



AWS  
re:Invent

**AIM 214 - R**

# Introducing Amazon SageMaker Studio

## **Sumit Thakur**

Senior Product Manager  
Amazon SageMaker  
Amazon Web Services

## **Sharath Pasupunuti**

Sr. Director of Engineering  
Edison AI at GE Healthcare

# Agenda

Why machine learning

Why machine learning is hard

Build, train, and deploy models with Amazon SageMaker

Introducing Amazon SageMaker Studio

Demo

Customer story—GE Healthcare

# Why machine learning



Better products

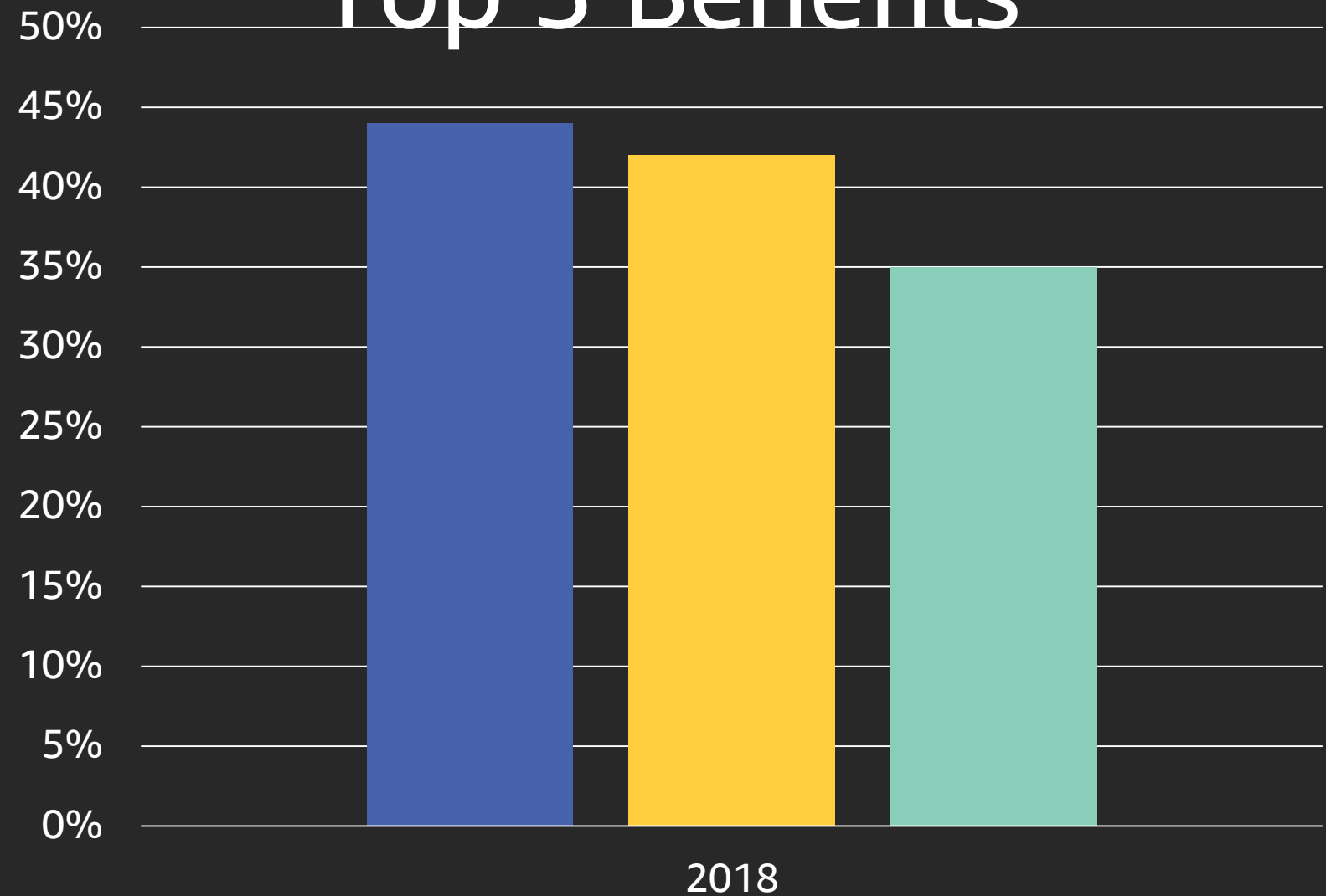


Better operations

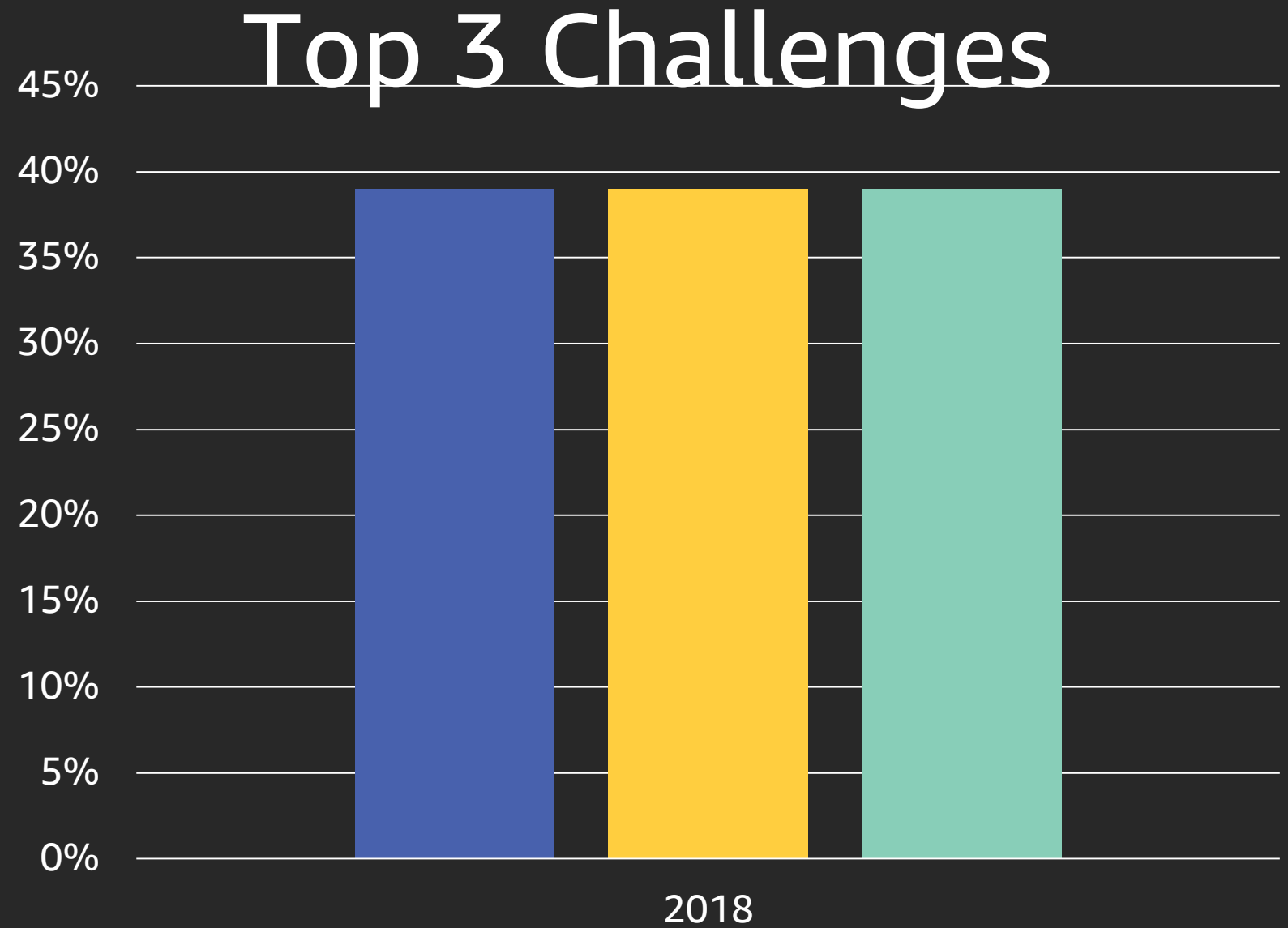
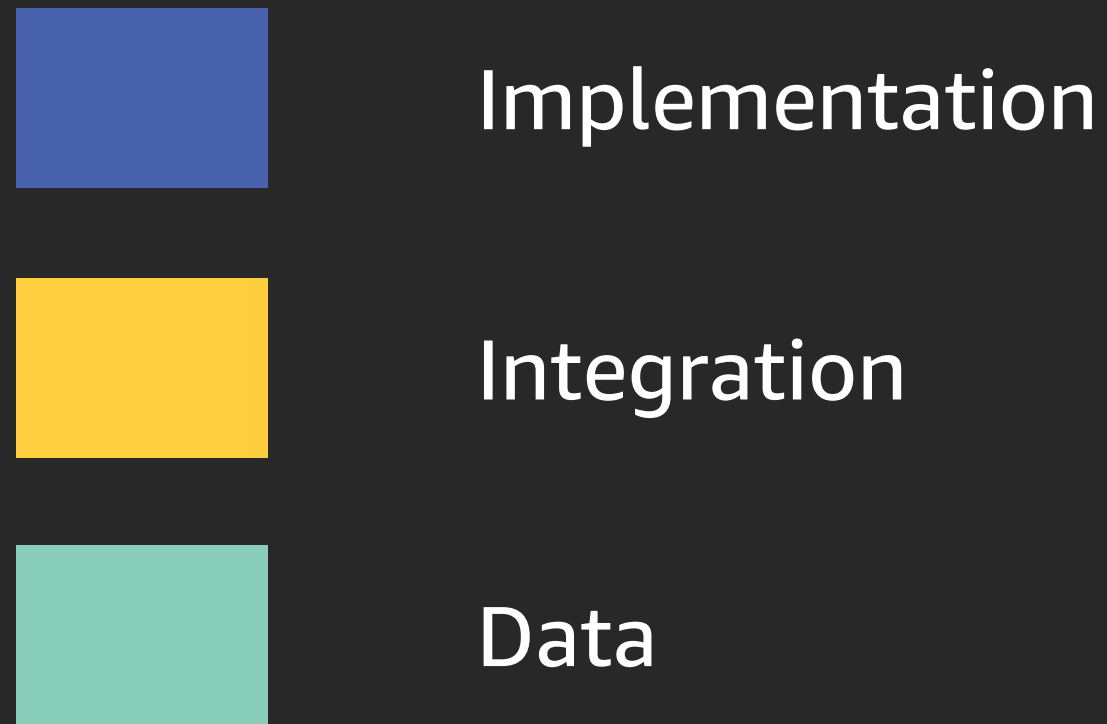


