MACHINE LEARNING IN MANUFACTURING

Increase Quality and Reduce Waste with Automation

AllCloud

Dr. Carsten Riggelsen
Head of Data & ML/AI – AllCloud

carsten.riggelsen@allcloud.io

9/29/2021

ABOUT ALLCLOUD

AllCloud

3,000+
Successful Deployments

6
AWS Competencies

8
Global Operating Centers

250+
Cloud Experts

200+
AWS Certifications

Tel Aviv | Bucharest | Munich | Berlin | Vienna | New York | San Francisco | Toronto

aws partner network
Premier
Consulting Partner
Migration
DevOps
Security
SaaS
Microsoft Workloads

aws partner network
Premier
Consulting Partner
Machine Learning Competency

ISO 27001:2013
27017:2015 Certified

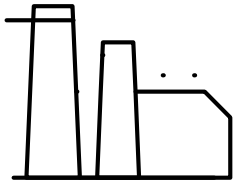
EU GDPR COMPLIANT

AWS – Ecosystem Partners
Data Analytics and Machine Learning
Leader Germany
ISG Provider Lens
Quadrant Study
2020

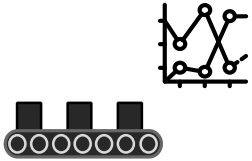
aws 200 certified
AWS PARTNER NETWORK

MANUFACTURING USE CASES

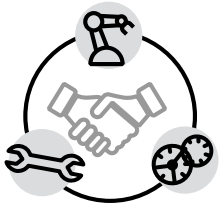
AllCloud



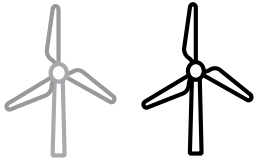
Production/Process optimization



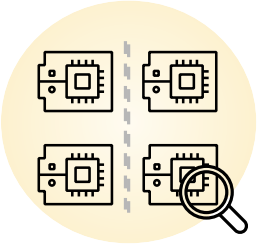
Predictive maintenance for machines



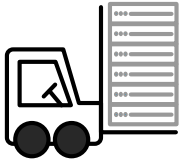
Machine as a service



Digital Twin



Computer vision for quality control



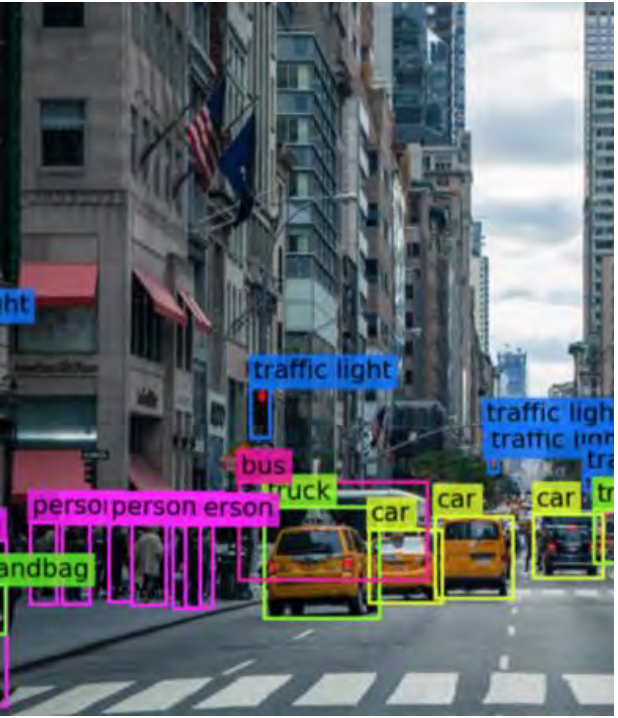
Automated material management

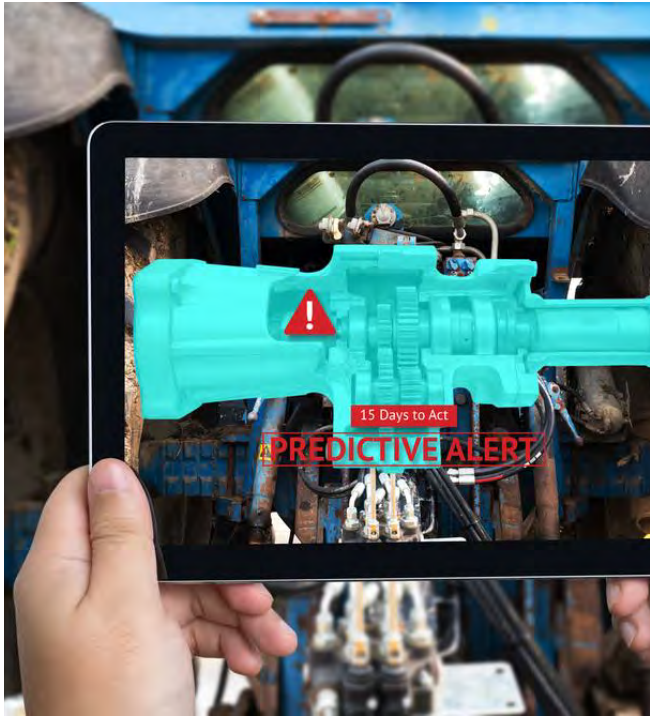
Track & Trace

Data visualization

POSSIBLE APPROACH:

Computer Vision for Quality Control (QC)





USE CASE:

Automated QC of Textile/Fabric

Challenge

- Early detection of flaws in weaving.

Goals

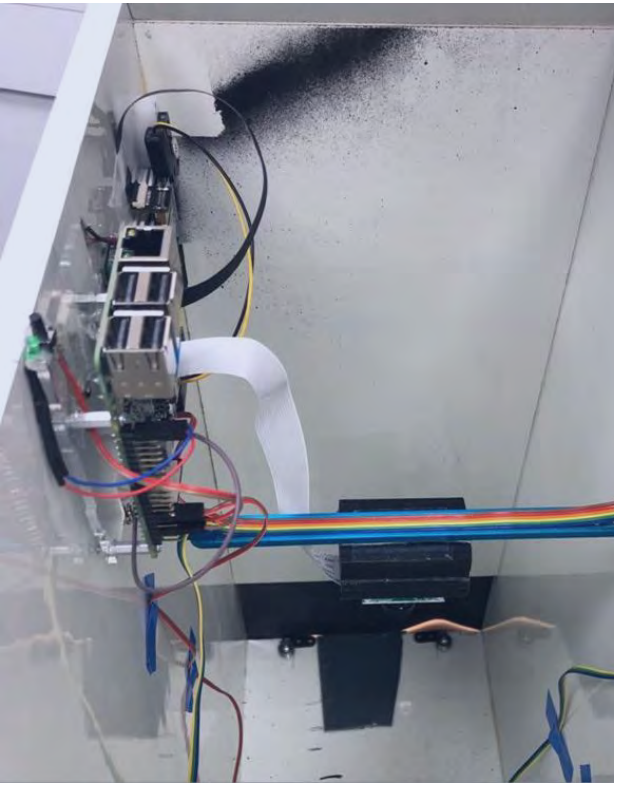
- Reduce manual QC efforts.
- Reduce number of flawed prods. from leaving factory.

