AI in Real: Today and Tomorrow

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Global Artificial Intelligence Team

Artificial Intelligence

is the science of training systems to emulate human tasks through **Learning** and **Automation**

Understand Context

Learn Patterns

Recognize Objects

LEARNING & AUTOMATION

Artificial Intelligence

Human Capability

Evolution

The term "Artificial Intelligence"

Neural Network

Machine Learning

Classical

Modern

Deep Learning

Applied Artificial Intelligence

Data Size , Variety & Compute Power

Past to Present

1950s

1990s

2010's

Present

Today, AI is seen as both Threat and Opportunity

THREAT

IRRATIONAL

Massive Job Loss

Robots Replace Humans

RATIONAL

Lose Competitive Edge

Bias and Discrimination

Lose Autonomy and Control

OPPORTUNITY

Gain Competitive Edge

Find Growth Trends

Customer Centricity

New Capabilities

Efficiency in Process

Process Elimination

Workforce Transformation

Reduced Time to Value

Reduced Cost

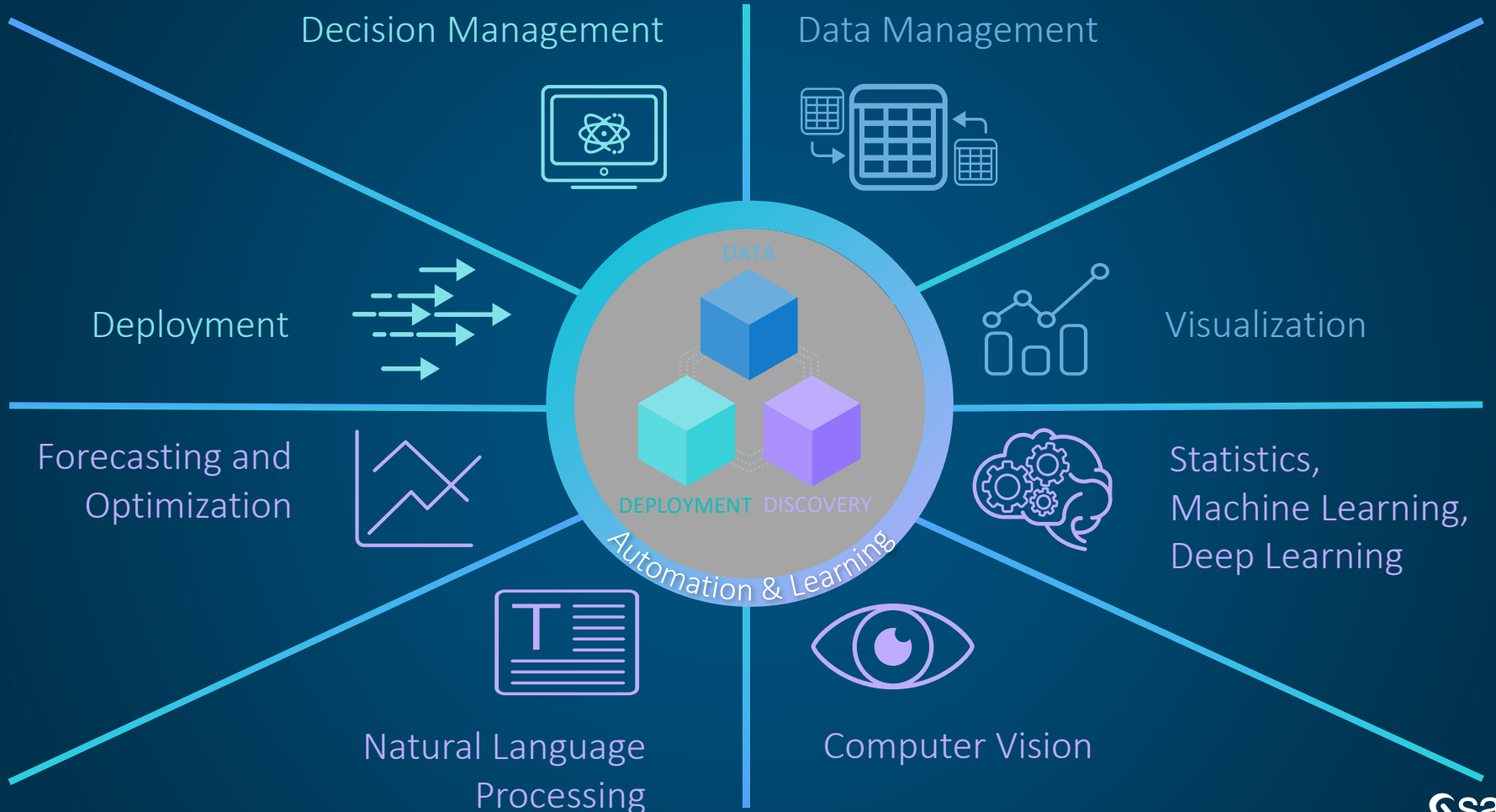
Improved Margin

61%

of organizations picked Machine Learning and AI as the most significant data initiative for next year

Source: Machine Learning and AI survey, O'Reilly Media and MemSQL, 2018

Tomorrow, AI will impact your industry



> *Only* **8%**
>
> *of companies effectively scale their analytic initiatives.*
>
> McKinsey 2018

WHY IS IT SO DIFFICULT?

CHALLENGES

How does artificial intelligence fit into our current business paradigm?

We can’t get our models into production in a timely manner.

We need flexibility in our software deployment patterns.

We can’t find, hire & retain enough high-level talent.

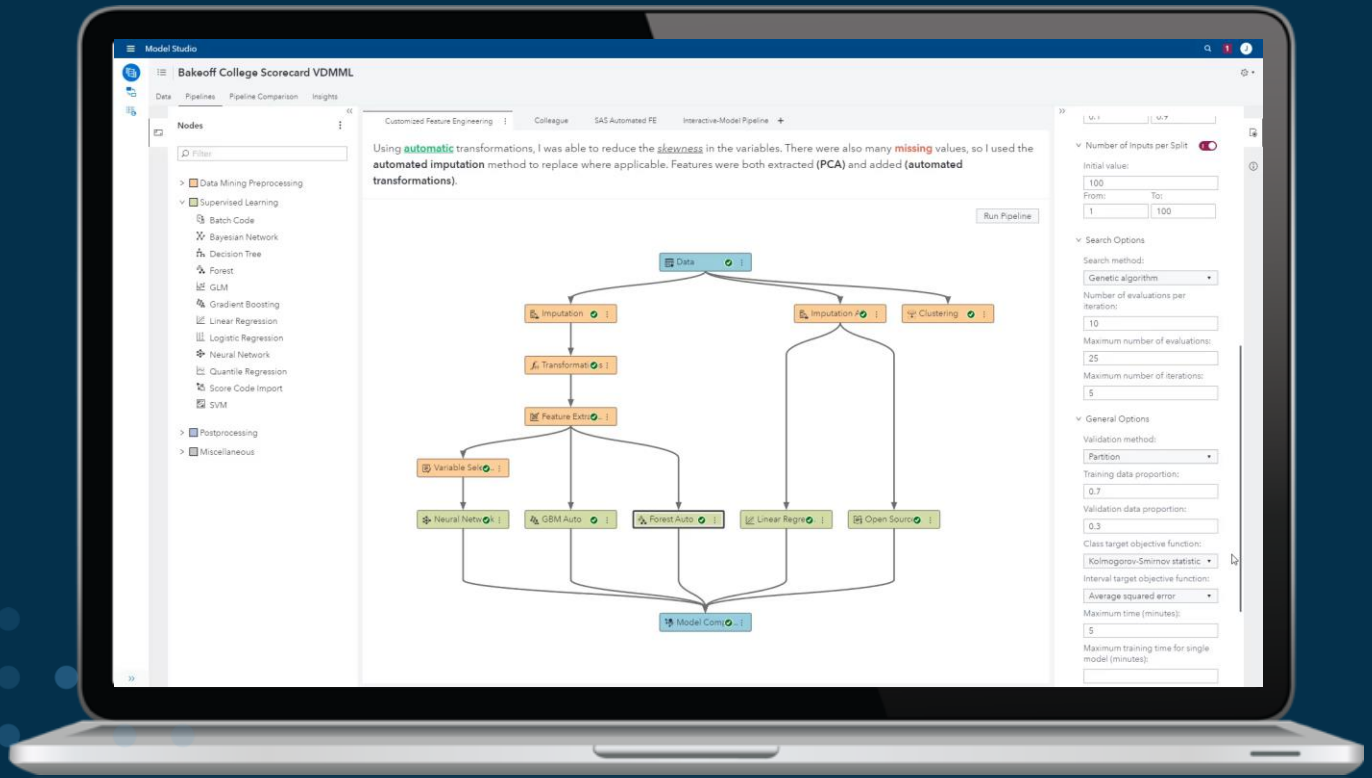
We are struggling to adopt the data-driven decision making within our corporate culture.