Better decisions

## Top 3 Benefits



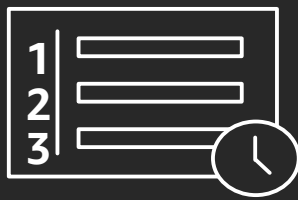
# Why machine learning is hard



# Machine learning workflow



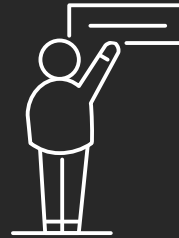
Collect and  
prepare training  
data



Choose and  
optimize your  
ML algorithm



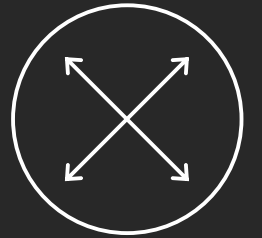
Set up and  
manage  
environments  
for training



Train and  
tune ML models



Deploy models  
in production



Scale and manage  
the production  
environment

# Build, train, and deploy models with Amazon SageMaker

## Build

Fast, accurate labeling  
Fully managed notebooks

Collect and prepare  
training data

Choose and  
optimize algorithm

## Train

One-click training  
Automatic model tuning

Manage training  
environments

Train and tune ML  
models

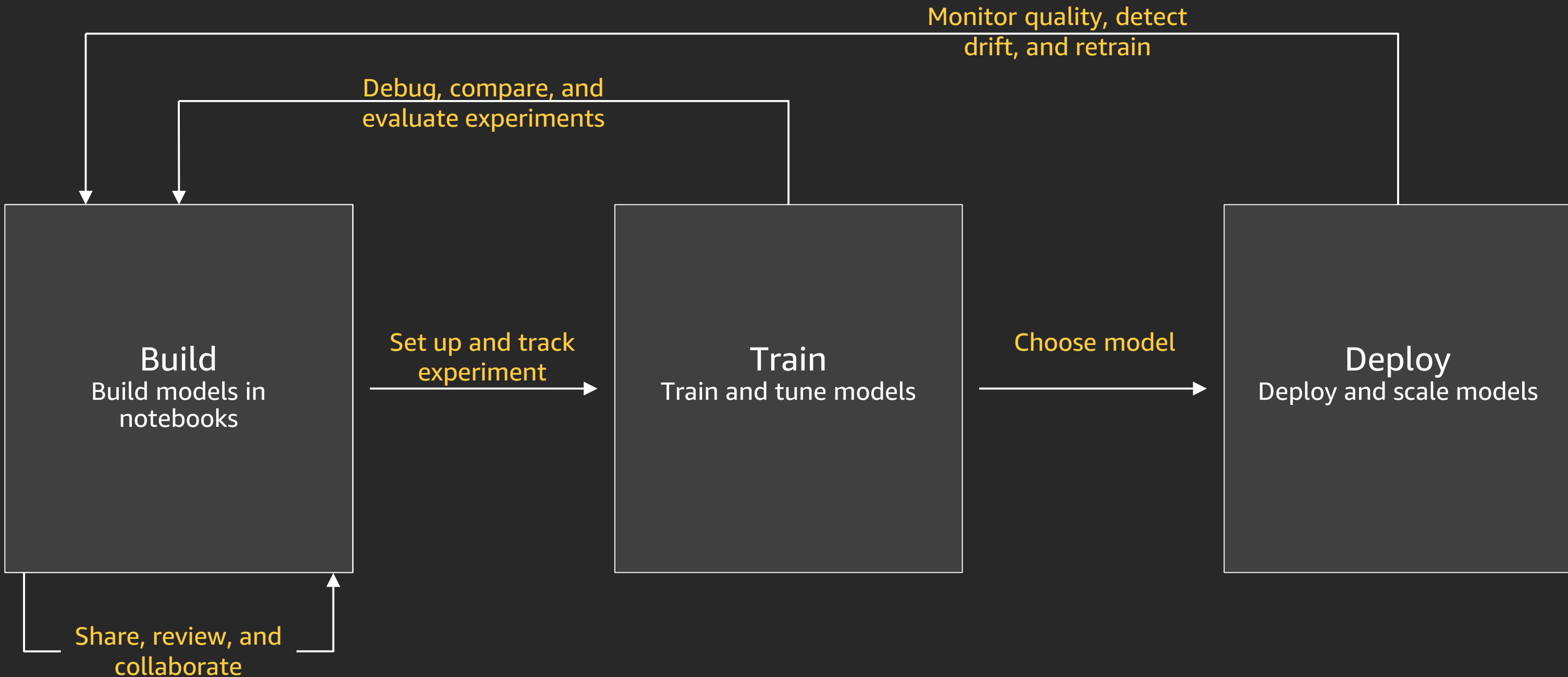
## Deploy

One-click deployment  
Fully managed Auto Scaling

Deploy models in  
production

Scale production  
environment

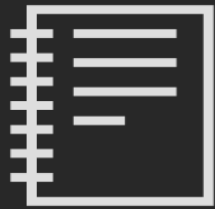
# Machine learning is iterative





# Introducing Amazon SageMaker Studio

# Introducing Amazon SageMaker Studio



## Amazon SageMaker Notebooks

Quick start collaborative notebooks



## Amazon SageMaker Experiments

Organize, track, and compare ML experiments



## Amazon SageMaker Debugger

Debug models with real-time, automated alerts



## Amazon SageMaker Model Monitor

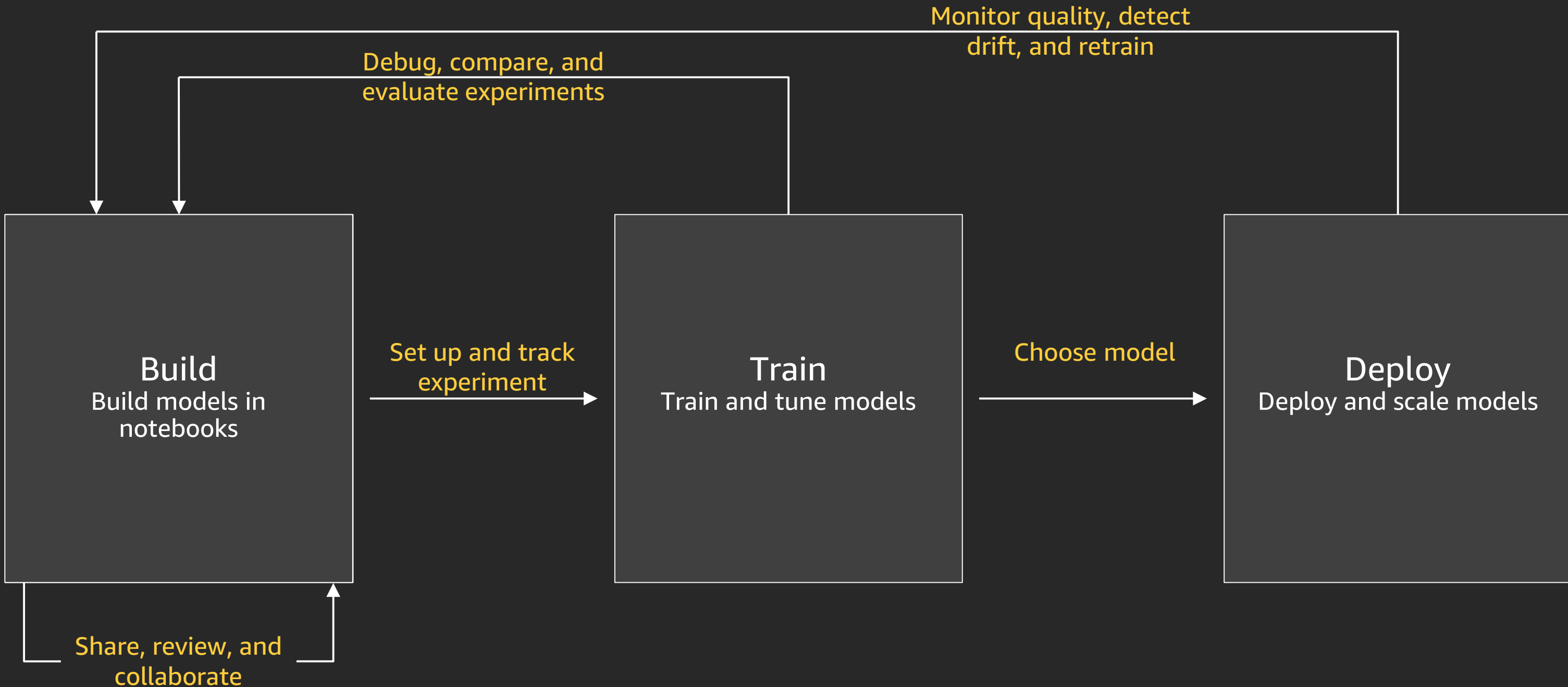
Monitor models in production and detect drift



