Become a Machine Learning developer with AWS services

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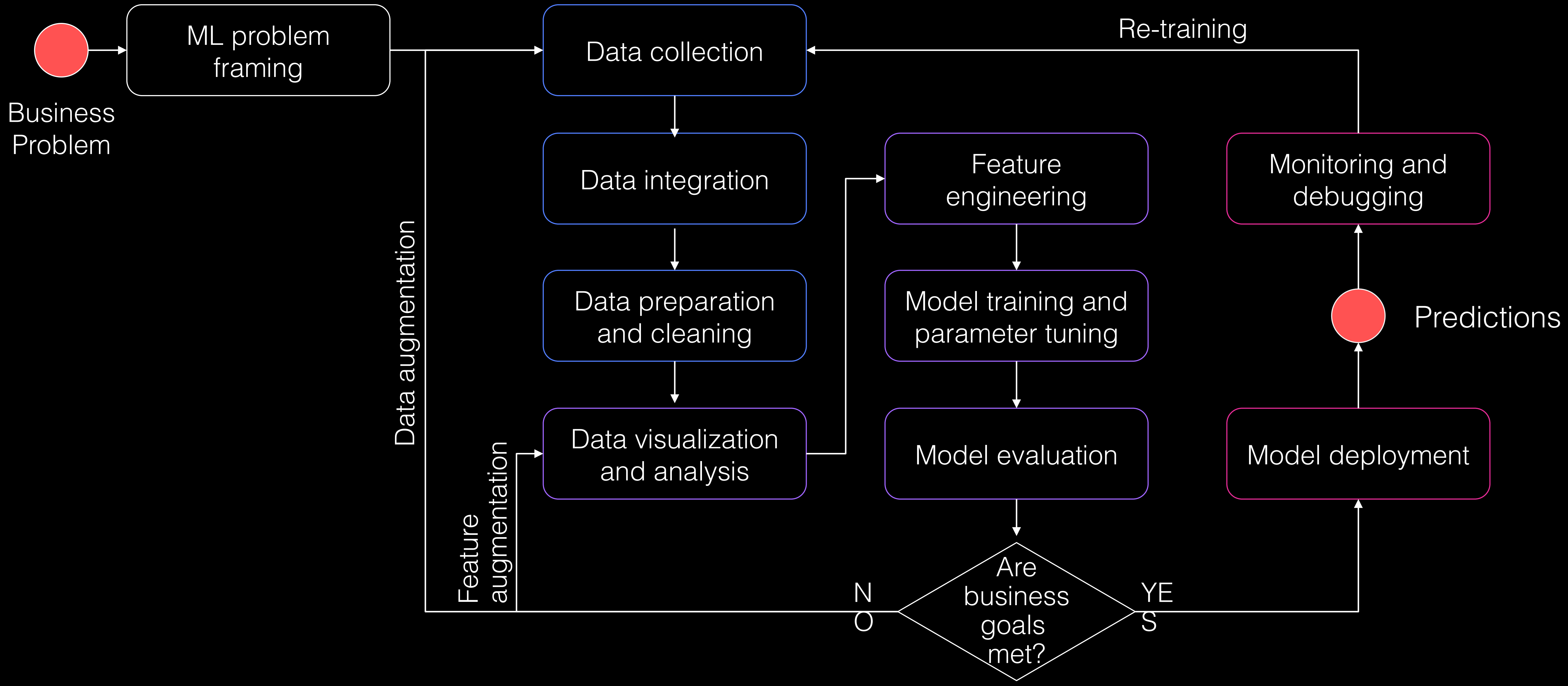
Breght
Boschker
CTO, SkinVision

aws SUMMIT

Machine learning cycle



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SkinVision

Applying Machine Learning to skin cancer detection

Breght Boschker, CTO
www.skinvision.com

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SkinVision

Together we care

Early detection of skin cancer

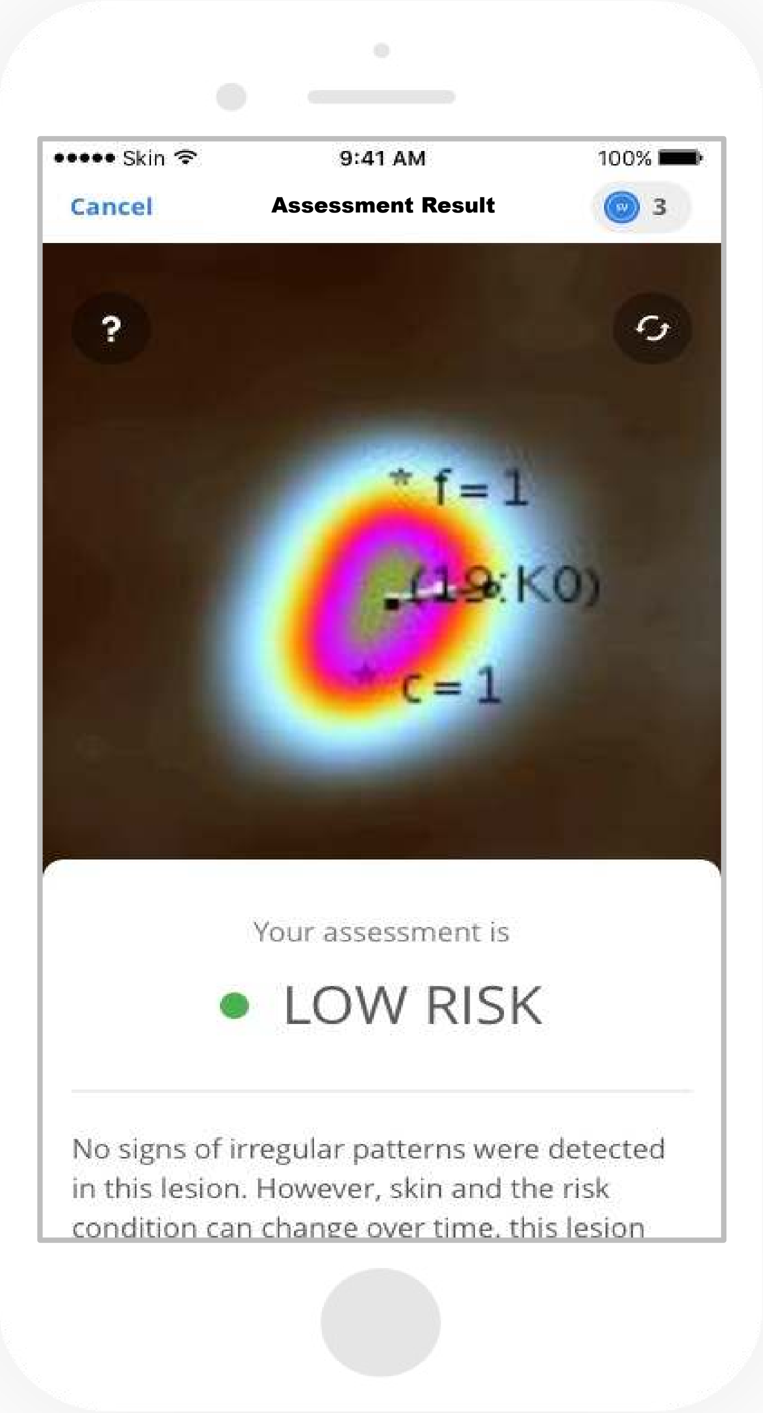
- 1 in 5 people get skin cancer
- Act when it’s most treatable
- Awareness is key

