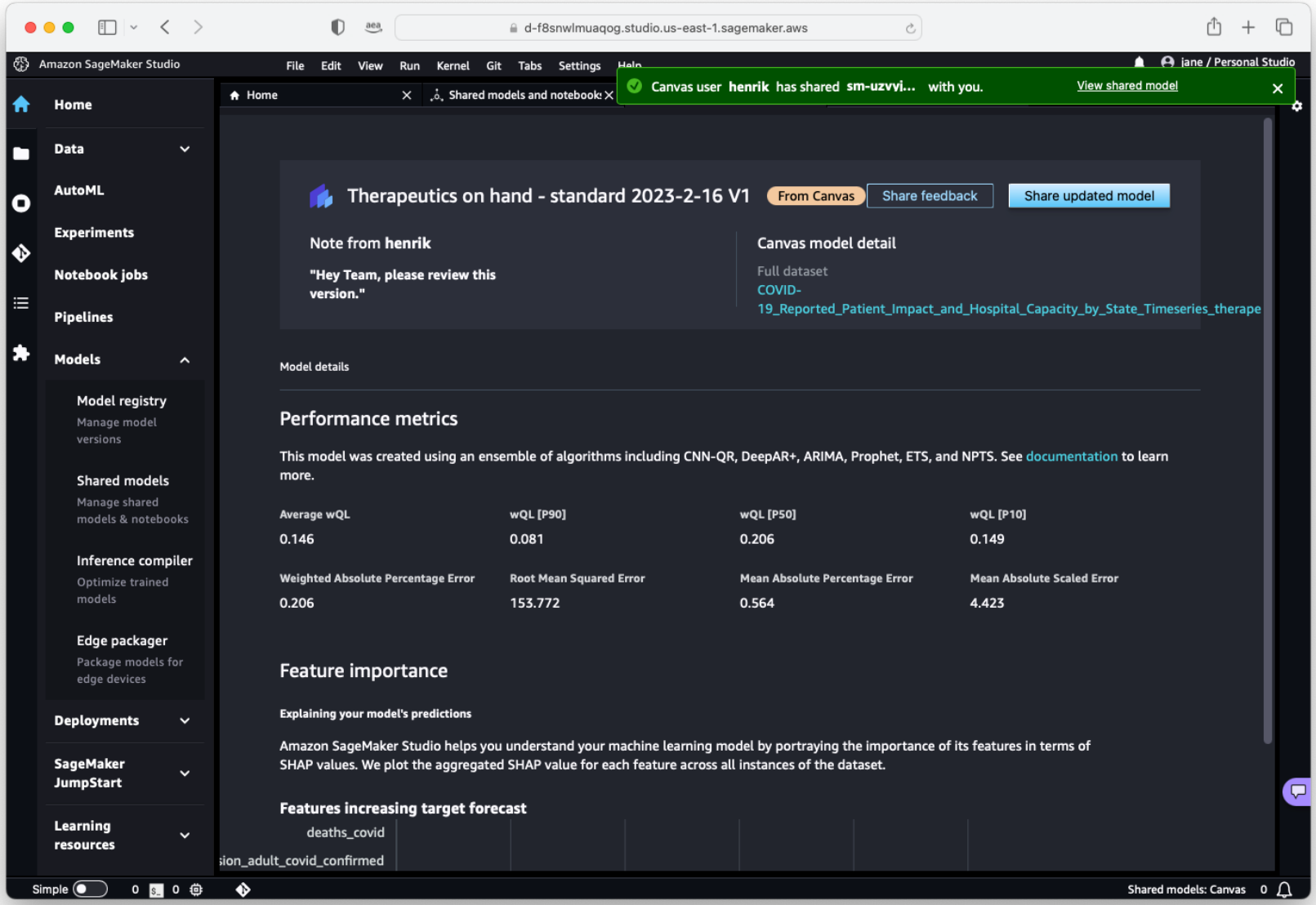
Import ML models built and trained *anywhere* and generate predictions directly in SageMaker Canvas