Approach

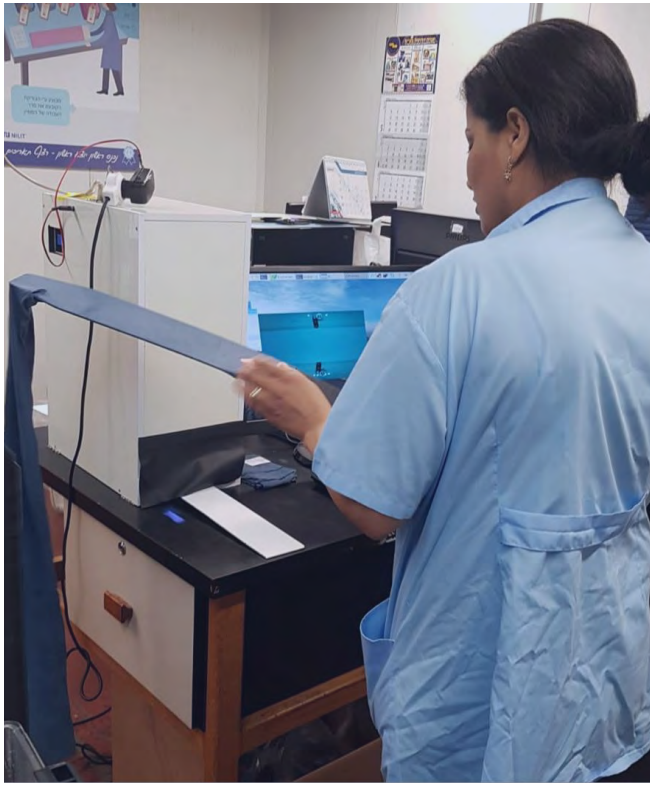
- Self-developed IoT hardware (Raspberry Pi).
- ML using Amazon SageMaker.