Using your smartphone

Scientifically proven technology

At the level of a specialized dermatologist

Available globally*



Cancel

Assessment Result

Your assessment is

● LOW RISK

No signs of irregular patterns were detected in this lesion. However, skin and the risk condition can change over time, this lesion

* Coming to USA & Canada

SkinVision
Together we care

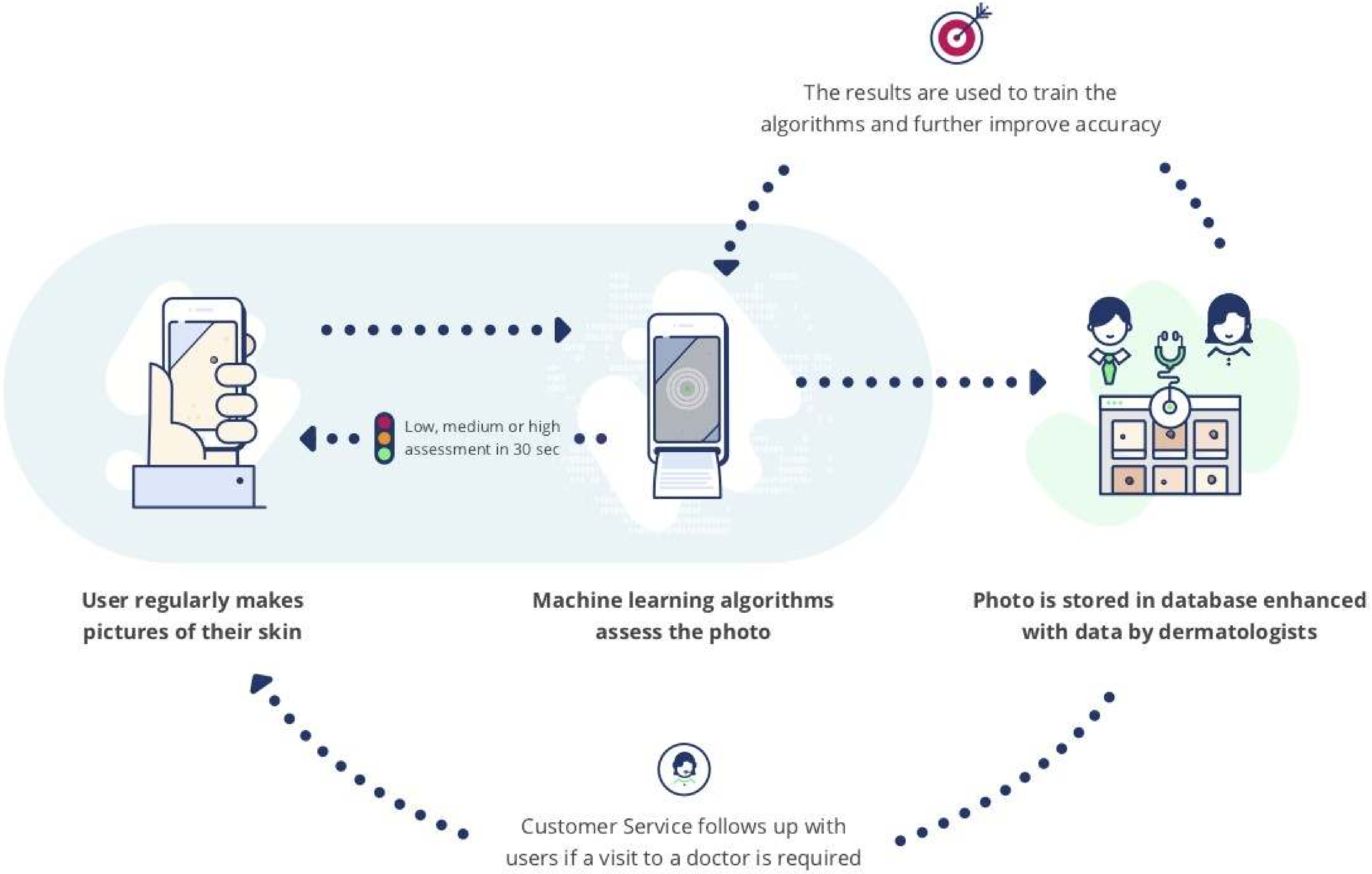
Guide a user in their health journey

- Should you see a Healthcare Professional?
- Continuous Monitoring
- Follow-up

Machine Learning Risk Assessment

Continuous data enrichment

- Clinical Validation
- Customer Validation



The results are used to train the algorithms and further improve accuracy

User regularly makes pictures of their skin

Machine learning algorithms assess the photo

Photo is stored in database enhanced with data by dermatologists

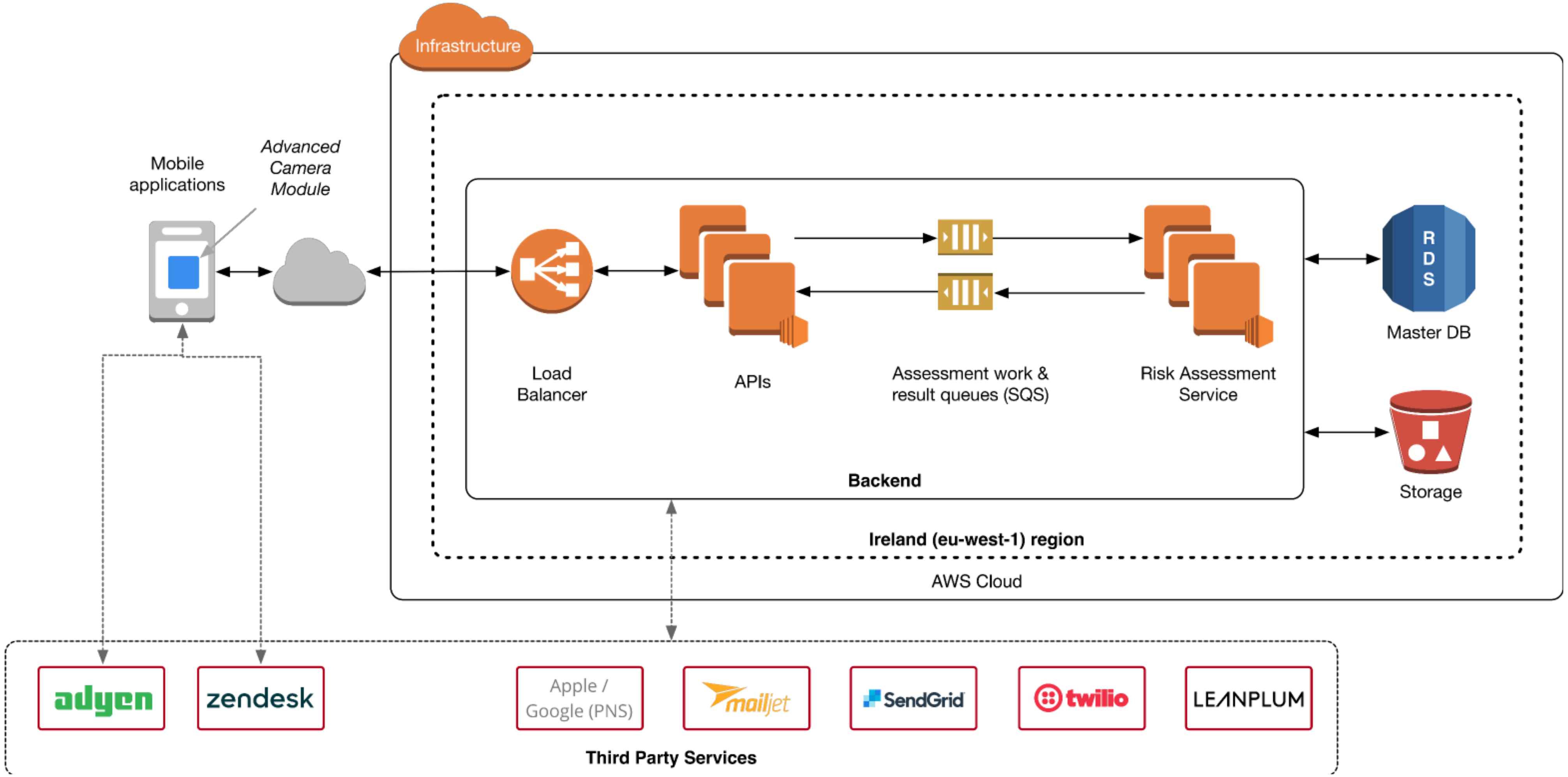
Customer Service follows up with users if a visit to a doctor is required