## Amazon SageMaker Autopilot

Get from data to models automatically

# Build fast and collaborate



# Quick Start collaborative Amazon SageMaker Notebooks



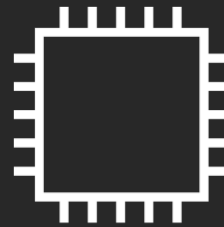
Single sign-on

Integrated with AWS SSO



Secure

Administrators govern access and permissions



Switch compute environments

Switch compute instances on the fly



One-click share

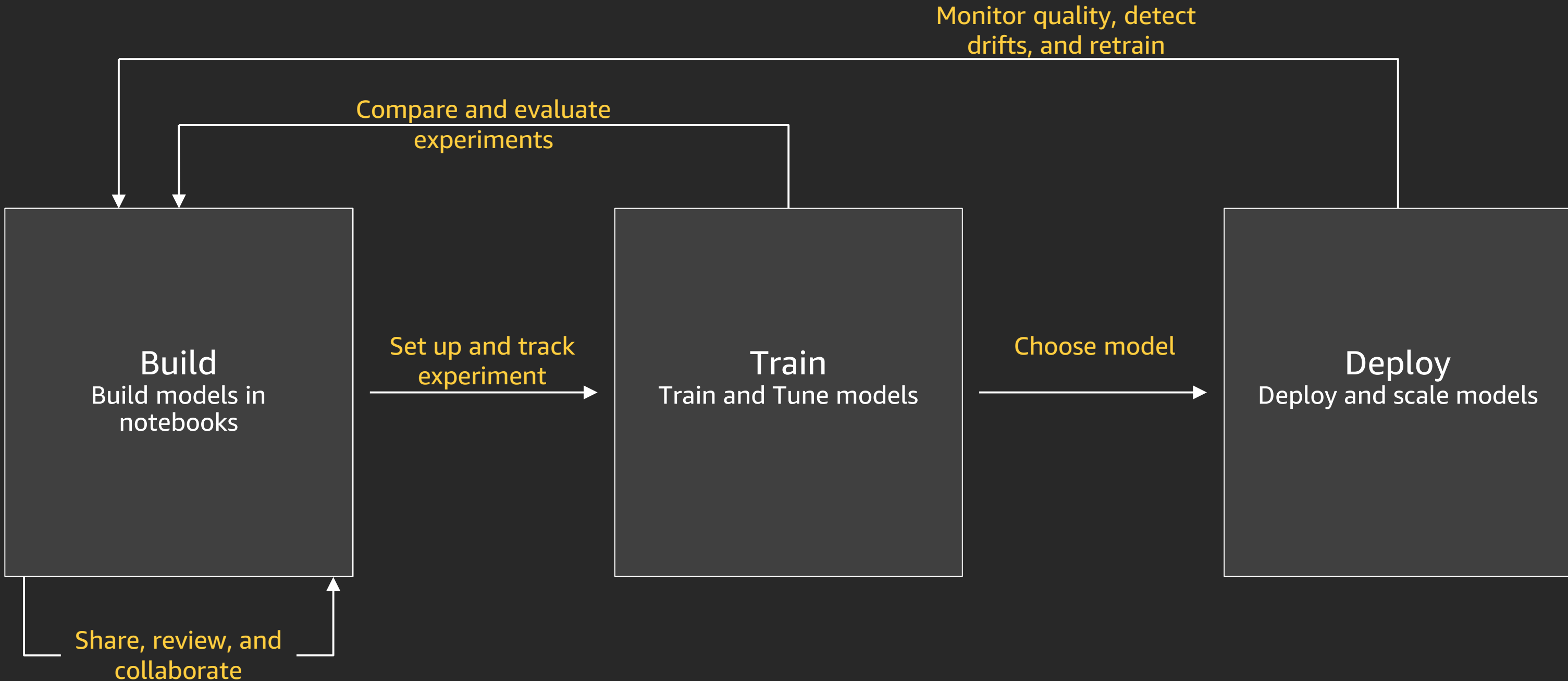
Share URL with a single click



Reproducible notebooks

Easily reproduce and review notebooks

# Manage Experiments

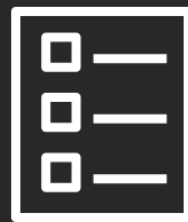


# Amazon SageMaker Experiments



Track experiments

Track parameters, metrics,  
models, and more



Organize

Organize your experiments  
and trials



Compare  
experiments

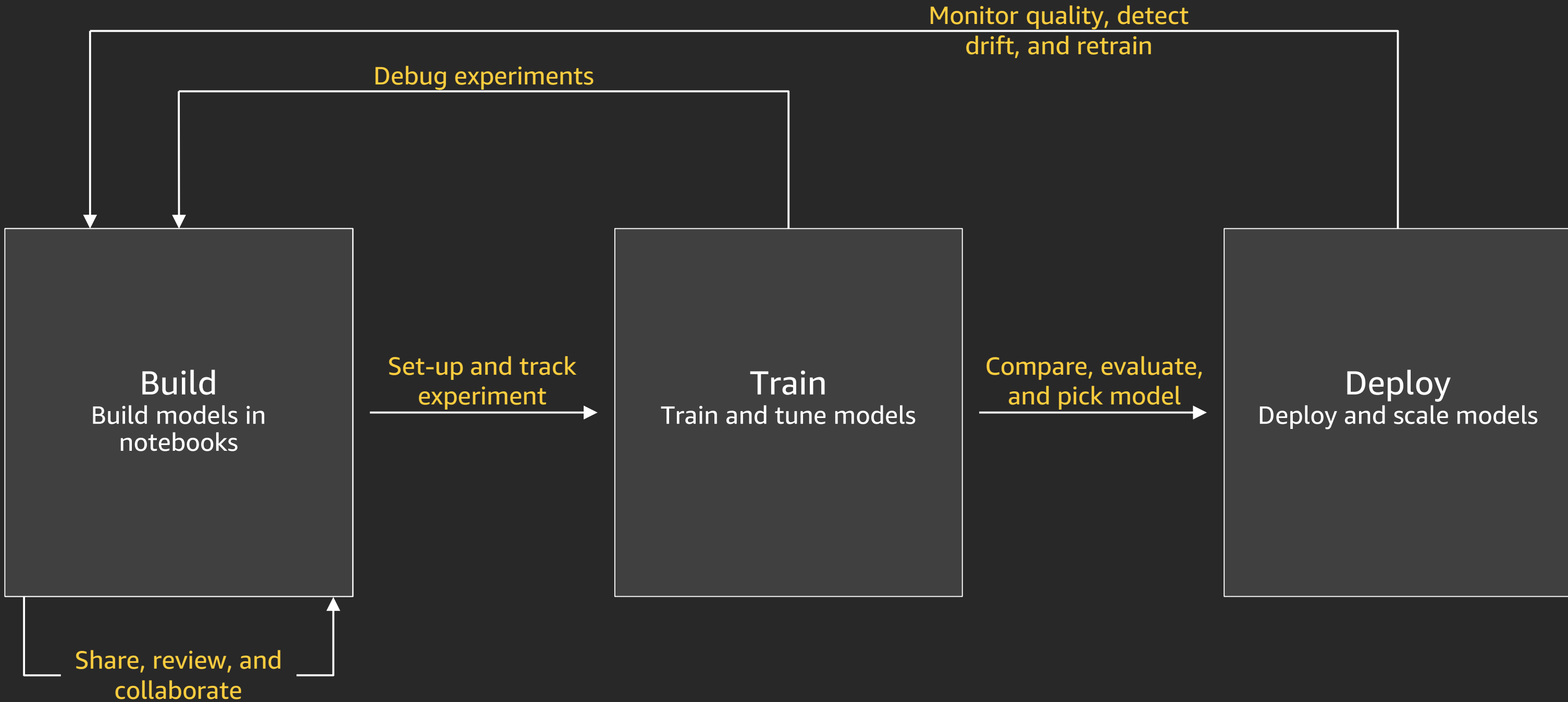
Compare, evaluate, and  
iterate



Python SDK

Tracking and analytics APIs

# Debug training runs



# Amazon SageMaker Debugger



## Framework support

TensorFlow, Apache  
MXNet, PyTorch, XGBoost



## Introspect models

Introspects, collects and  
analyzes tensors



## Rules and Alerts

Provides real-time alerts  
when bottleneck is  
identified

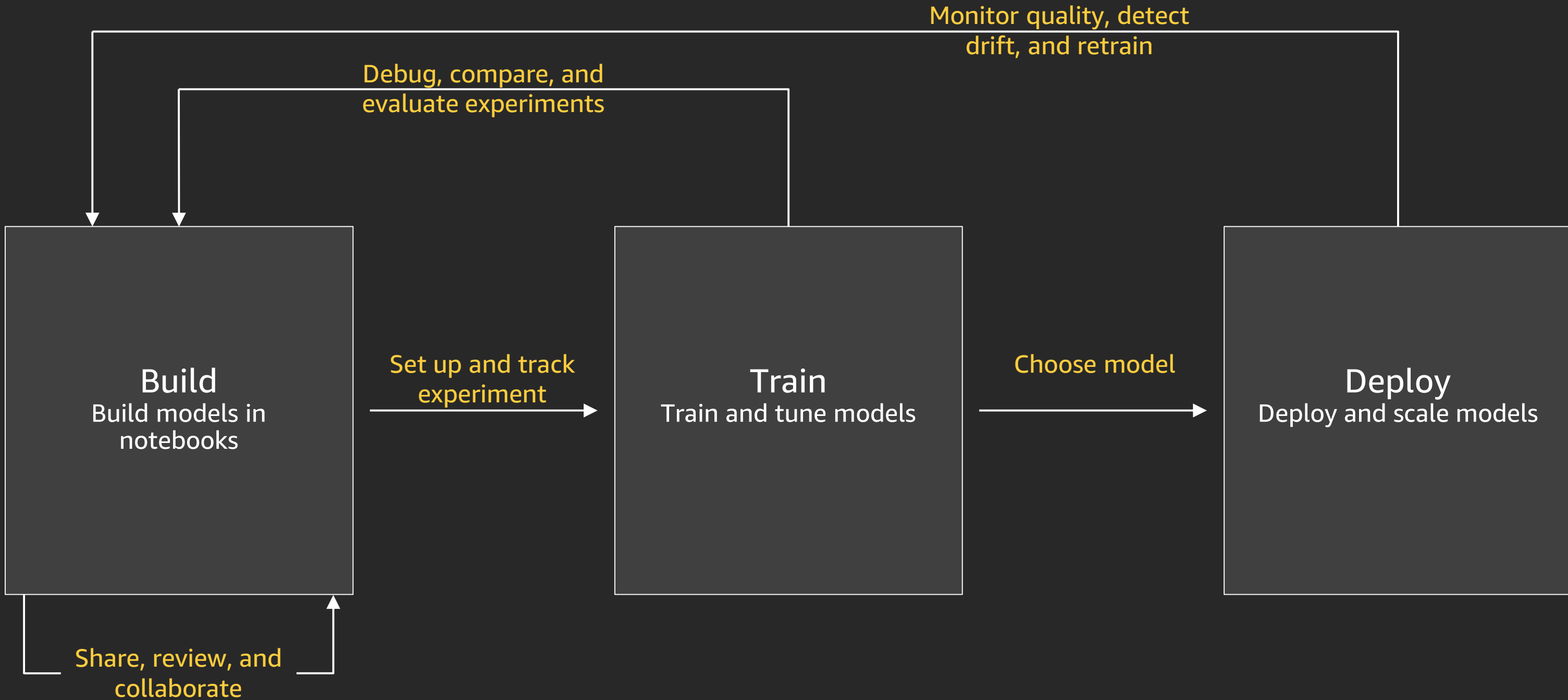


## Python SDK

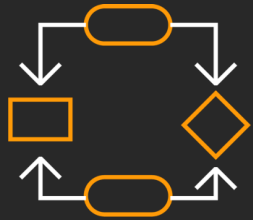
Write your own debug  
rules



# Monitor models



# Amazon SageMaker Model Monitor



## Collect data

Periodically collects data  
from endpoints into  
Amazon S3



## Analyze

Computes feature statistics



## Monitor

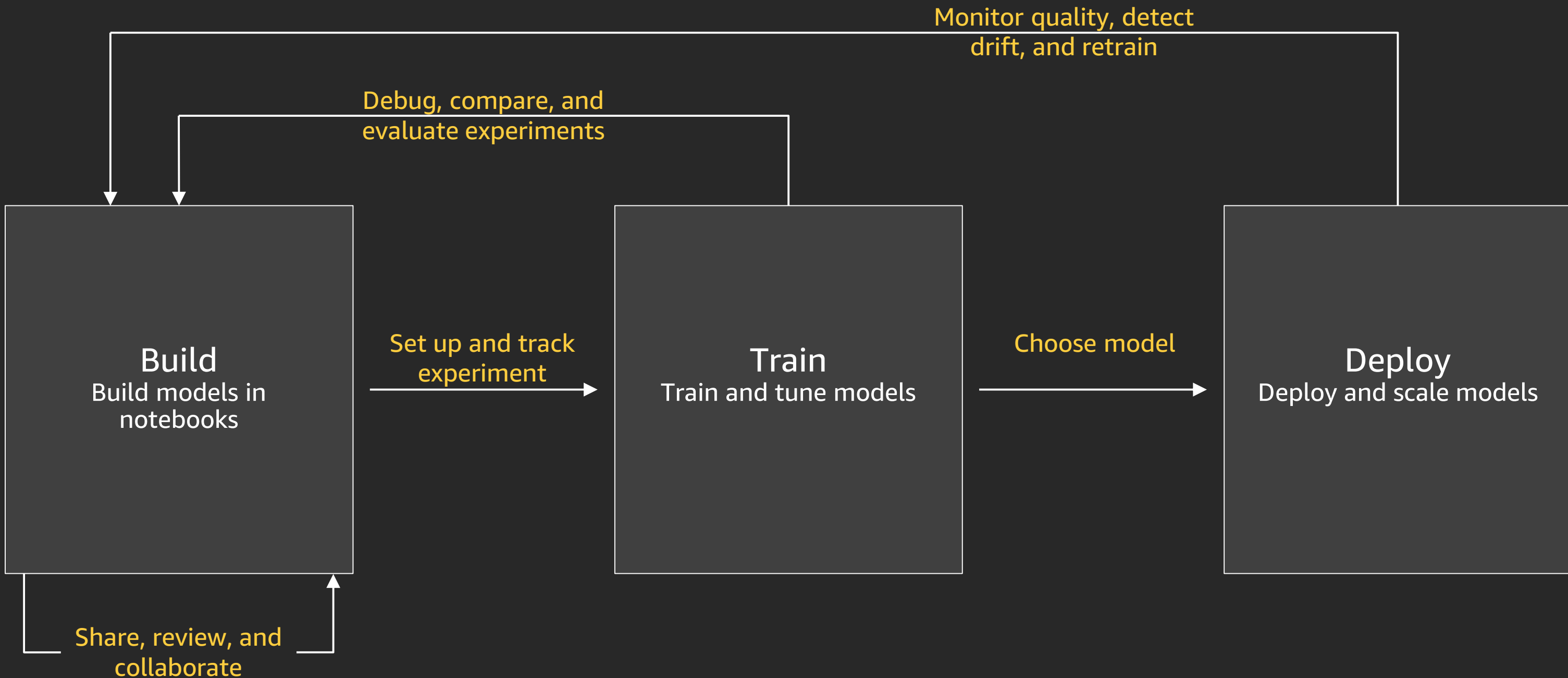
Monitors trends in data  
and detects drifts



## Alerts

Alerts on Amazon  
CloudWatch and Amazon  
SageMaker Studio

# How else can we accelerate ML workflow?



# Amazon SageMaker Autopilot



Provide data

Data in tabular form



Specify column to  
predict

Support for regression and  
classification



Create model

Feature generation,  
algorithm selection, and  
parameter tuning



Track experiment

Automatically tracked as an  
experiment



Transparent

Get notebook with  
source code

# Demo

# GE Healthcare story



~130M

babies born every year

~350K

babies born every day







**~74K**

babies are born in  
India daily


**~50K**

babies are born in  
rural India daily

Births Per day. Medindia:  