CHOICE
& AUTOMATION
OPENNESS
& INTEGRATION
LEARNING
& EXPLAINING
FAST
DEPLOYMENT
ANALYTICS
ORCHESTRATION

F.A.T.E.

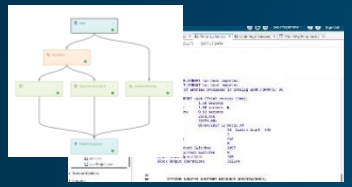
Fairness, Accountability, Transparency, Explainability

Explainability in Simple Language

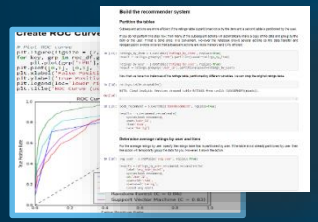


What does it mean to be “Open”?

Interface



- SAS® Program
- SAS® Visual Data Mining and Machine Learning



- **R** or **Python** coding environment

Analytics Engine

Open source Model

SAS® Model

CAS or ESP

How to Develop and Deploy Complex Models Easily?

SAS DLpy Package on GitHub

Train the model

```
model.fit(train_image, mini_batch_size=12, max_epochs=20, optimizer=dict(algorithm=dict(method='adam', learningrate=.001)))
```

```
NOTE: Training based on existing weights.
WARNING: Source layer conv1 to batch normalization layer bn_conv1 includes a bias term.
NOTE:  The Synchronous mode is enabled.
NOTE:  The total number of parameters is 23514243.
NOTE:  The approximate memory cost is 82974.00 MB.
NOTE:  Loading weights cost       0.23 (s).
NOTE:  Initializing each layer cost     282.85 (s).
NOTE:  The total number of threads on each worker is 32.
NOTE:  The total mini-batch size pe
NOTE:  The maximum mini-batch size
NOTE:  Target variable: _label_
NOTE:  Number of levels for the tar
NOTE:  Levels for the target variab
NOTE:  Level      0: NoDamage
NOTE:  Level      1: Major
NOTE:  Level      2: Minor
```