SkinVision

SkinVision // AWS

- AWS has been SkinVision’s first choice from the beginning
- Security
- Scalability
- Global availability
- Strong support & growth model
- Innovation driver
- Continuous focus on ease of use, automation

SkinVision Architecture



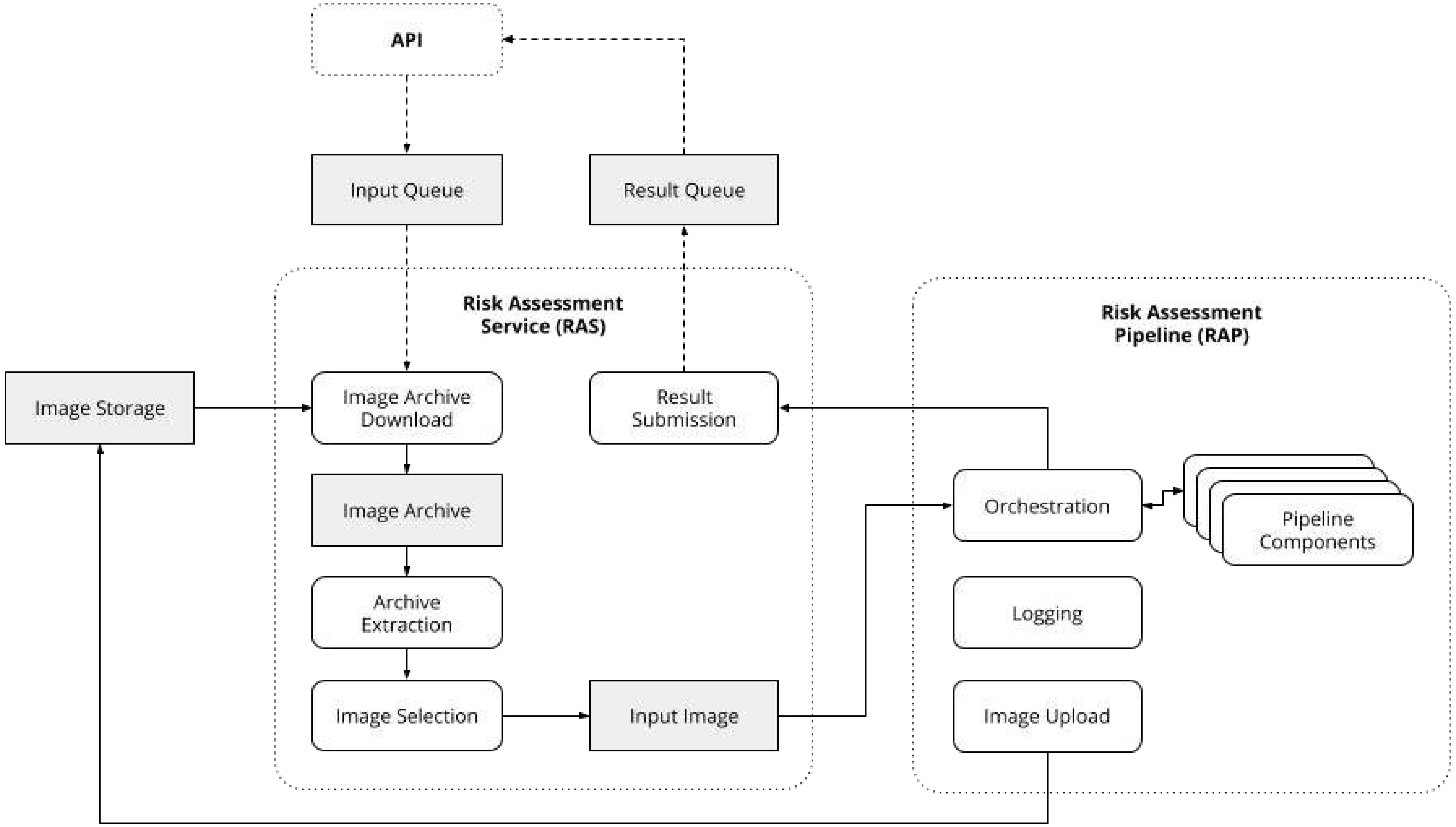
- Mobile applications
- Backend Systems
- ML Risk Assessment
- Internal Health Quality Management Systems
- Data Analysis & Business Intelligence
- Messaging