QUALITY CONTROL

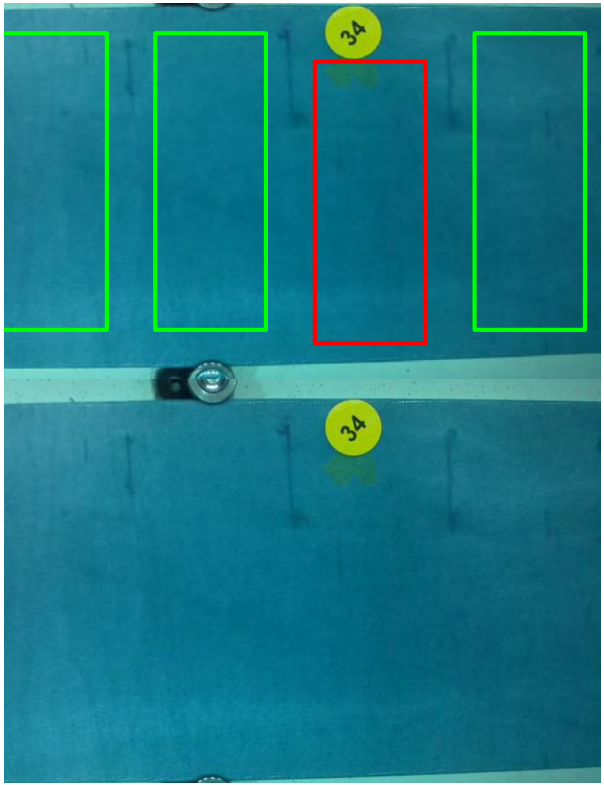
AllCloud



PROTOTYPE



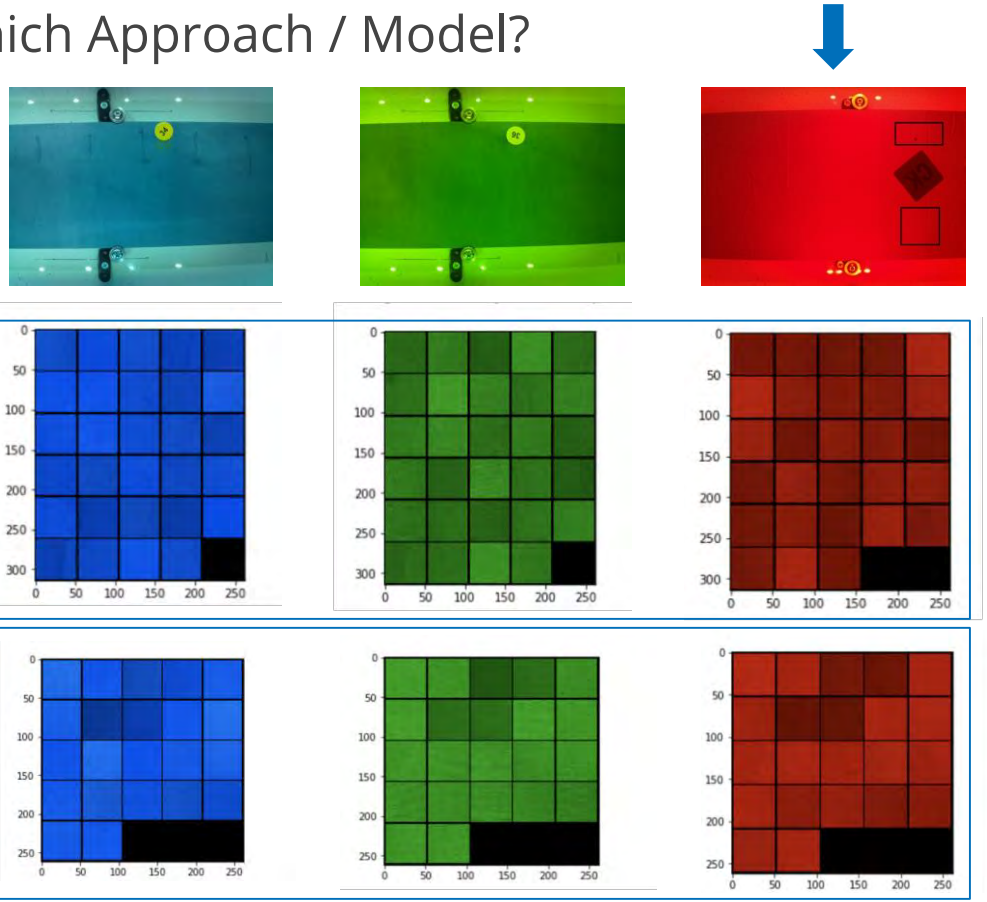
DATA COLLECTION

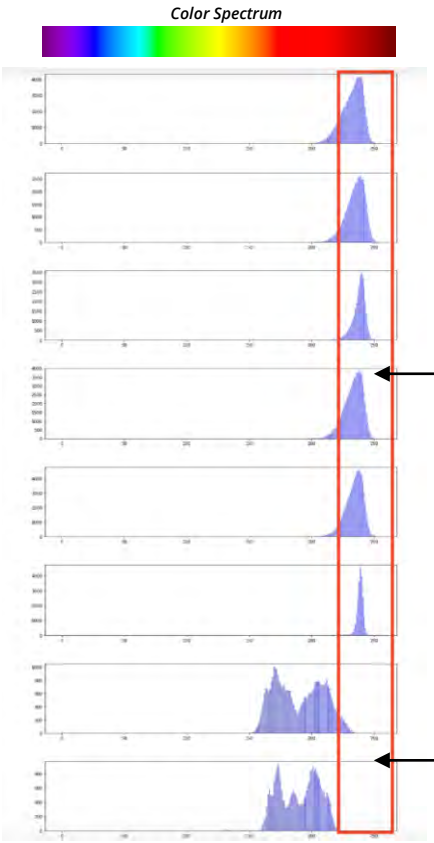


LABELLING

COMPUTER VISION

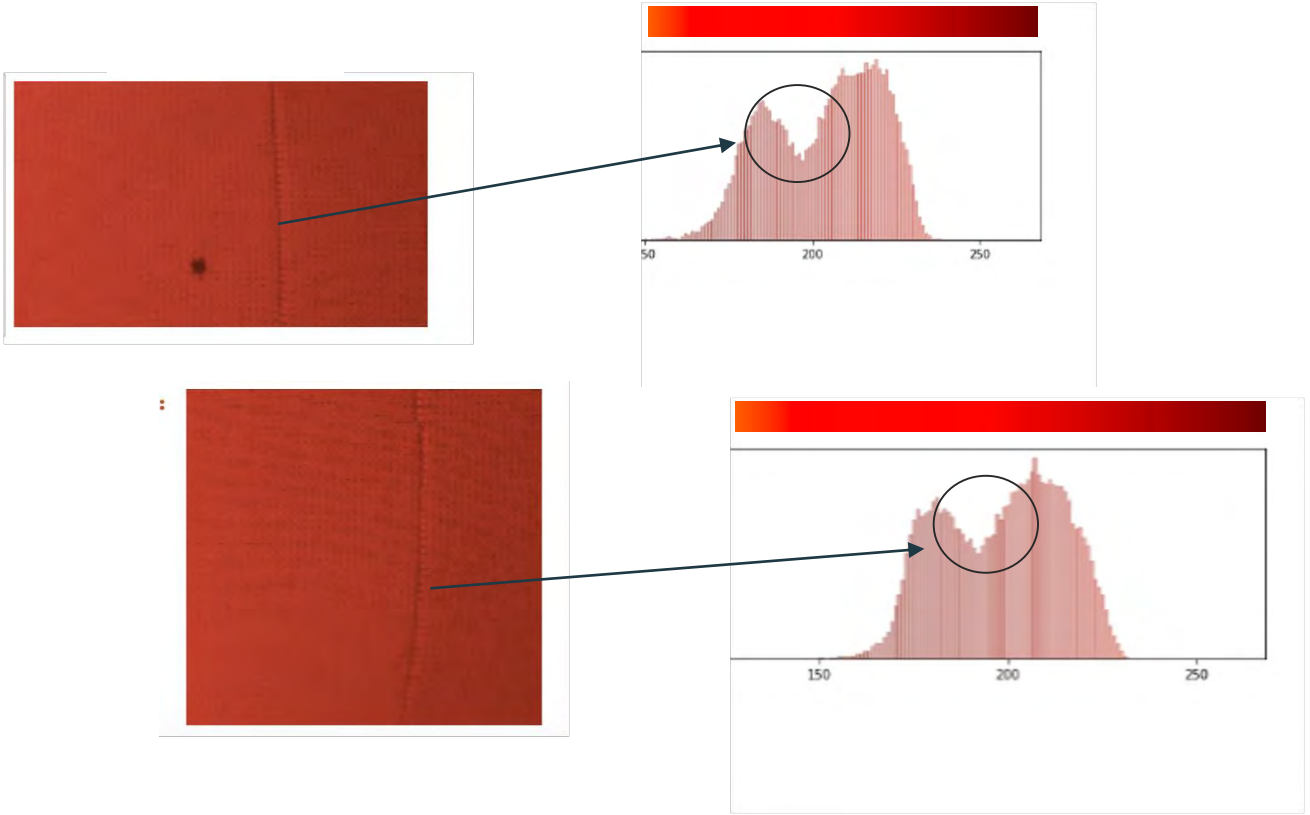
Which Approach / Model?