Model Deployment

Create Astore & ONNX of deep learning model

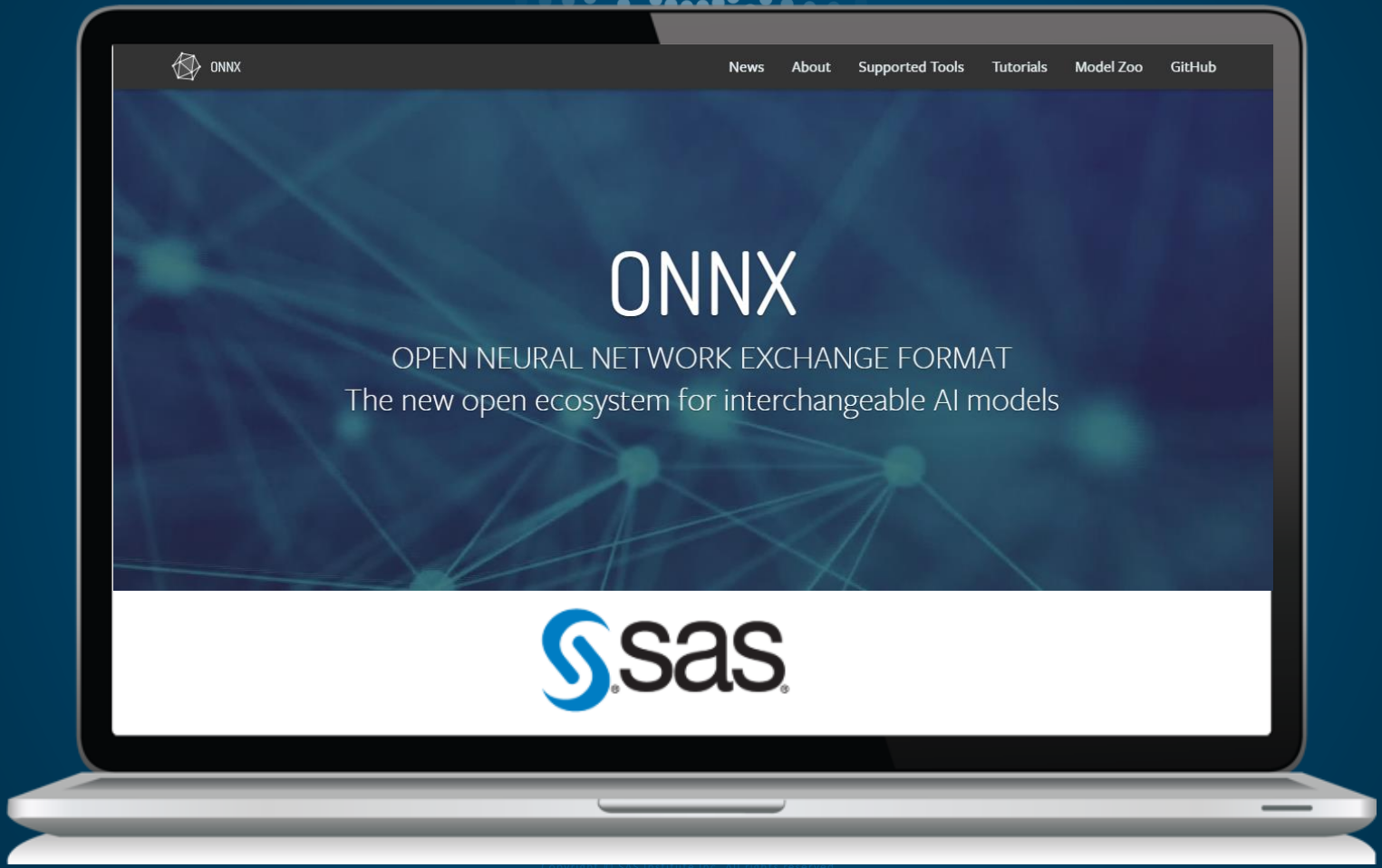
```
model1.deploy(path='/data/model/CarDamage', output_format='astore')
```

```
model1.deploy(path='/data/model/CarDamage', output_format='onnx')
```