[https://www.medindia.net/patients/calculators/pop\\_clock.asp](https://www.medindia.net/patients/calculators/pop_clock.asp)

Rural Population. World Bank:  
<https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=IN>





Ultrasound is highly user dependent, technical, and manual.

Training is often neglected.

**40% Shortage**

in practicing  
obstetrics/gynecology doctors

**2.1** nurse/midwife

**.8** doctor

**.6** obstetrics/gynecology  
doctor

**4% occurrence** of  
Central Nervous System [CNS]  
abnormalities in semi-urban  
communities like Noida, India

*Per 1,000 people in India*

Prevalence Stats: <https://data.worldbank.org/indicator/SH.MED.NUMW.P3>

Occurrence of CNS: Occurance of CNS abnormalities: [http://www.ijmr.org.in/temp/IndianJMedRes1454471-5575188\\_152911.pdf](http://www.ijmr.org.in/temp/IndianJMedRes1454471-5575188_152911.pdf)

Shortage of practicing obstetrics/gynaecology doctors: <https://indianexpress.com/article/india/india-others/paediatrics-to-gynae-where-are-the-surgeons-physicians/>



Voluson  
E10

Make sure the Transthalamic plane (TT) is visible in the A-plane area, adjust if needed.

Then press **Start Alignment**

Scan the QR code below with your mobile device to access the ISUOG Guidelines.



V = 0.684 lit  
Vol.Angle



Calculating...

No Exam History available



P5

P3

P1

Img

3D

P6

P4

P2



3D



a

GE

@

# Healthcare Artificial Intelligence | An infinite AI space

Endless Opportunities for AI: Selecting Use Cases From Billions of Images

	COMPUTED TOMOGRAPHY	MAGNETIC RESONANCE	POSITRON EMISSION	RADIOGRAPHY	ANGIOGRAPHY	ULTRASOUND	FLUOROSCOPY	
ABDOMINAL IMAGING								FINDINGS
BREAST IMAGING								FINDINGS
CARDIAC IMAGING								FINDINGS
EMERGENCY IMAGING								FINDINGS
MUSCULOSKELETAL								FINDINGS
NEURORADIOLOGY								FINDINGS
NUCLEAR MEDICINE								FINDINGS
PEDIATRIC IMAGING								FINDINGS
THORACIC IMAGING								FINDINGS
INTERVENTIONAL								FINDINGS
	ANATOMY	ANATOMY	ANATOMY	ANATOMY	ANATOMY	ANATOMY	ANATOMY	

- Physics
- Anatomy
- Function (fMR)
- Pre/intra/post scan
- Genomics
- And more



# Edison | An intelligence platform

## » Data/Content

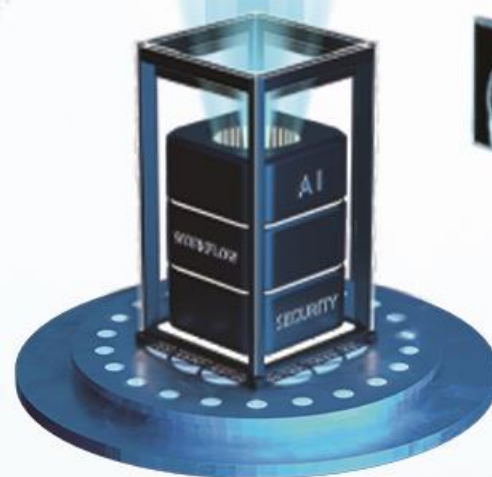
Imaging/DICOM •  
Monitoring/Waveform •  
EMR/HIS/RIS • Genomics