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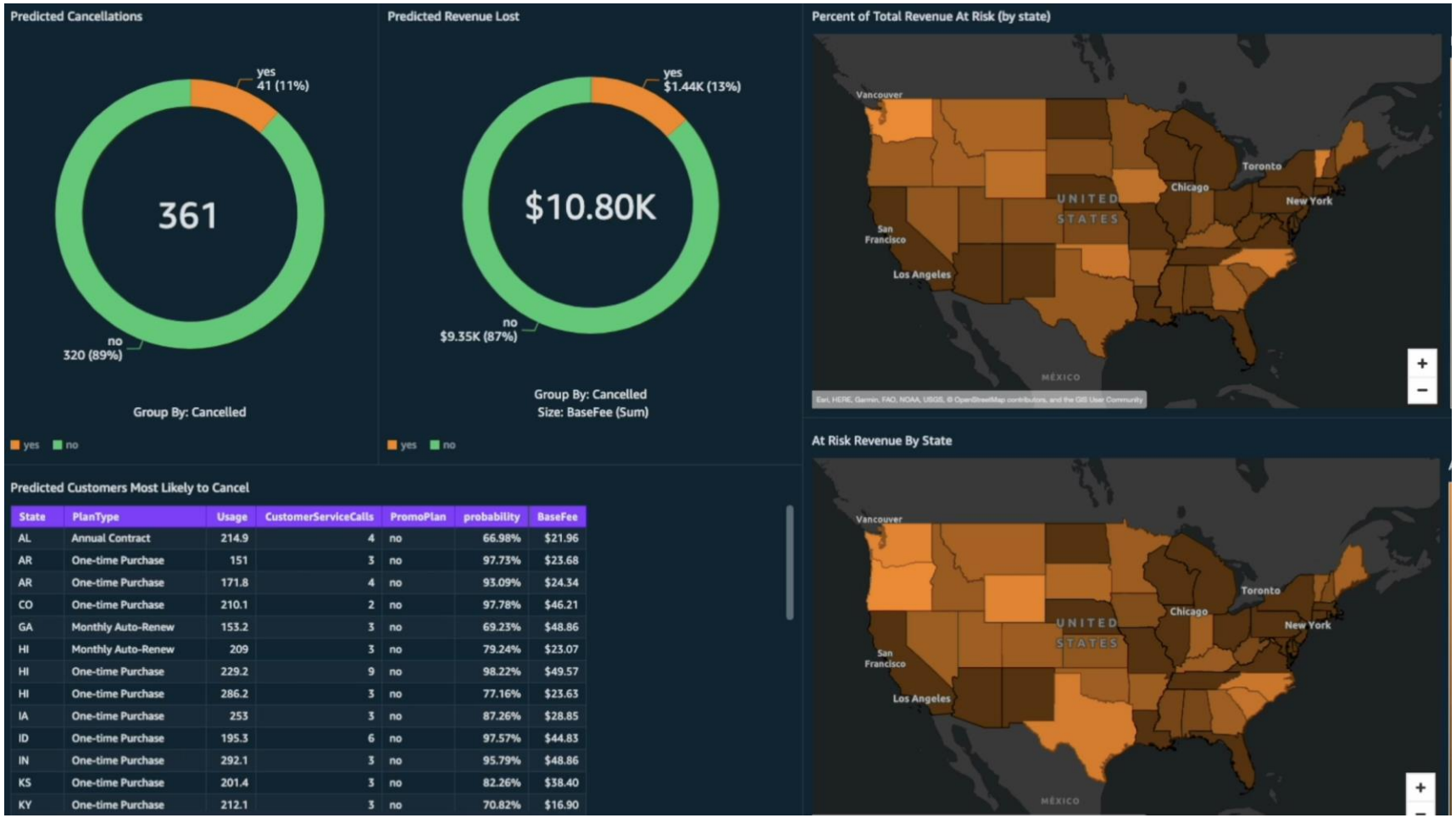
Run what-if scenarios, get predictions on an entire dataset, or build predictive dashboards



State	PlanType	Usage	CustomerServiceCalls	PromoPlan	probability	BaseFee
AL	Annual Contract	214.9	4	no	66.98%	$21.96
AR	One-time Purchase	151	3	no	97.73%	$23.68
AR	One-time Purchase	171.8	4	no	93.09%	$24.34
CO	One-time Purchase	210.1	2	no	97.78%	$46.21
GA	Monthly Auto-Renew	153.2	3	no	69.23%	$48.86
HI	Monthly Auto-Renew	209	3	no	79.24%	$23.07
HI	One-time Purchase	229.2	9	no	98.22%	$49.57
HI	One-time Purchase	286.2	3	no	77.16%	$23.63
IA	One-time Purchase	253	3	no	87.26%	$28.85
ID	One-time Purchase	195.3	6	no	97.57%	$44.83
IN	One-time Purchase	292.1	3	no	95.79%	$48.86
KS	One-time Purchase	201.4	3	no	82.26%	$38.40
KY	One-time Purchase	212.1	3	no	70.82%	$16.90

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Opportunities for making better decisions in public health

Health outcomes

- Improve diagnostics
- Early detection for faster intervention
- Disease risk prediction
- Decision support
- Health risk prediction

Public health

- Surveillance and detecting adverse events
- Advancing health equity
- Analyze large volumes of data
- Identify health trends
- Provide situational awareness

Response readiness

- Demand forecasting
- Capacity forecasting
- Inventory efficiency
- Predictive quality
- Scenario modeling

and many more…

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Interested in learning more about how no-code ML can drive forecasting and analytics?

Visit our Amazon SageMaker Canvas site to find out more

Get started with Amazon SageMaker machine learning tutorials

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Thank you!

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Henrik Balle
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