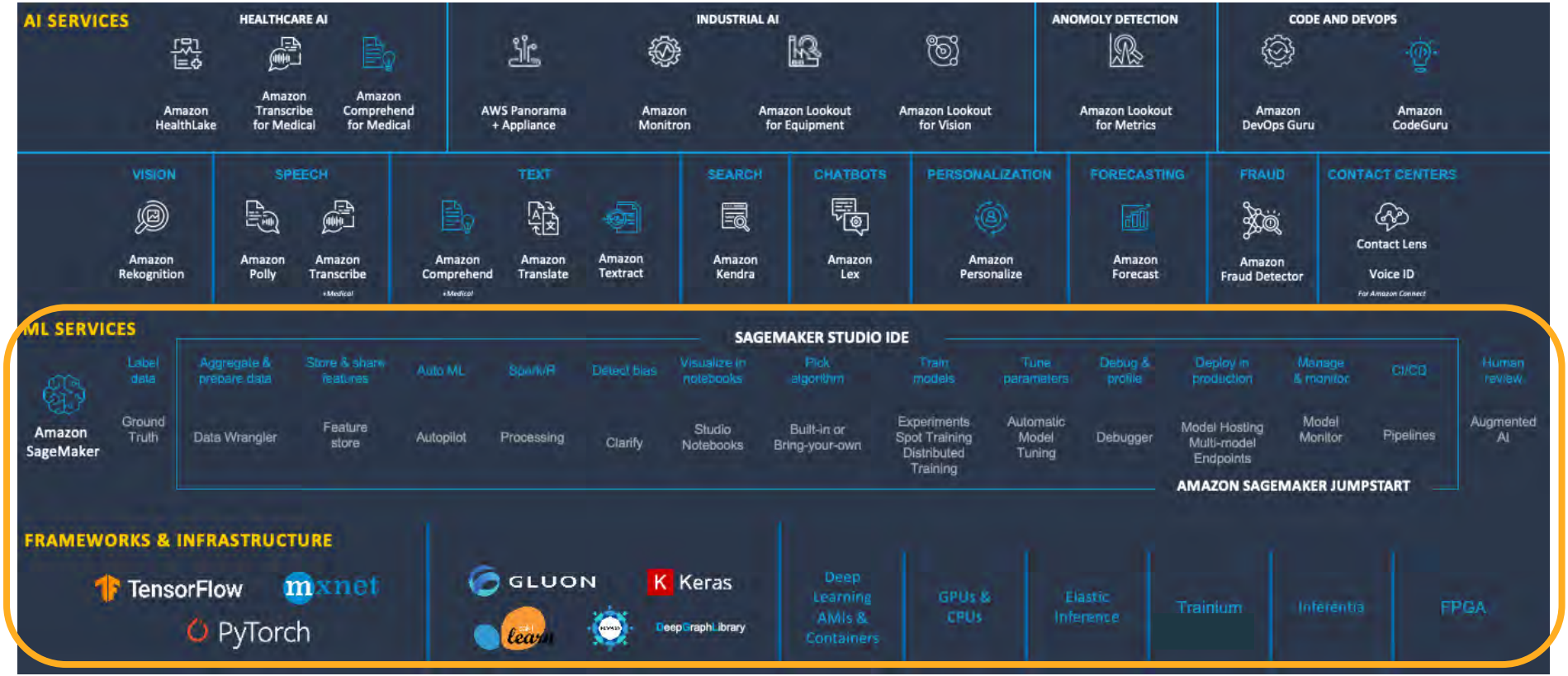


COMPUTER VISION

Distribution of RED for DEFECTS



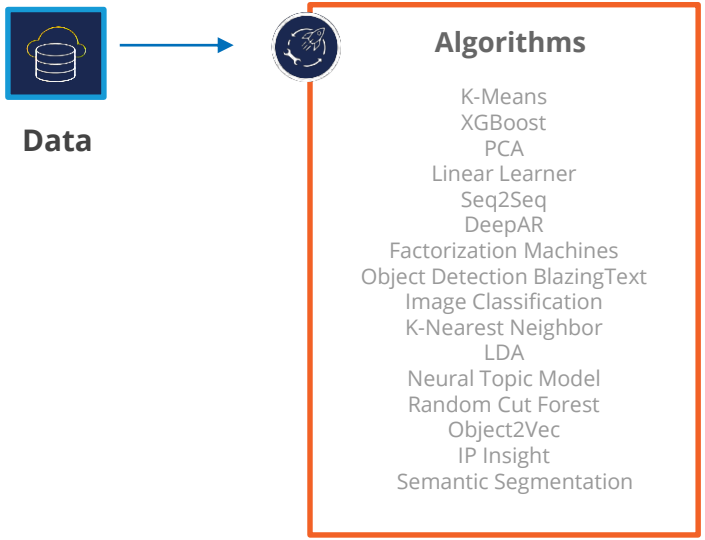
ML/AI on AWS


AI SERVICES
HEALTHCARE AI
Amazon HealthLake
Amazon Transcribe for Medical
Amazon Comprehend for Medical
INDUSTRIAL AI
AWS Panorama + Appliance
Amazon Monitron
Amazon Lookout for Equipment
Amazon Lookout for Vision
ANOMOLY DETECTION
Amazon Lookout for Metrics
CODE AND DEVOPS
Amazon DevOps Guru
Amazon CodeGuru
VISION
Amazon Rekognition
SPEECH
Amazon Polly
Amazon Transcribe
+Medical
TEXT
Amazon Comprehend
+Medical
Amazon Translate
Amazon Textract
SEARCH
Amazon Kendra
CHATBOTS
Amazon Lex
PERSONALIZATION
Amazon Personalize
FORECASTING
Amazon Forecast
FRAUD
Amazon Fraud Detector
CONTACT CENTERS
Contact Lens
Voice ID
For Amazon Connect
ML SERVICES
Amazon SageMaker
Label data
Ground Truth
SAGEMAKER STUDIO IDE
Aggregate & prepare data
Data Wrangler
Store & share features
Feature store
Auto ML
Autopilot
Spark/R
Processing
Detect bias
Clarify
Visualize in notebooks
Studio Notebooks
Pick algorithm
Built-in or Bring-your-own
Train models
Experiments Spot Training Distributed Training
Tune parameters
Automatic Model Tuning
Debug & profile
Debugger
Deploy in production
Model Hosting Multi-model Endpoints
Manage & monitor
Model Monitor
CI/CD
Pipelines
Human review
Augmented AI
AMAZON SAGEMAKER JUMPSTART
FRAMEWORKS & INFRASTRUCTURE
TensorFlow
mxnet
PyTorch
GLUON
Keras
DeepGraphLibrary
Deep Learning AMIs & Containers
GPUs & CPUs
Elastic Inference
Trainium
Inferentia
FPGA

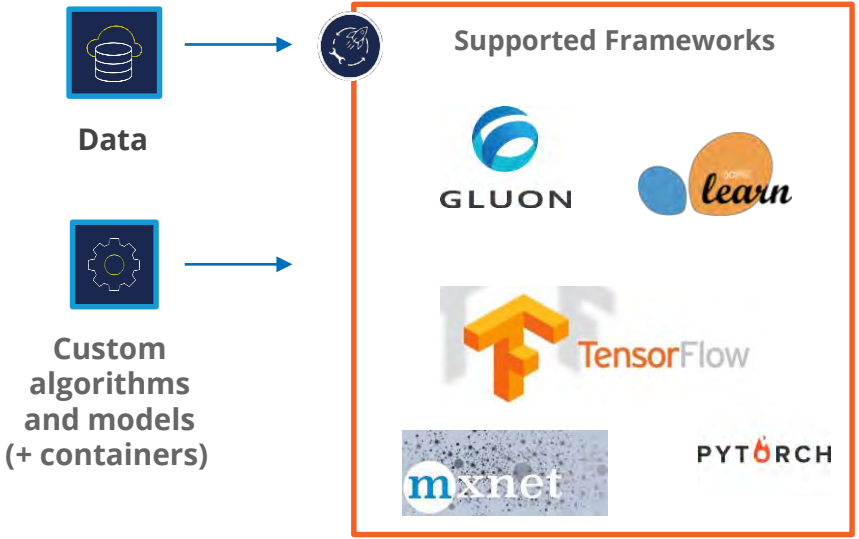
AMAZON SAGEMAKER

AllCloud

Built-In Algorithms

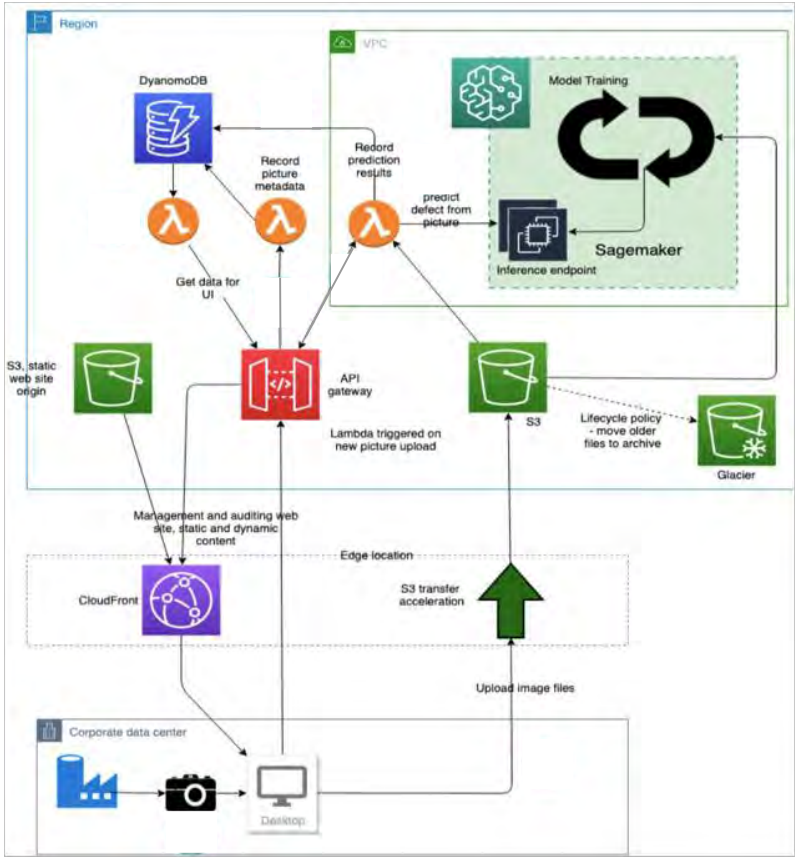


Build/Bring-Your-Own-Code



FROM R&D TO PRODUCTION

- R&D, iterative, non-trivial, more open questions than in other IT projects:
  - Does it even work?
  - Visual data enough?
  - Which algorithms to use?
  - ...
- Amazon Web Services (AWS):
  - Inherently scalable ecosystem.
  - Fast, goal-oriented, perfect for tests and trials.
  - High-level building blocks.