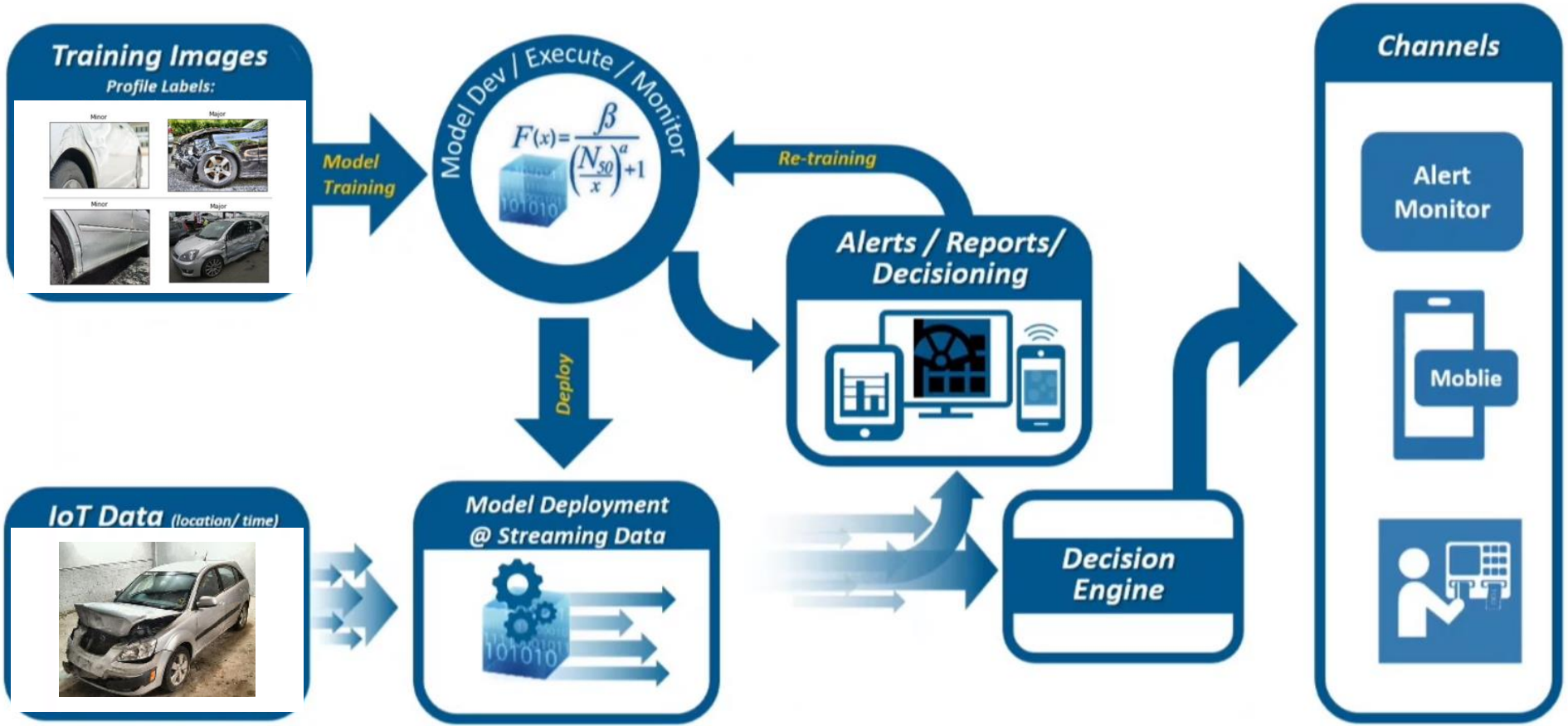
- RNN based tasks: text classification, text generation, and sequence labeling
- Object detection
- Time series processing and modeling
- Processing audio files and creating speech recognition models

- Additional pre-defined network architectures such as DenseNet, DarkNet, Inception, and Yolo
- Enhanced data visualization and metadata handling

Note: With the release of DLPy 1.0, we moved to python-style functions and parameters. This might break your old code with camelCase parameters and functions.


ONNX
News
About
Supported Tools
Tutorials
Model Zoo
GitHub
ONNX
OPEN NEURAL NETWORK EXCHANGE FORMAT
The new open ecosystem for interchangeable AI models
sas