## » Catalog of Services

100+ Services

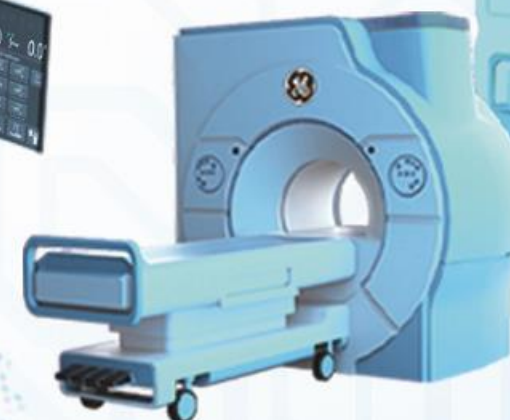
Security • Storage • Workflow  
•  
Applications • Analytics • AI



## » Intelligent Applications

50+ Applications

Imaging Protocol Manager • AIRx •  
Imaging Insights • Mural • SonoCNS •  
CT Smart Subscription • Bone VCAR •  
True Fidelity • Auto EF 2.0



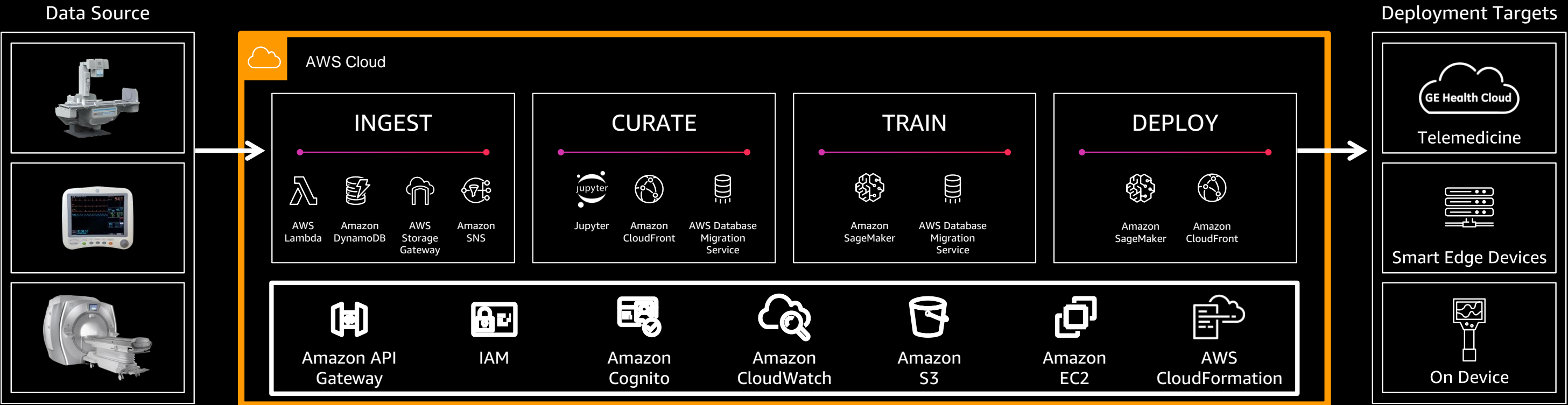
## » Smart Devices

Applications are  
seamlessly embedded in  
devices, enabling improved  
workflow, productivity,  
diagnostics and more