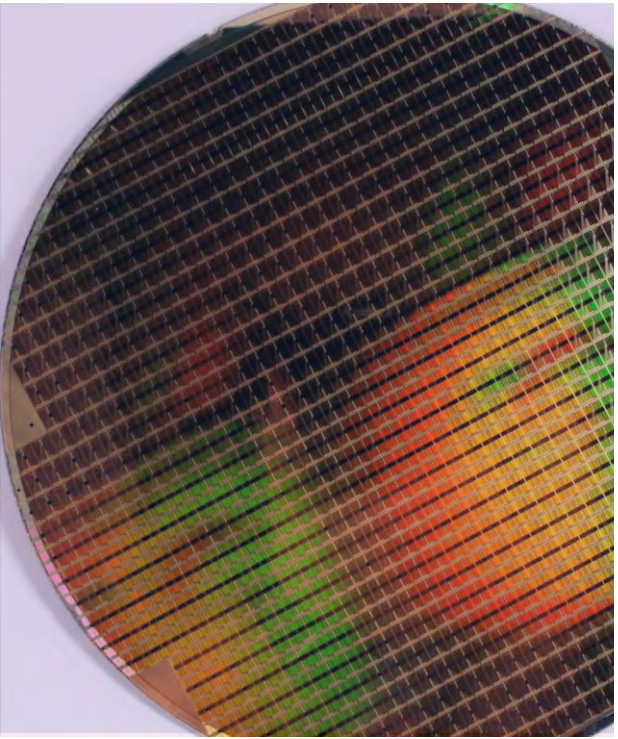


USE CASE:

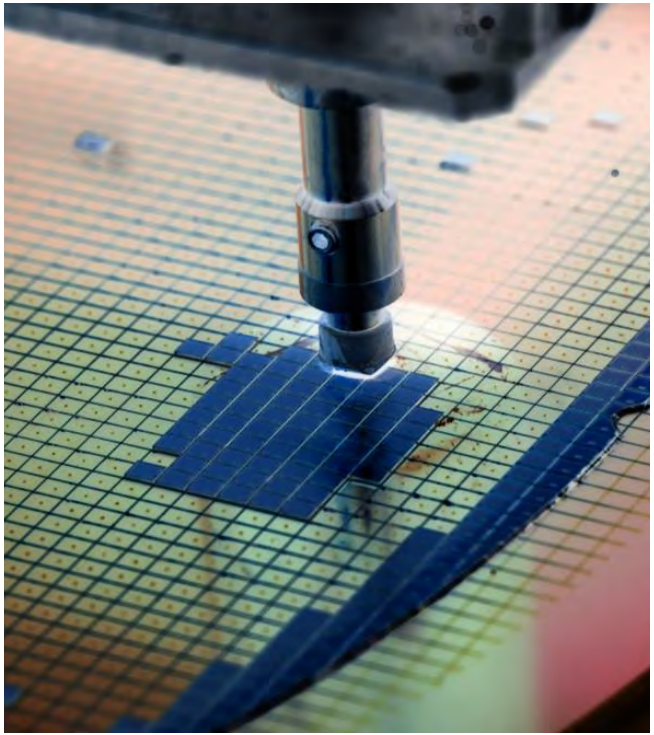
Tower Semiconductor
Where Analog and Value Meet

AllCloud

WAFER QC



SILICON WAFERS



CHIP PRODUCTION

DEFECTS DETECTION

AllCloud

USE CASE:

Tower Semiconductor

Challenge

- Automate QC from hi-res pictures.

Goals

- Reduce downstream “surprises”.
- Improve upon the existing system.

Approach

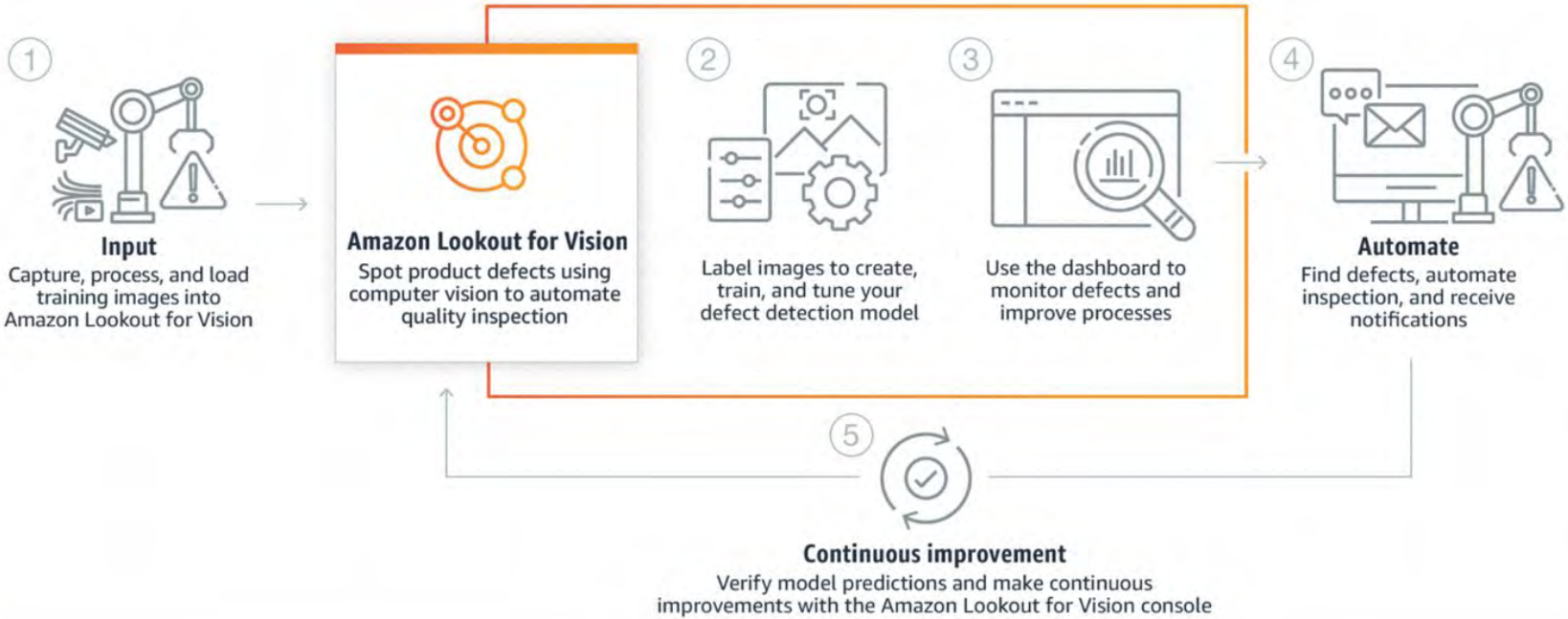
- ML approach based on SageMaker.
- Low / No code ML: Lookout for Vision.