Fast Deployment of AI in Production



Automation & Learning in Business Applications

Credit Scoring
Next Best Offers

Fraud

Customer Segmentation

Online
Recommendations

Predictive Asset
Maintenance

Targeted Acquisition /
Retention / Attrition

Real-time Ad
placements

Natural Language
Processing

Network Intrusion
Detection

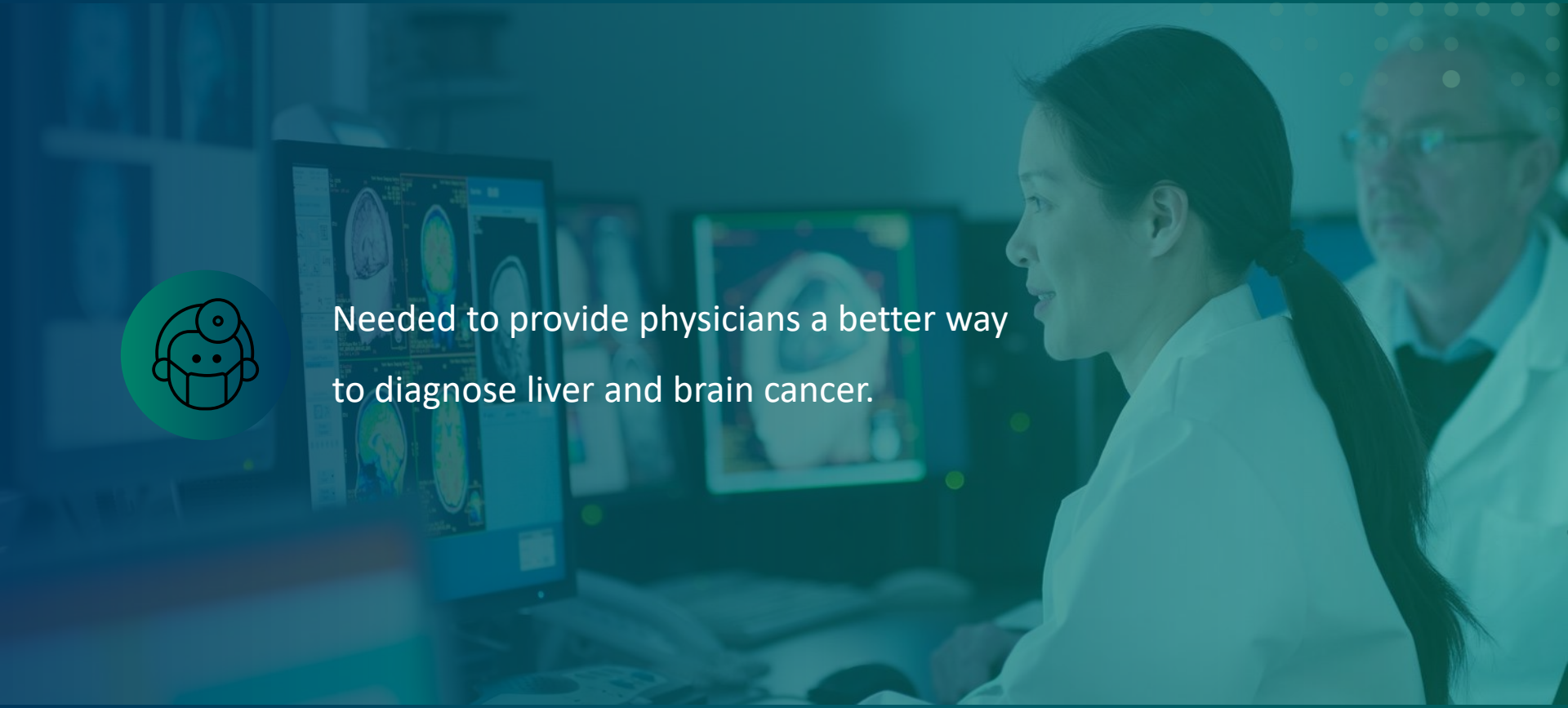
Computer Vision for
Damage Classification

Real AI Implementations

VUmc

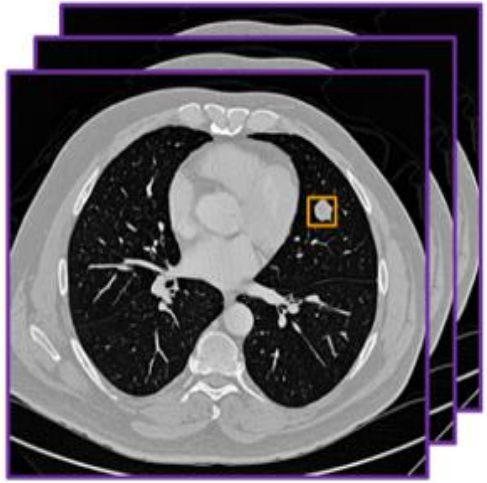
Force a breakthrough by developing innovative treatments for cancer.