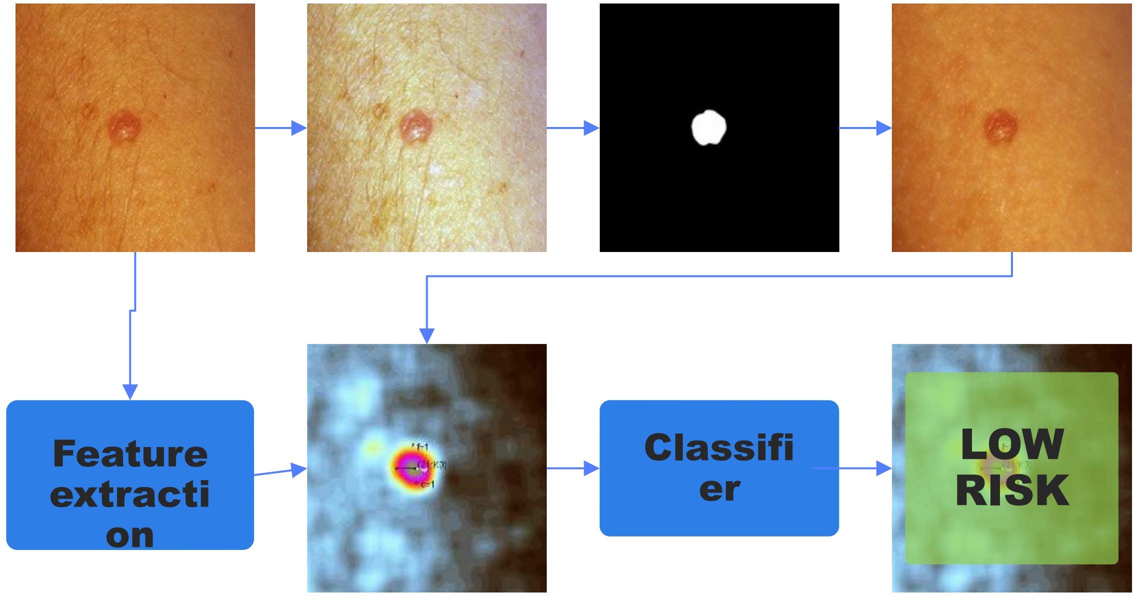
TensorFlow   Keras   looker   amazon REDSHIFT

SkinVision Architecture

Machine Learning at Scale

- Mobile apps for iOS & Android
- API
- Amazon SQS
- Service Workers: Docker
- Risk Assessment Pipeline: Docker Orchestration
- Amazon S3





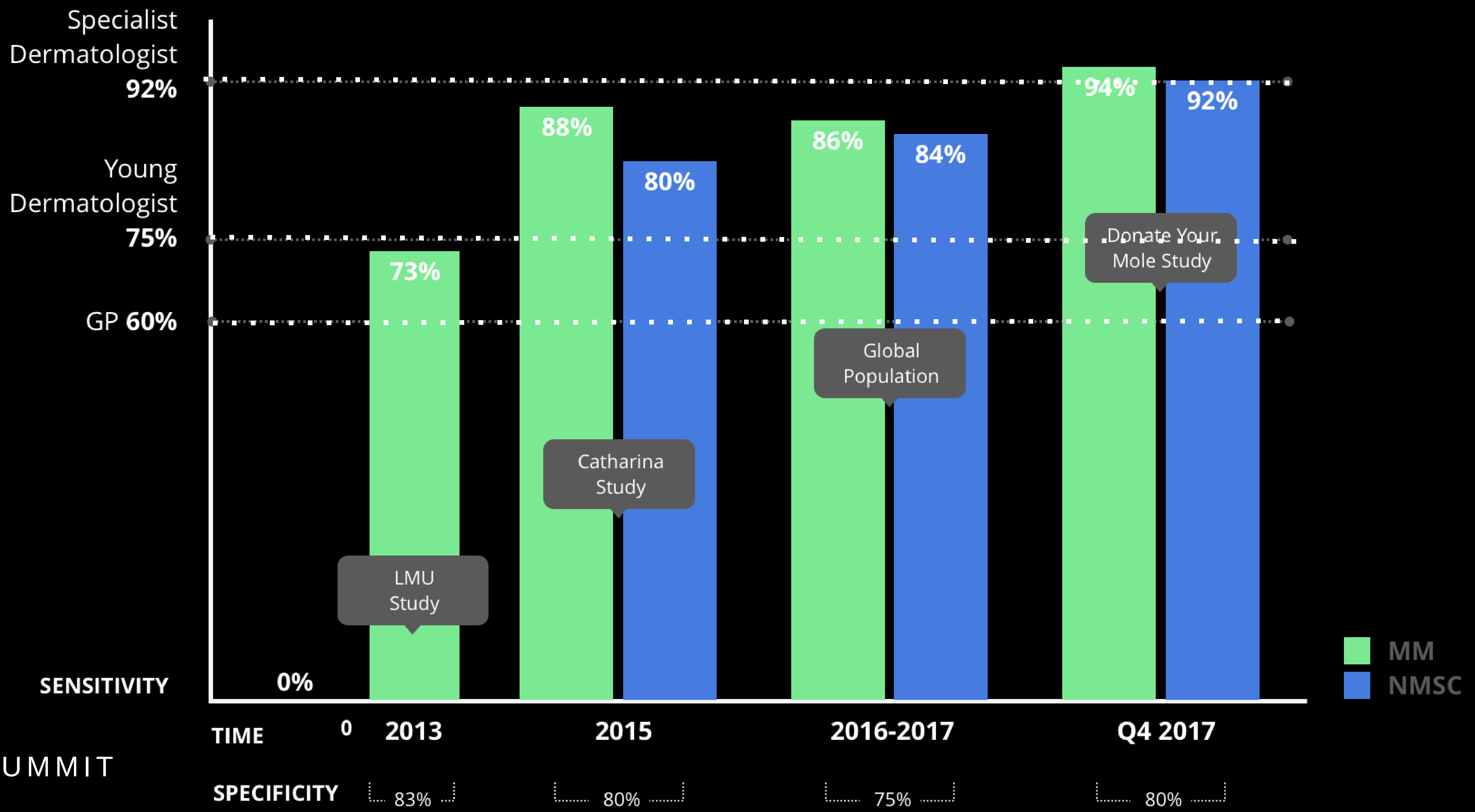
SkinVision Approach

- Machine Learning as an Engineering Problem
  - Repeatable
  - Traceable
  - Measurable
  - Automated
  - Infrastructure as Code
  - Cost

- Proof through data
  - Scientific
  - ‘Shadow’ pipelines on AWS

Active: 1.2 million users, 1,500+ daily assessments

Effective: 27,000+ skin cancers found, 5,000+ melanoma found



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Ongoing work

- Multiple disease areas

- Compliance Attestation & Compliance Automation
  - AWS Landing Zone
  - AWS Config
  - AWS GuardDuty