Tower Semiconductor
Where **Analog** and **Value** Meet

ML/AI on AWS

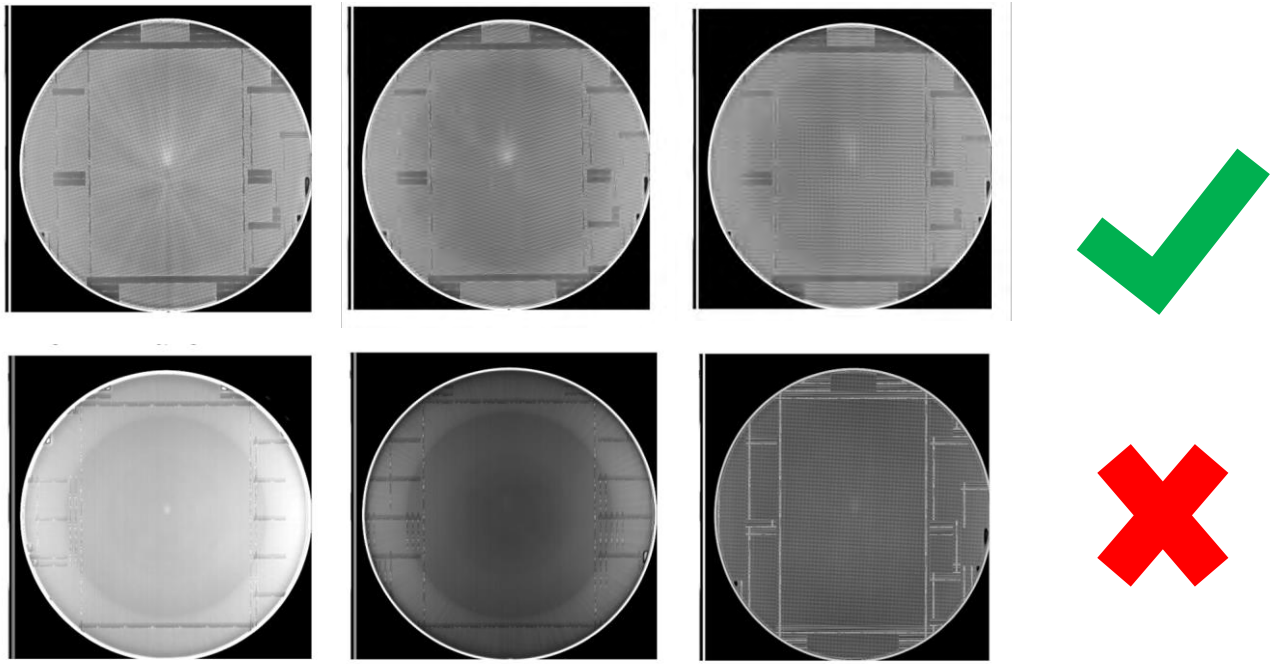

AI SERVICES
HEALTHCARE AI
Amazon HealthLake
Amazon Transcribe for Medical
Amazon Comprehend for Medical
INDUSTRIAL AI
AWS Panorama + Appliance
Amazon Monitron
Amazon Lookout for Equipment
Amazon Lookout for Vision
ANOMOLY DETECTION
Amazon Lookout for Metrics
CODE AND DEVOPS
Amazon DevOps Guru
Amazon CodeGuru
VISION
Amazon Rekognition
SPEECH
Amazon Polly
Amazon Transcribe
+Medical
TEXT
Amazon Comprehend
+Medical
Amazon Translate
Amazon Textract
SEARCH
Amazon Kendra
CHATBOTS
Amazon Lex
PERSONALIZATION
Amazon Personalize
FORECASTING
Amazon Forecast
FRAUD
Amazon Fraud Detector
CONTACT CENTERS
Contact Lens
Voice ID
For Amazon Connect
ML SERVICES
SAGEMAKER STUDIO IDE
Amazon SageMaker
Label data
Ground Truth
Aggregate & prepare data
Data Wrangler
Store & share features
Feature store
Auto ML
Autopilot
Spark/R
Processing
Detect bias
Clarify
Visualize in notebooks
Studio Notebooks
Pick algorithm
Built-in or Bring-your-own
Train models
Experiments Spot Training Distributed Training
Tune parameters
Automatic Model Tuning
Debug & profile
Debugger
Deploy in production
Model Hosting Multi-model Endpoints
Manage & monitor
Model Monitor
CI/CD
Pipelines
Human review
Augmented AI
AMAZON SAGEMAKER JUMPSTART
FRAMEWORKS & INFRASTRUCTURE
TensorFlow
mxnet
PyTorch
GLUON
Keras
DeepGraphLibrary
Deep Learning AMIs & Containers
GPUs & CPUs
Elastic Inference
Trainium
Inferentia
FPGA

AMAZON LOOKOUT FOR VISION



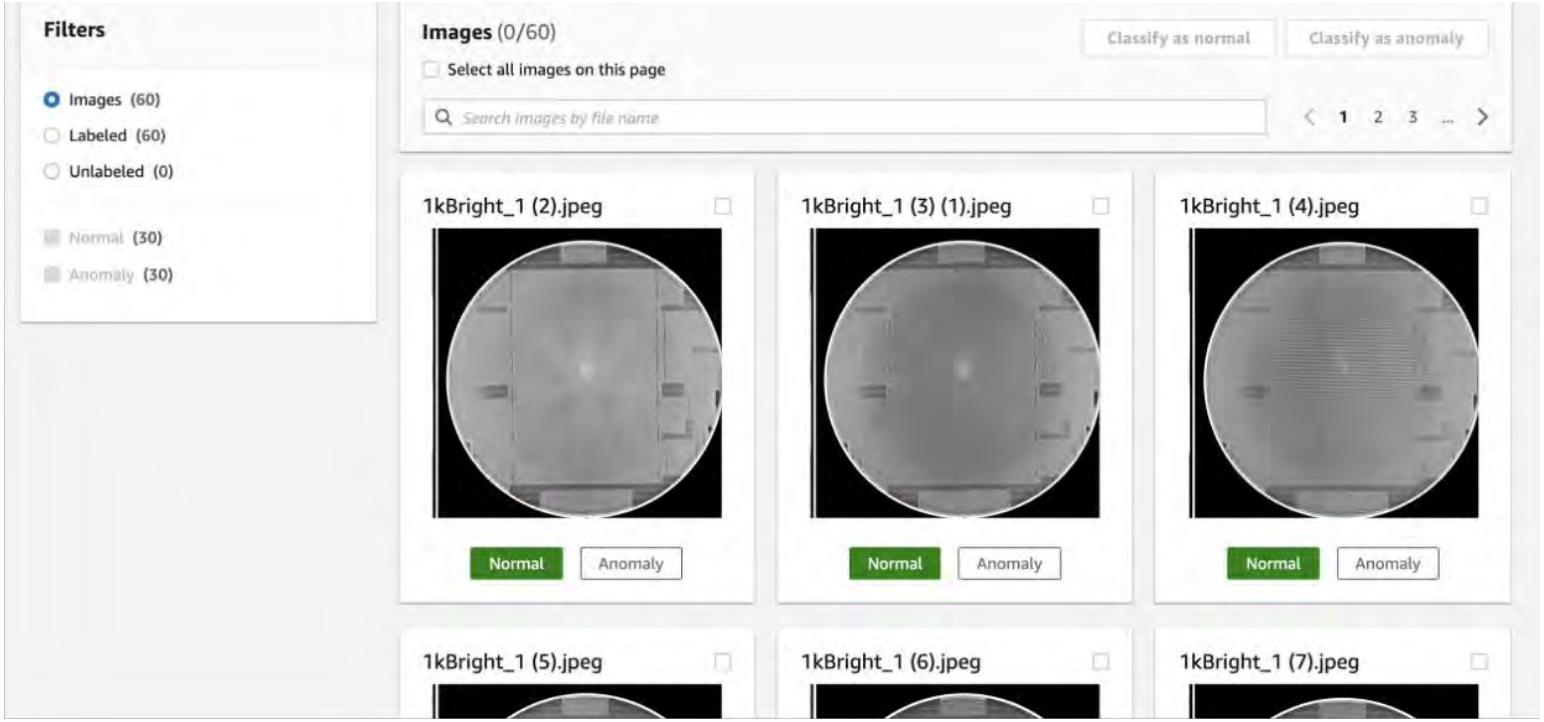
USE CASE:

Tower Semiconductor



LOOKOUT - LOW / NO-CODE

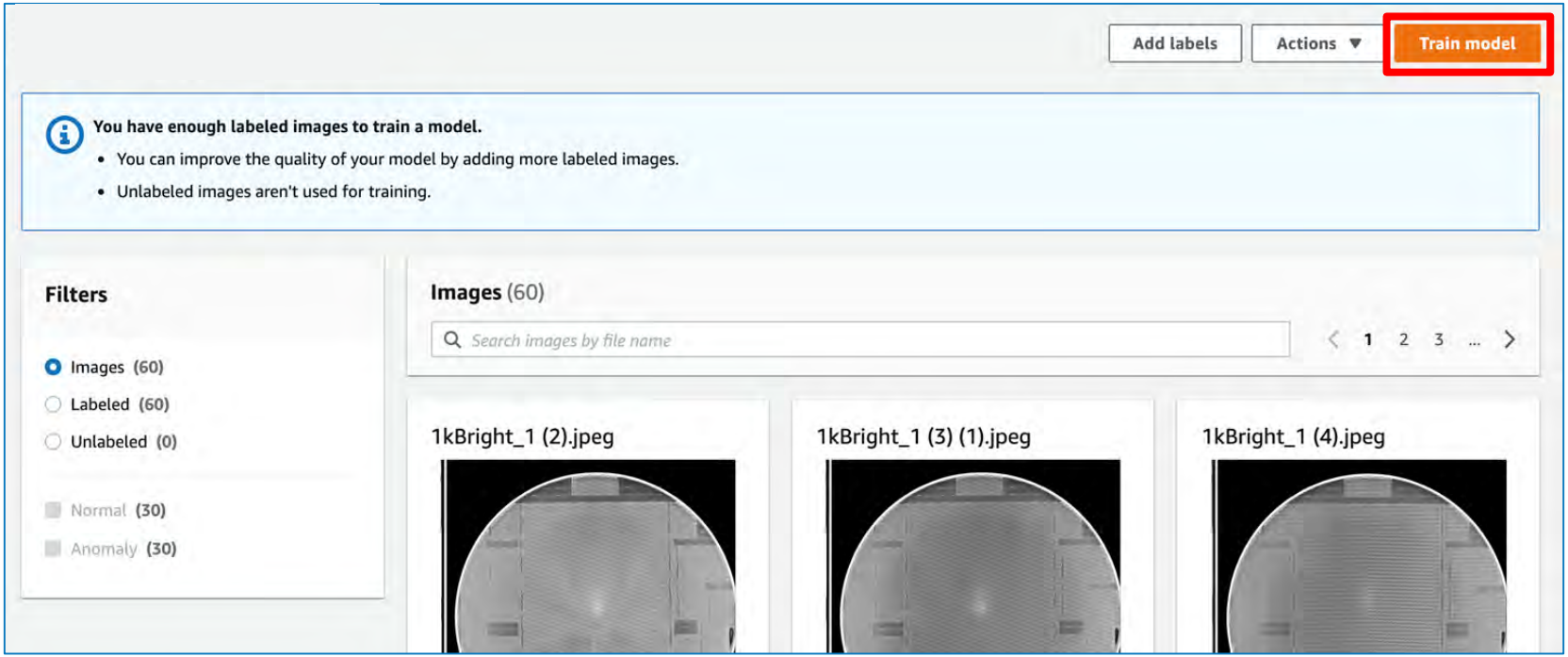
Labeling of known normal/abnormal wafers



LOOKOUT - LOW / NO-CODE

AllCloud

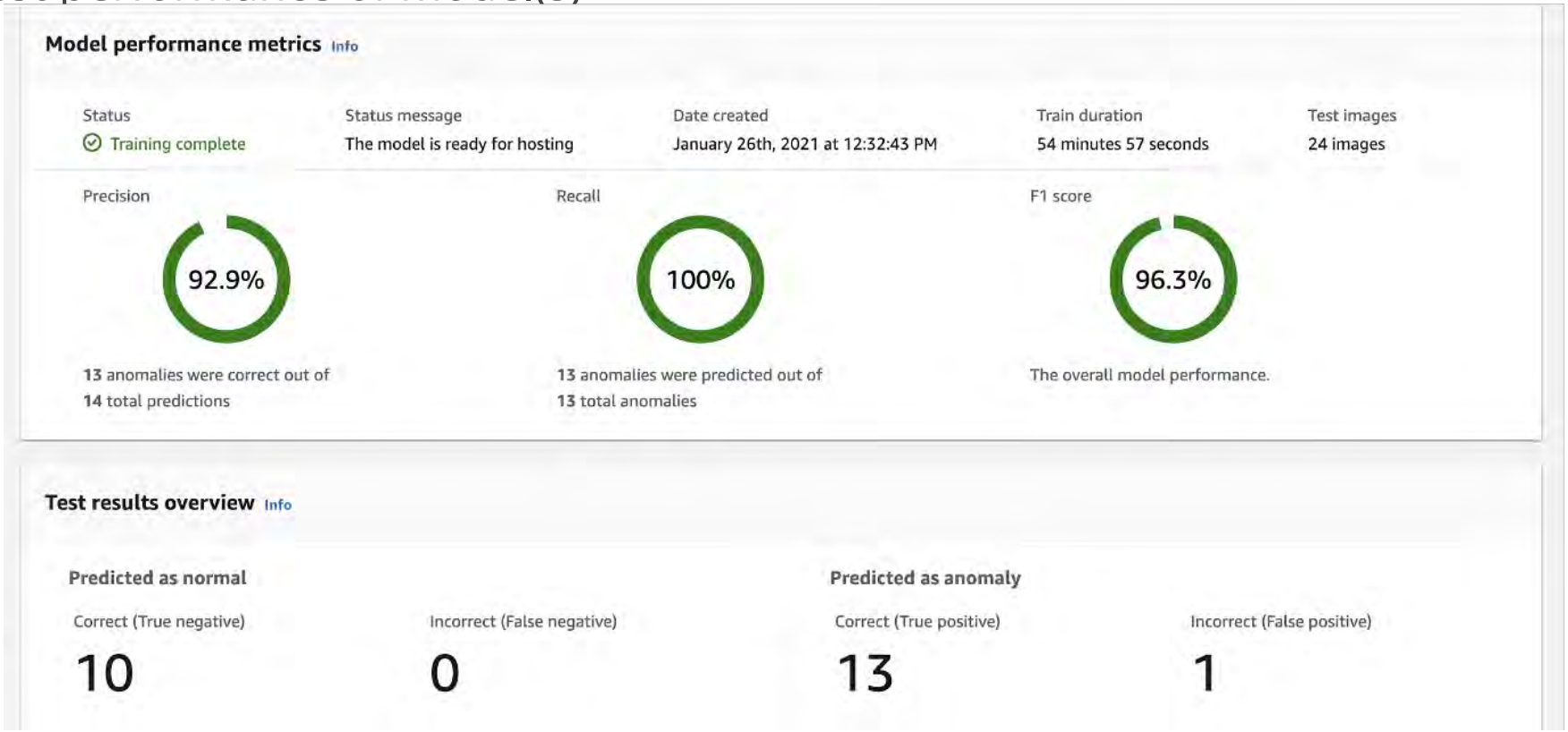
Training the model(s)