sas

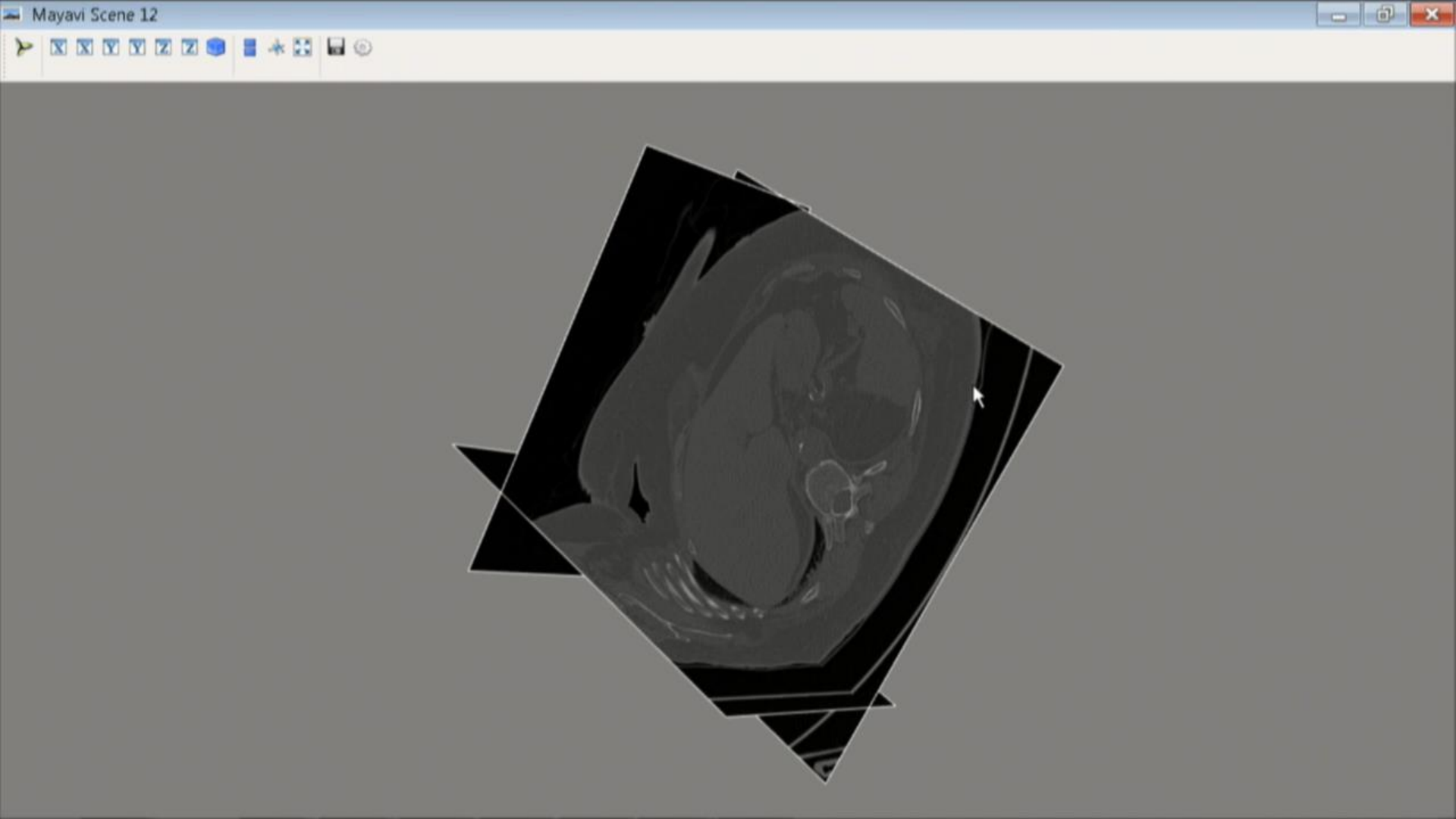


Needed to provide physicians a better way to diagnose liver and brain cancer.