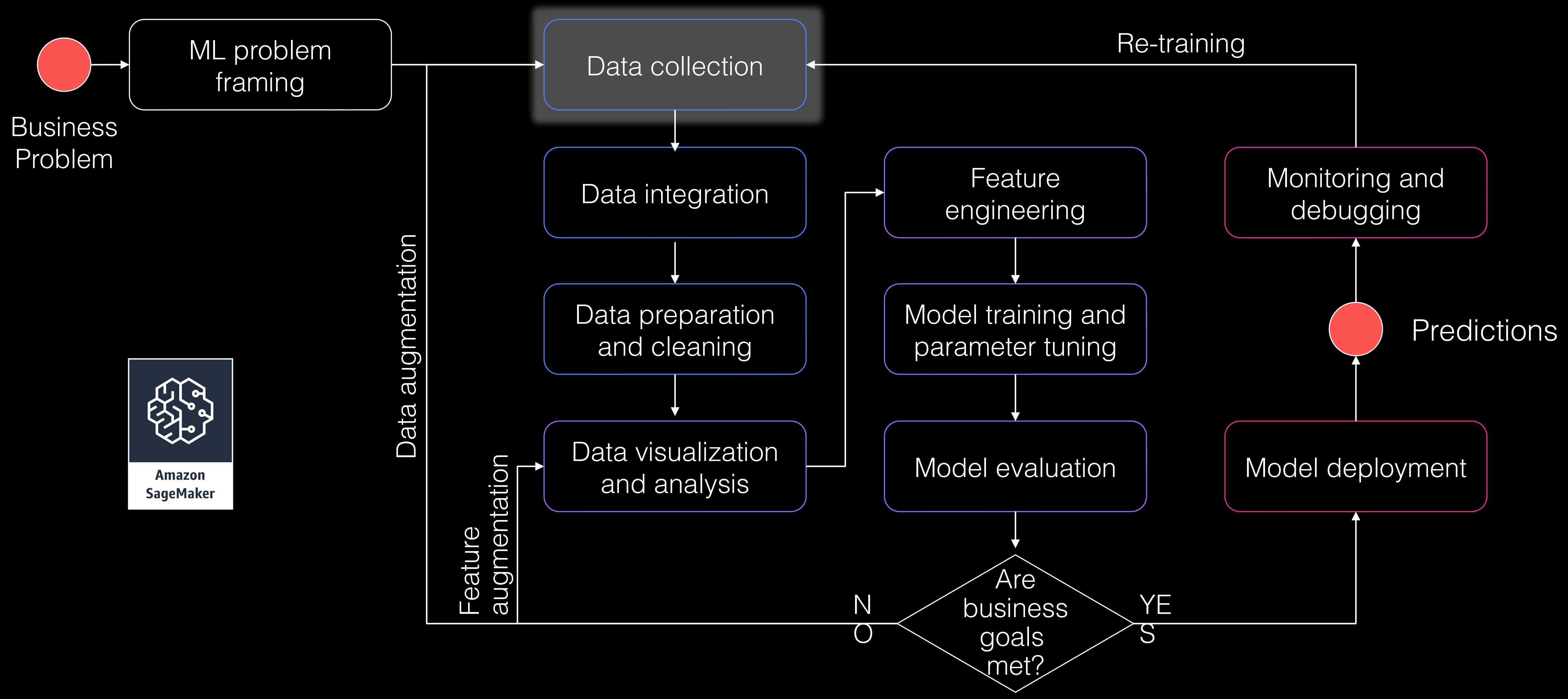
- Cost-down & scalability
  - Amazon SageMaker
  - Optimized frameworks
  - Amazon EKS / Container solutions
  - Amazon RedShift Spectrum

When was the last time *you* checked your skin?