# Edison | An Artificial Intelligence Factory For Everyone

## Edison AI Services

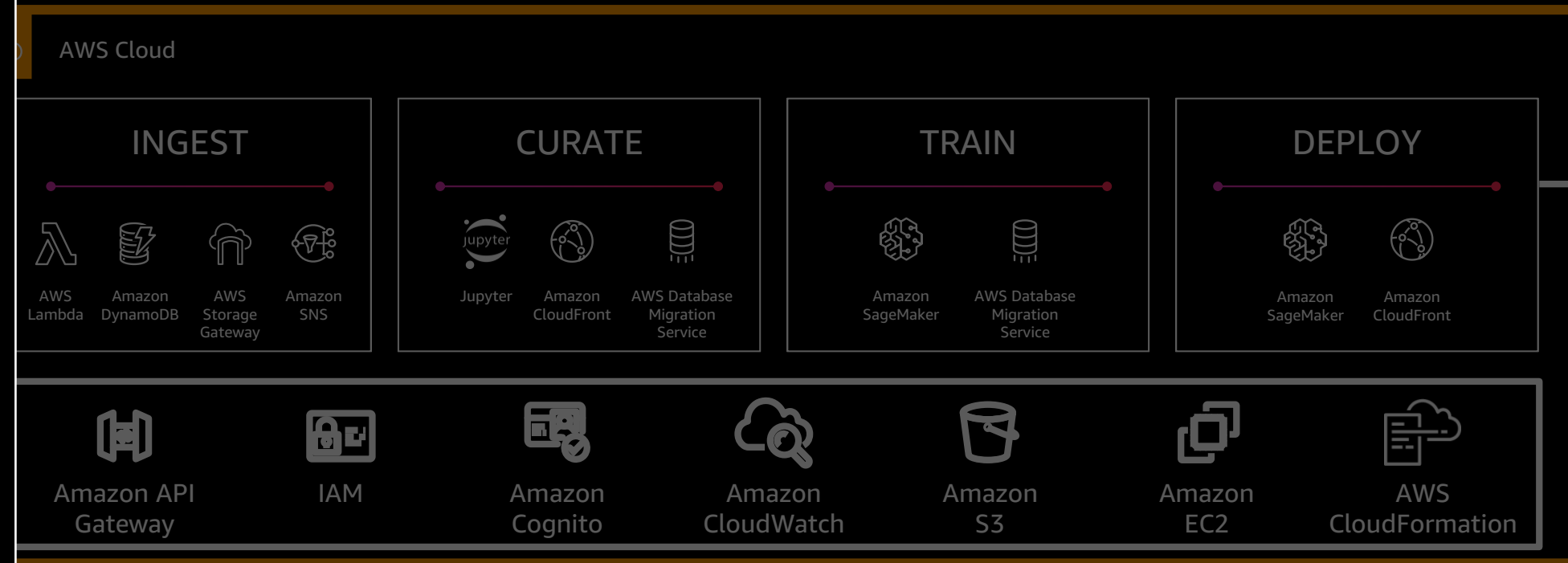




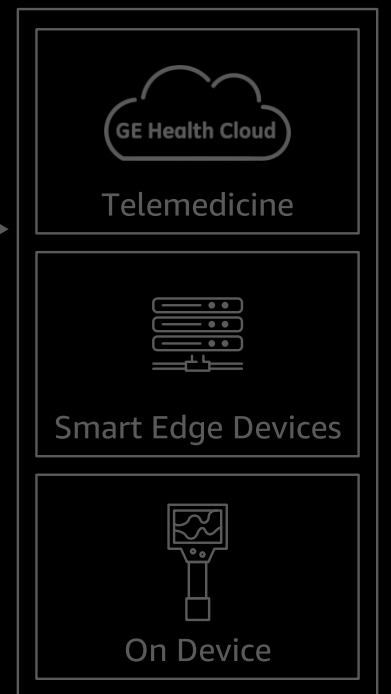
## Data Source



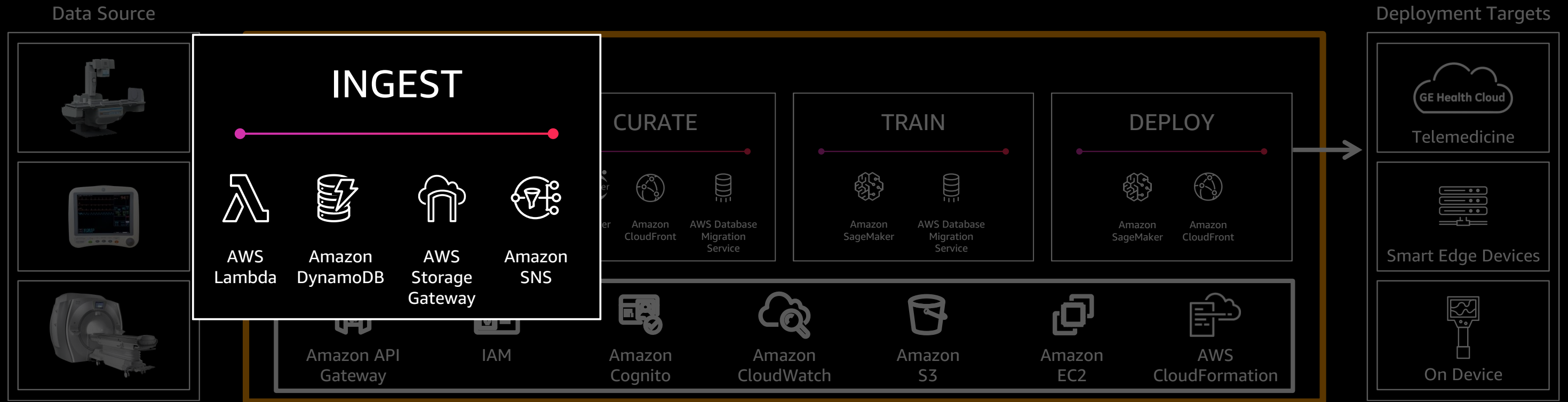
## Edison AI Services



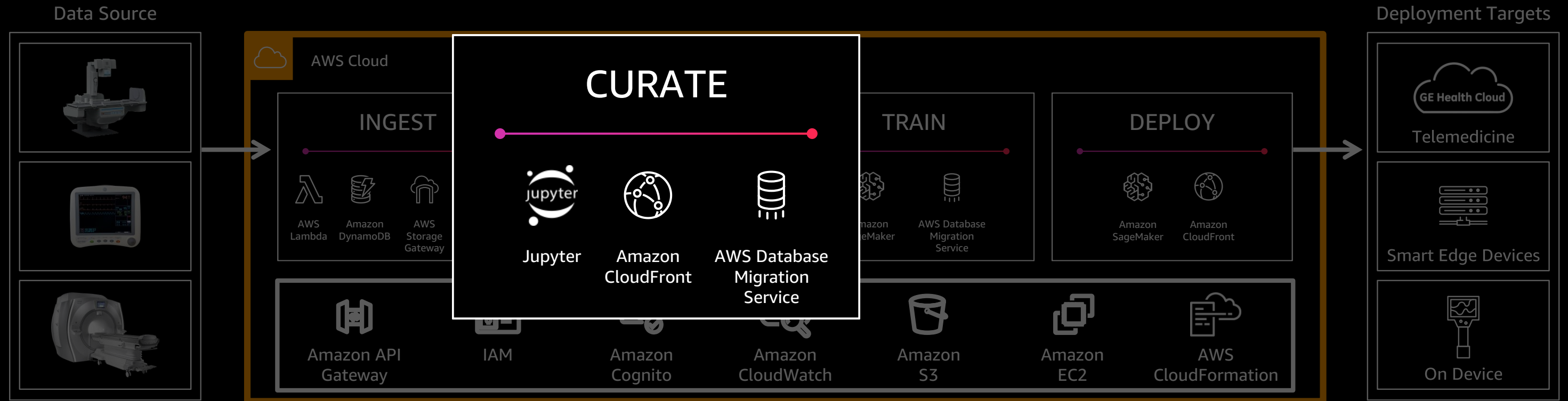
## Deployment Targets



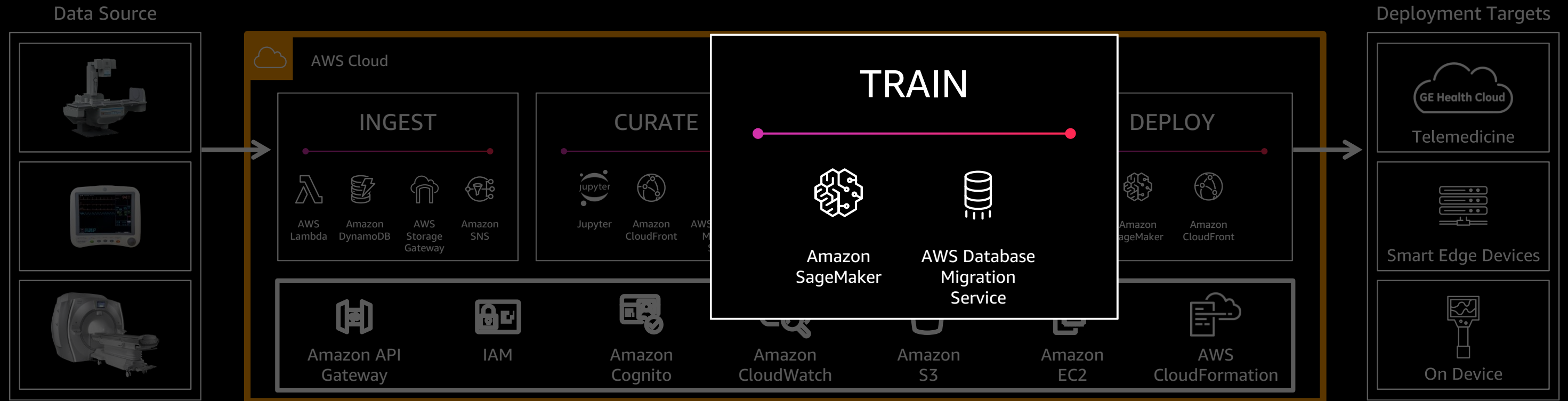
# Edison AI Services



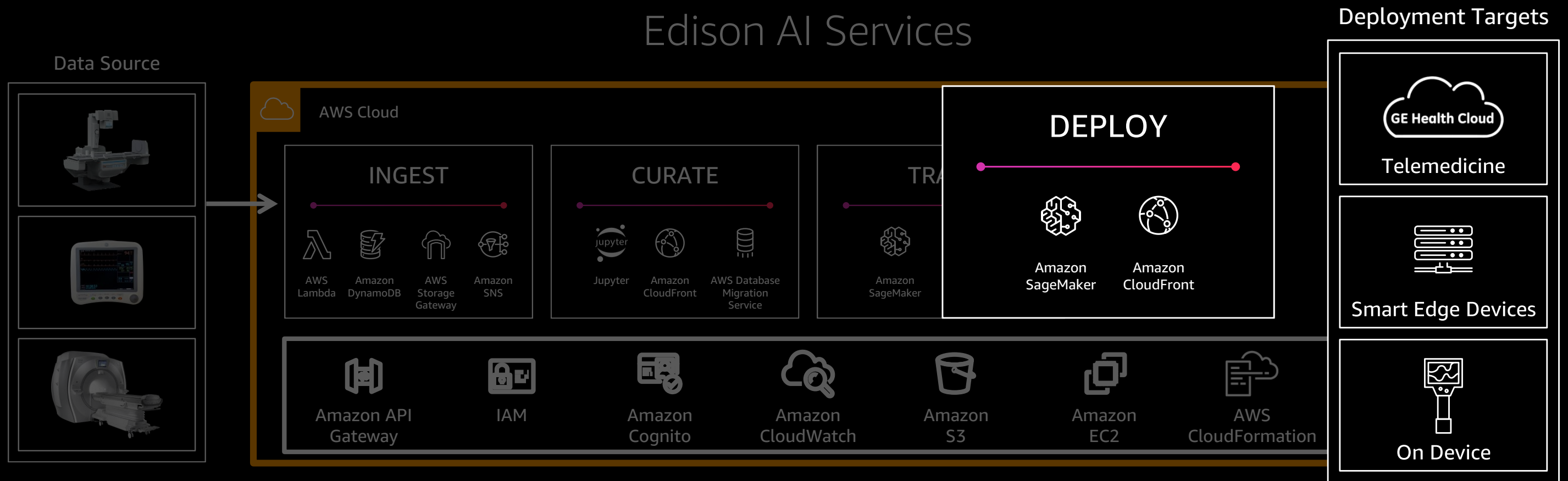