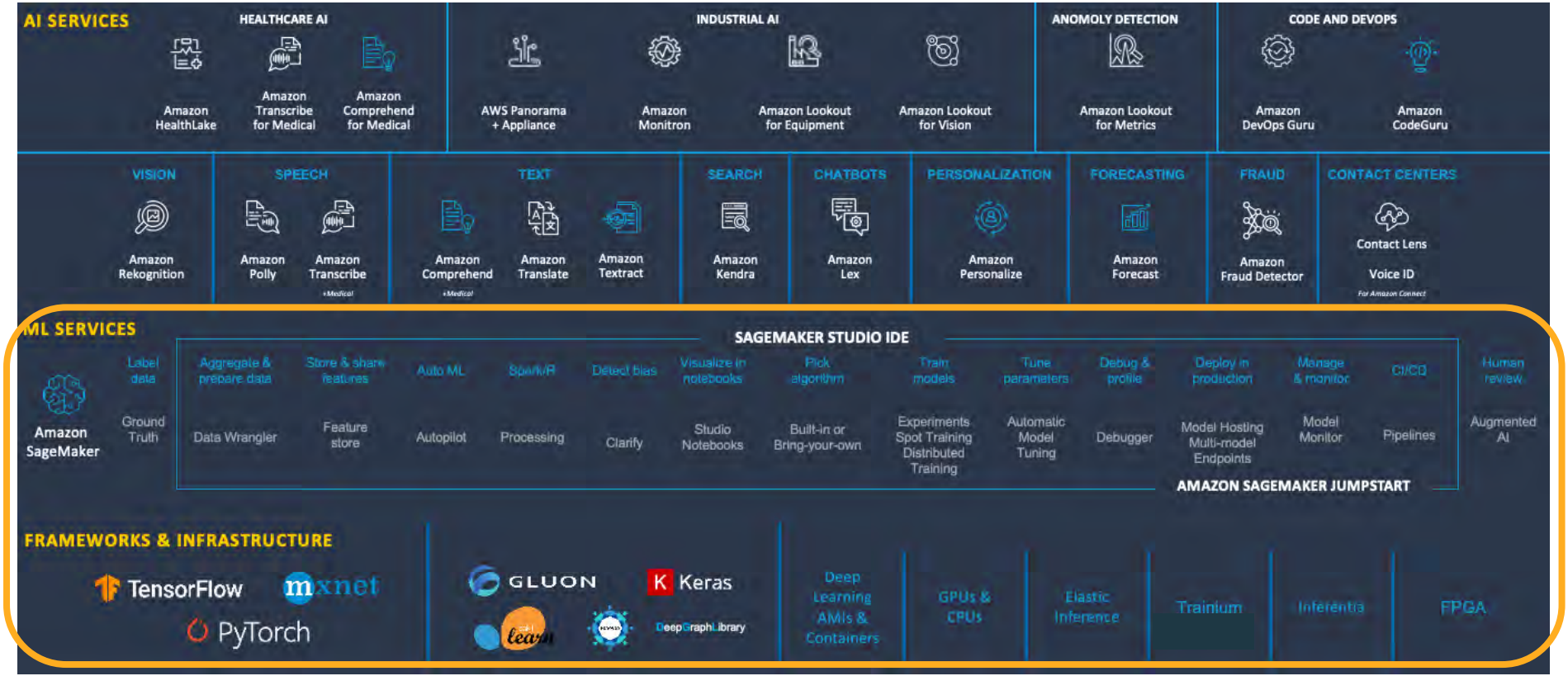
LOOKOUT - LOW / NO-CODE

AllCloud

Test performance of model(s)



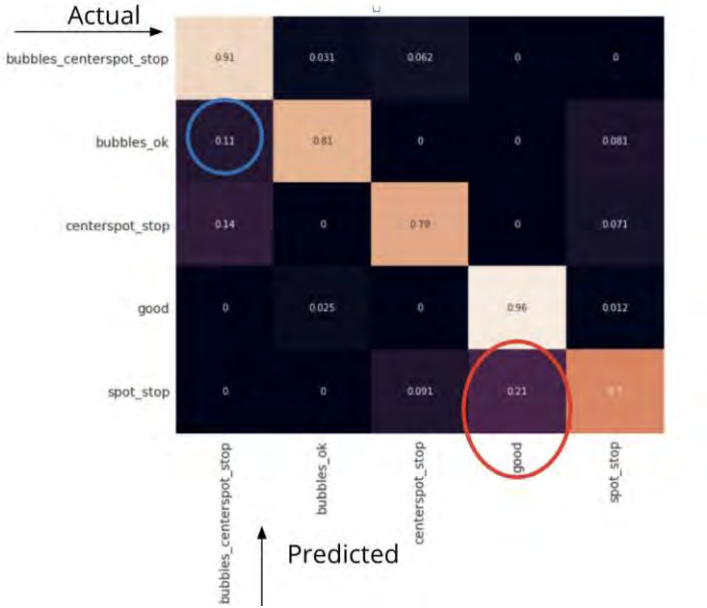
ML/AI on AWS


AI SERVICES
HEALTHCARE AI
Amazon HealthLake
Amazon Transcribe for Medical
Amazon Comprehend for Medical
INDUSTRIAL AI
AWS Panorama + Appliance
Amazon Monitron
Amazon Lookout for Equipment
Amazon Lookout for Vision
ANOMOLY DETECTION
Amazon Lookout for Metrics
CODE AND DEVOPS
Amazon DevOps Guru
Amazon CodeGuru
VISION
Amazon Rekognition
SPEECH
Amazon Polly
Amazon Transcribe
+Medical
TEXT
Amazon Comprehend
+Medical
Amazon Translate
Amazon Textract
SEARCH
Amazon Kendra
CHATBOTS
Amazon Lex
PERSONALIZATION
Amazon Personalize
FORECASTING
Amazon Forecast
FRAUD
Amazon Fraud Detector
CONTACT CENTERS
Contact Lens
Voice ID
For Amazon Connect
ML SERVICES
Amazon SageMaker
Label data
Ground Truth
SAGEMAKER STUDIO IDE
Aggregate & prepare data
Data Wrangler
Store & share features
Feature store
Auto ML
Autopilot
Spark/R
Processing
Detect bias
Clarify
Visualize in notebooks
Studio Notebooks
Pick algorithm
Built-in or Bring-your-own
Train models
Experiments Spot Training Distributed Training
Tune parameters
Automatic Model Tuning
Debug & profile
Debugger
Deploy in production
Model Hosting Multi-model Endpoints
Manage & monitor
Model Monitor
CI/CD
Pipelines
Human review
Augmented AI
AMAZON SAGEMAKER JUMPSTART
FRAMEWORKS & INFRASTRUCTURE
TensorFlow
mxnet
PyTorch
GLUON
Keras
DeepGraphLibrary
Deep Learning AMIs & Containers
GPUs & CPUs
Elastic Inference
Trainium
Inferentia
FPGA

USE CASE:

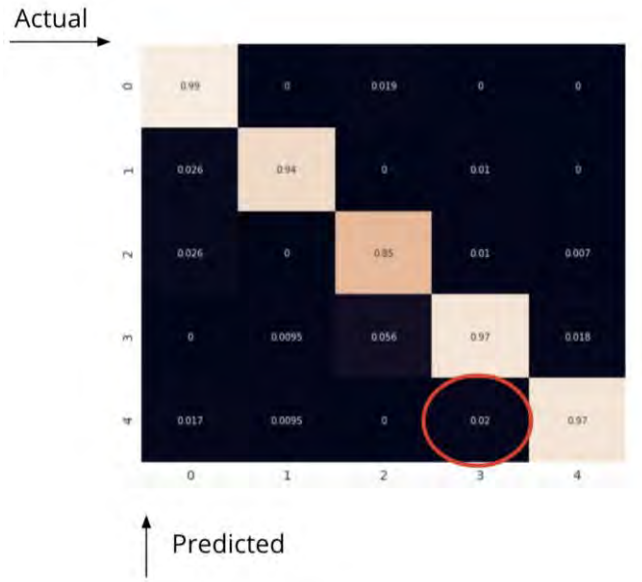
Tower Semiconductor - Using Deep Learning / ANNs

BEFORE



Existing system:
The error rate is **21%**

AFTER



With Machine Learning:
Error rate reduced to **2%**

AllCloud - DATA, ML / AI

AllCloud

Data Pipelines (Lakes / WH)

Setting-up/Implementing data lake projects and related data services

Data Analytics & BI

Setting up BI Solutions (or optimizing existing ones) on top of DWH/Lakes.

Data Access Frameworks

Applications Integration, Data Products, Digital Access, APIs

ML / AI - DS

SageMaker implementation, model & algorithms setup. Business cases: NLP Prediction, Computer-Vision

IoT Solutions

Connecting devices, Streaming data, Implementing end-point AI

Data Operations

Managed-Service for Data Operation Center - Ensuring system productivity

Carsten Riggelsen - carsten.riggelsen@allcloud.io

>> WE ARE HIRING <<


AllCloud