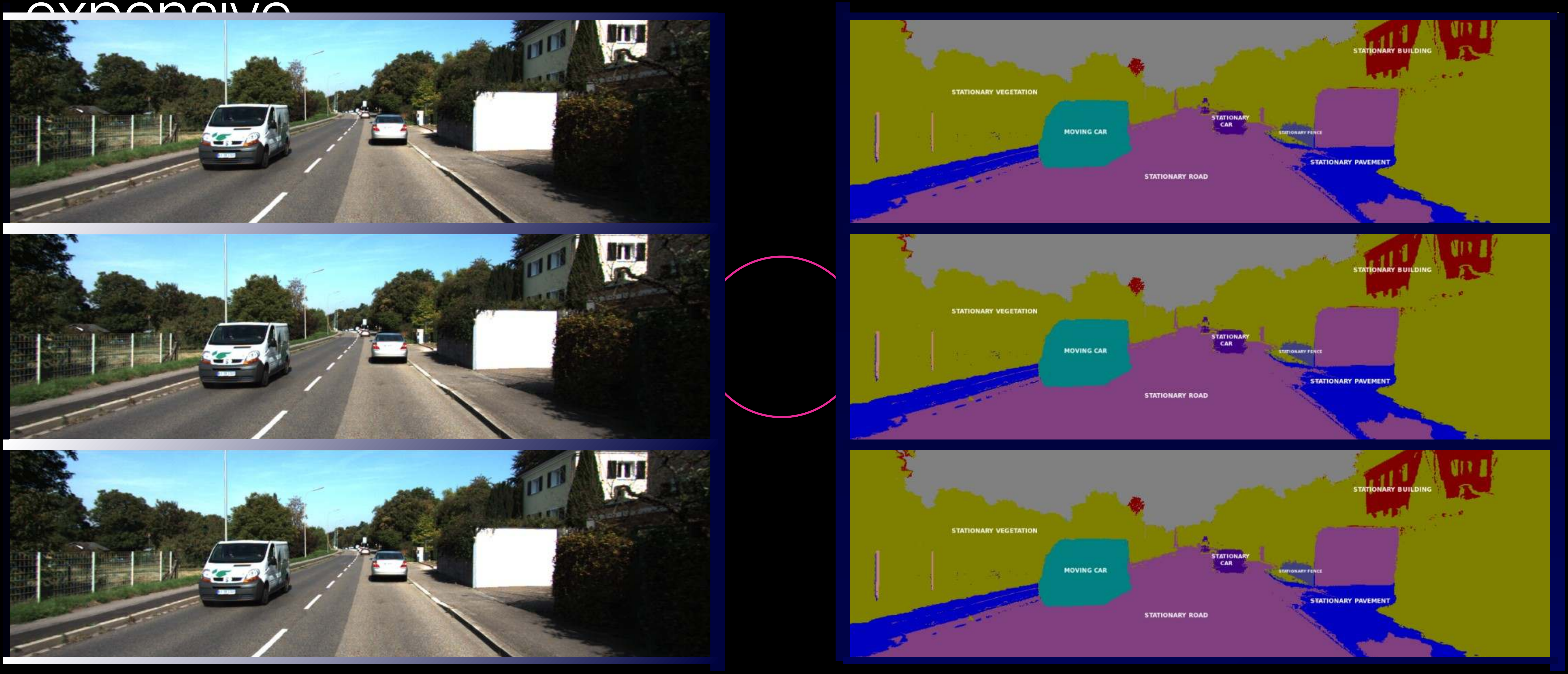
http://www.skinvision.com/download

AWS services for Machine Learning

Build your dataset



Annotating data at scale is time-consuming and expensive



Amazon SageMaker Ground Truth

Build scalable and cost-effective labeling workflows

Quickly label training data

Easily integrate human labelers

Get accurate results

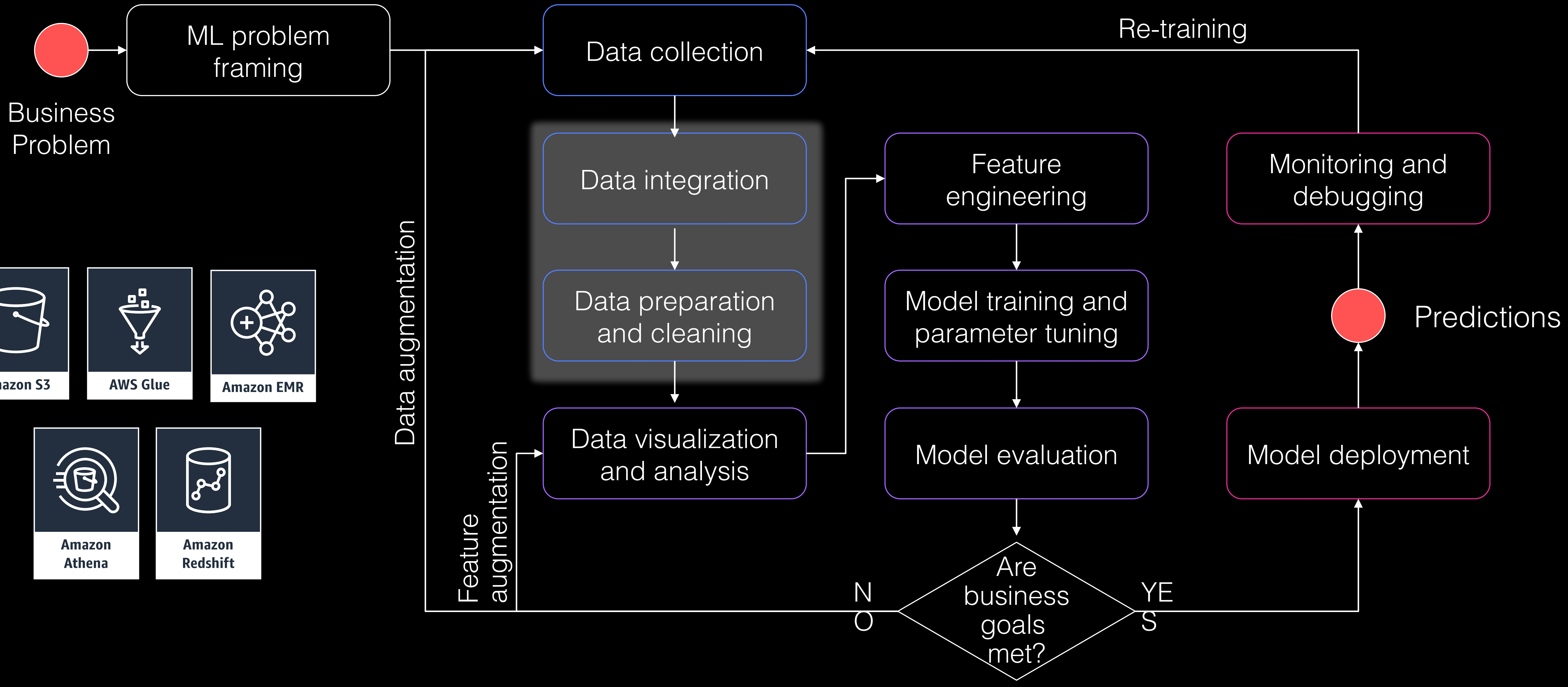
KEY FEATURES

Automatic labeling via machine learning

Ready-made and custom workflows for image bounding box, segmentation, and text

Private and public human workforce

Prepare your dataset for Machine Learning



Business Problem

ML problem framing

Data collection

Data integration

Data preparation and cleaning

Data visualization and analysis

Feature engineering

Model training and parameter tuning

Model evaluation

Are business goals met?

NO

YES

Model deployment

Predictions

Monitoring and debugging

Re-training

Data augmentation

Feature augmentation

Amazon S3

AWS Glue

Amazon EMR

Amazon Athena

Amazon Redshift

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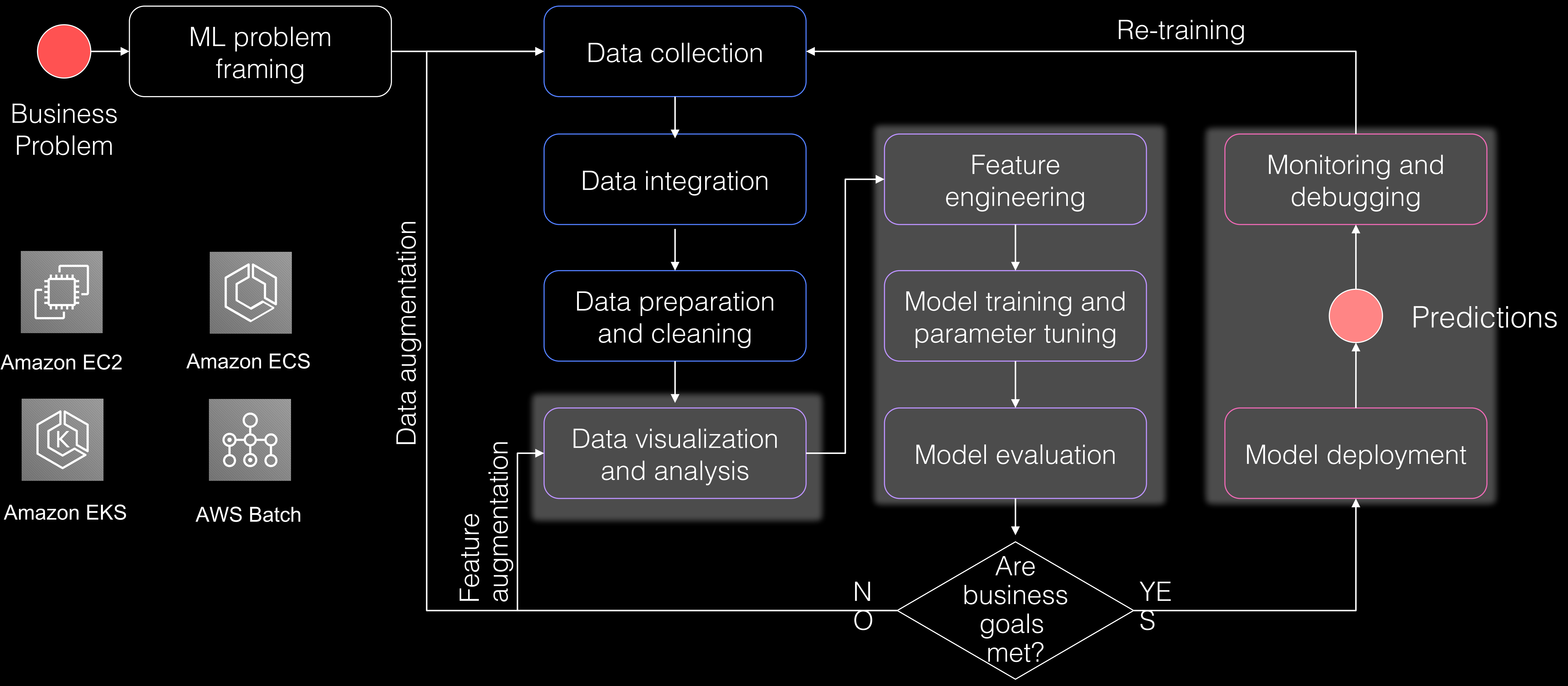
Build, train and deploy models using compute services



Amazon EC2

Amazon ECS

Amazon EKS

AWS Batch

AWS Deep Learning AMIs

Preconfigured environments on Amazon Linux or Ubuntu

NEW (March 27th) Deep Learning containers

Conda AMI
For developers who want pre-installed pip packages of DL frameworks in separate virtual environments.