# Edison AI Services



# Edison AI Services

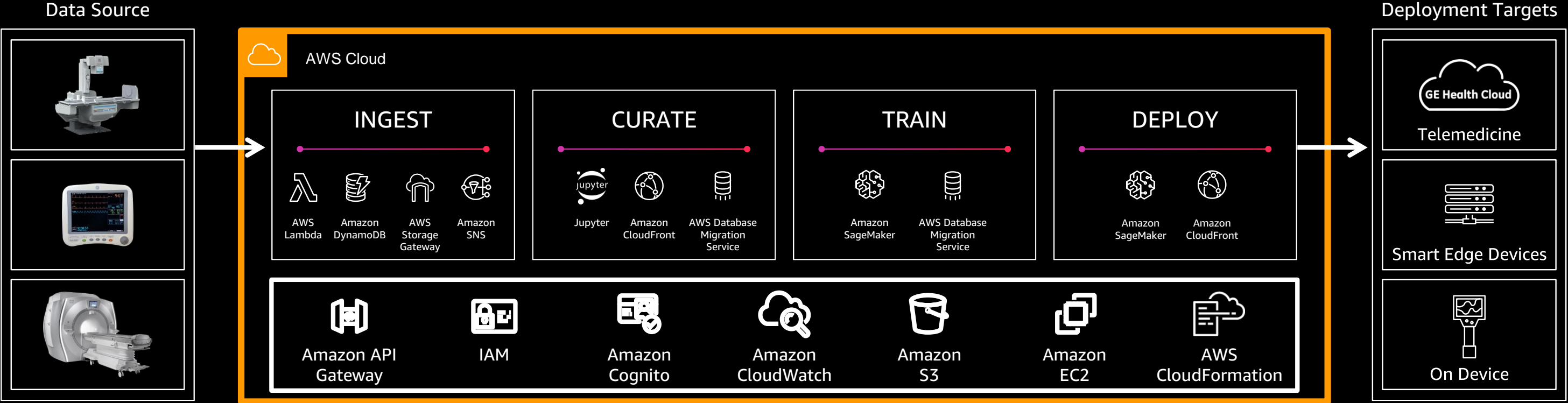


# Edison AI Services



# Edison | An Artificial Intelligence Factory For Everyone

## Edison AI Services

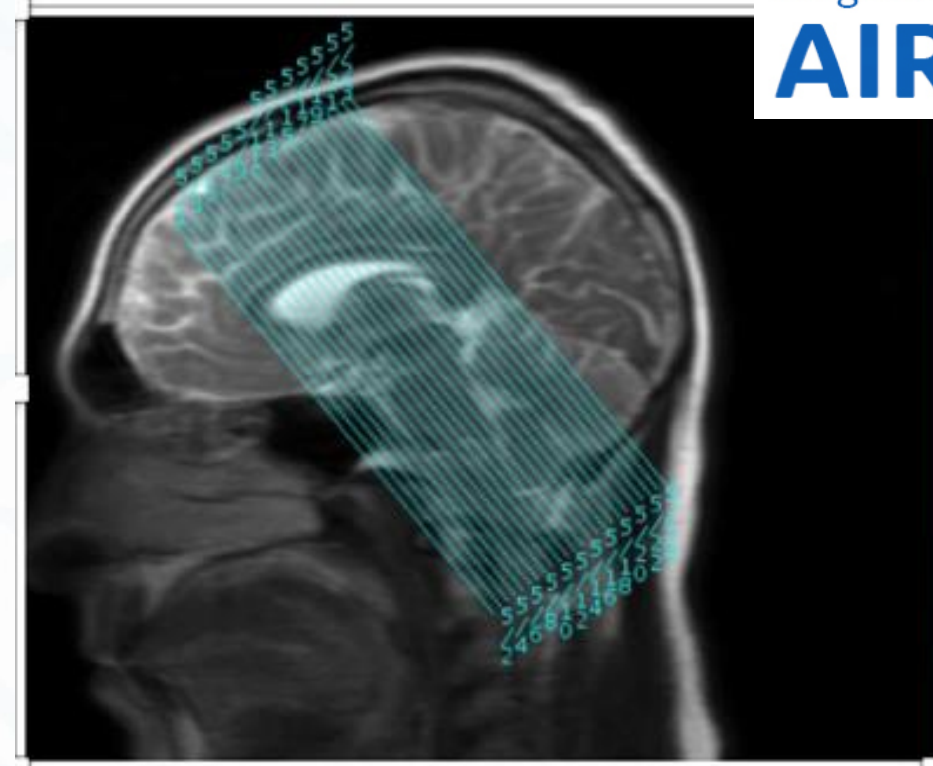


# FDA Cleared AI Solutions

**X-Ray  
Critical Care Suite**



Diagnostics  
**AIRx™**

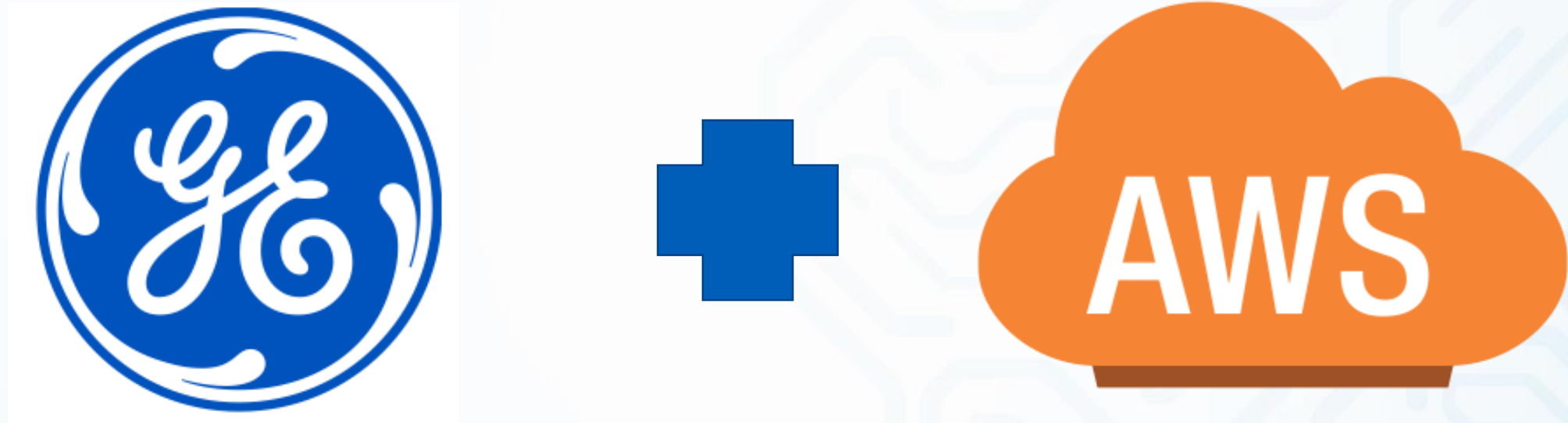


Diagnostics  
**SonoCNS**





# Conclusion | Partnerships will be key to build AI @ Scale



**Improving lives in moments that matter**



# Related breakouts

AIM230-R, -R1 Introducing a new experience for Amazon SageMaker Notebooks

AIM216-R, -R1 Introducing Amazon SageMaker Debugger

AIM215-R, -R1 Introducing Amazon SageMaker Autopilot

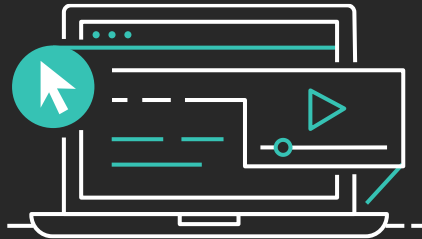
AIM213-R, -R1 Introducing Amazon SageMaker Model Monitor

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# Thank you!



Please complete the session  
survey in the mobile app.