Base AMI
For developers who want a clean slate to set up private DL engine repositories or custom builds of DL engines.

AMI with source code
For developers who want preinstalled DL frameworks and their source code in a shared Python environment.

TensorFlow mxnet torch Microsoft CNTK Caffe2 ONNX

Keras GLUON PYTORCH Chainer HOROVOD

Amazon SageMaker

Amazon SageMaker

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

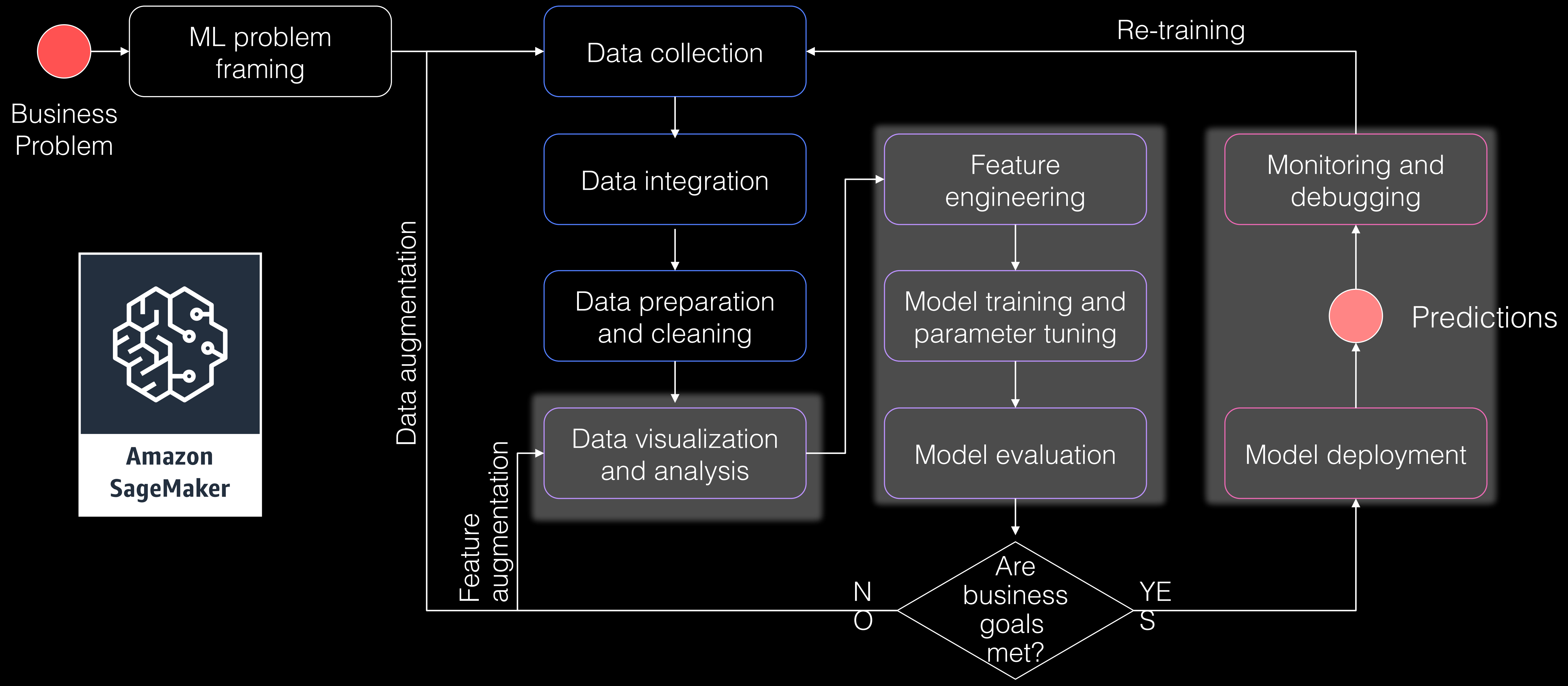
Scale and manage the production environment

Same service and APIs from experimentation to production

DOW JONES

GE Healthcare

Build, train and deploy models using SageMaker



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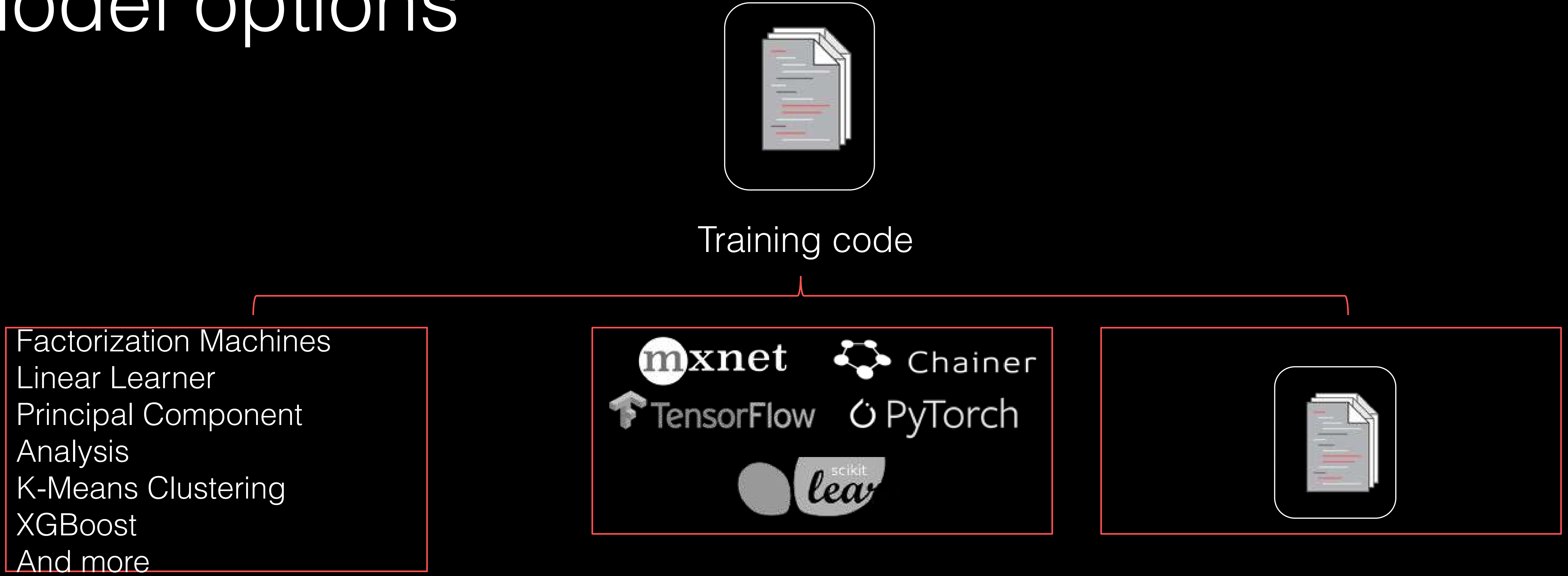
The Amazon SageMaker API

- Python SDK orchestrating all Amazon SageMaker activity
  - High-level objects for algorithm selection, training, deploying, automatic model tuning, etc.
  - Spark SDK (Python & Scala)

- AWS SDK
  - For scripting and automation
  - CLI : '*aws sagemaker*'
  - Language SDKs: boto3, etc.

Model options



Training code

Factorization Machines
Linear Learner
Principal Component Analysis
K-Means Clustering
XGBoost
And more

Built-in Algorithms (17)

No ML coding required
No infrastructure work required
Distributed training
Pipe mode

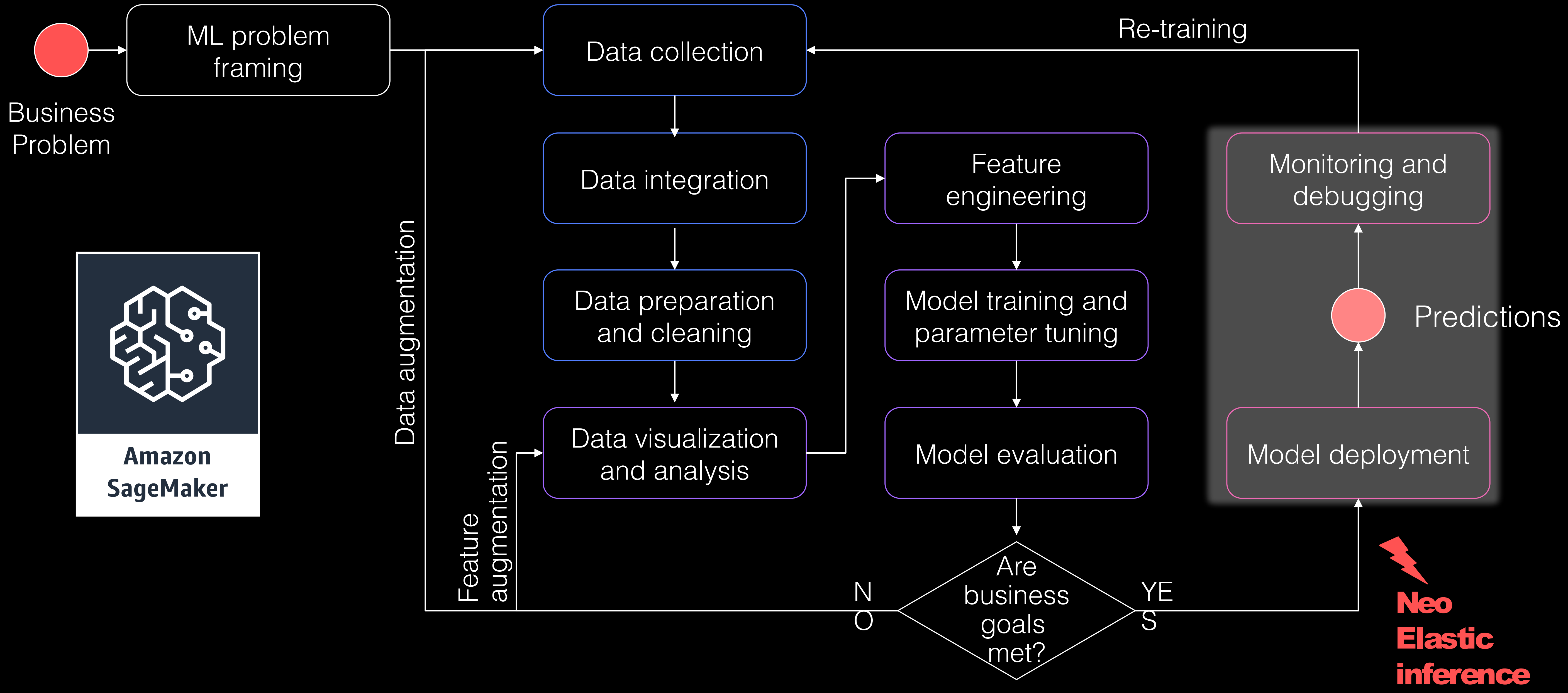
Built-in Frameworks

Bring your own code: script mode
Open source containers
No infrastructure work required
Distributed training
Pipe mode

Bring Your Own Container

Full control, run anything!
R, C++, etc.
No infrastructure work required

Optimize and deploy models using SageMaker



Amazon SageMaker Neo

Optimize models for the underlying hardware architecture

- Train once, run anywhere
- Supported frameworks and algorithms
  - TensorFlow, Apache MXNet, PyTorch, ONNX, and XGBoost
- Supported hardware architectures
  - ARM, Intel, and NVIDIA
  - Cadence, Qualcomm, and Xilinx hardware coming soon

The Neo compiler and runtime are open source, enabling hardware vendors to customize it for their processors and devices: https://github.com/neo-ai/

Compiling ResNet-50 for the Raspberry Pi

Configure the compilation job

```
{
  "RoleArn":$ROLE_ARN,
  "InputConfig": {
   "S3Uri":"s3://jsimon-neo/model.tar.gz",
   "DataInputConfig": "{\"data\": [1, 3, 224, 224]}",
   "Framework": "MXNET"
  },
 "OutputConfig": {
  "S3OutputLocation": "s3://jsimon-neo/",
  "TargetDevice": "rasp3b"
 },
 "StoppingCondition": {
 "MaxRuntimeInSeconds": 300
 }
}
```

Compile the model

```
$ aws sagemaker create-compilation-job
--cli-input-json file://config.json
--compilation-job-name resnet50-mxnet-pi

$ aws s3 cp s3://jsimon-neo/model-
rasp3b.tar.gz .

$ gtar tfz model-rasp3b.tar.gz
compiled.params
compiled_model.json
compiled.so
```

Predict with the compiled model

```
from dlr import DLRModel
model = DLRModel('resnet50', input_shape,
output_shape, device)
out = model.run(input_data)
```

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Amazon Elastic Inference

Attach fractional acceleration to any EC2 instance

Lower inference costs up to 75%

Match capacity to demand

Available between 1 to 32 TFLOPS

Integrated with Amazon EC2, Amazon SageMaker, and Amazon DL AMIs

Support for TensorFlow, Apache MXNet, and ONNX
with PyTorch coming soon

Single and mixed-precision operations

Demo:

Image classification on Caltech-256, with Automatic Model Tuning and Elastic Inference

https://gitlab.com/juliensimon/dlnotebooks/blob/master/sagemaker/08-Image-classification-advanced.ipynb

Getting started

http://aws.amazon.com/free

https://ml.aws
https://aws.amazon.com/sagemaker

https://github.com/aws/sagemaker-python-sdk
https://github.com/aws/sagemaker-spark
https://github.com/awslabs/amazon-sagemaker-examples
https://gitlab.com/juliensimon/ent321

https://medium.com/@julsimon
https://gitlab.com/juliensimon/dlnotebooks

Dank u wel!

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