Lung Nodule Classification



3D Lung CT


Mayavi Scene 12

SAS® Visual Analytics - Explore and Visualize Data

Search

Atrin Assa

Nodule Diagnosis

Diagnosis Chart

Data

Objects

Outline

Options

Roles

Actions

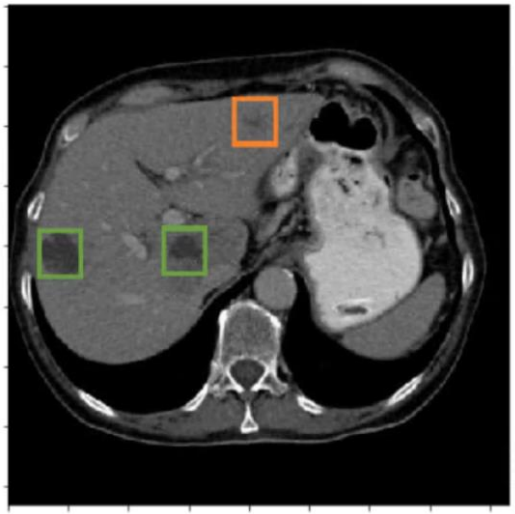
Rules

Filters

Ranks

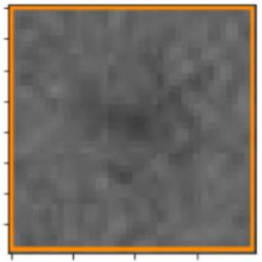
Patient Nodule Diagnoses

PatientID	X Pos	Y Pos	Z Pos	Nodule Width	Nodule Height	Nodule Computed Area	Feature Engineering	Deep Learning	Diagnosis
LUNGx-CT024	97	274	197	20	20	400	1	0	benign
LUNGx-CT019	114	345	131	36	36	1.3K	0	1	malignant
LUNGx-CT009	165	200	164	19	19	361	0	0	benign
LUNGx-CT003	359	359	146	31	31	961	1	1	malignant
LUNGx-CT002	311	328	205	37	37	1.4K	0	0	benign
CT-Training-LC009	129	279	63	39	43	1.7K	1	0	malignant
CT-Training-LC003	365	314	70	19	19	361	1	1	malignant
CT-Training-LC002	132	352	70	14	14	196	0	1	malignant
CT-Training-BE007	371	190	194	29	32	928	0	0	benign
CT-Training-BE001	396	288	169	12	12	144	0	0	benign

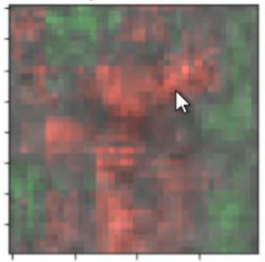


Report

Potential Lesion



Explanations



The model has found two lesions with high probabilities (green boxes) and one potential lesion (orange box) from the scan. The potential lesion area and the explanations are shown above. The red pixels in the explanations highlight the area that contributes to the lesion prediction according to the model. The green pixels highlight the area that the model finds unlikely to contain a lesion.

Image data

Object Detection

Unstructured & Structured data

Learning & Automation

Reports to Physicians

X-Rays

MRIs

CT-Scan

CNN for detecting

Nodules and

Lesions

Medications

Family history

Diet

Lifestyle

Treatment possibilities

and options

Results

“An in-depth scan has a lot of data and the outcomes can be improved with the use of advanced analytics on patients’ health data and history.”

Geert Kazemier
Cancer Center Amsterdam

Global manufacturers of heavy trucks based in Sweden and owned by AB Volvo.

New service offering for their

customers that increases vehicle uptime


Air temperature
Exhaust
Humidity
Transmission
Fault nodes
on engine
RPM
Incline or decline

Vehicle data

Engine RPM

Gear position

Exhaust performance

Load information

Environmental data

Altitude

Air temperature

Humidity

Incline / decline

Learning & Automation SAS ESP

175,000 Trucks

>20M measures per day

>300K faults per day

ML and Rules Based

Fault scenarios

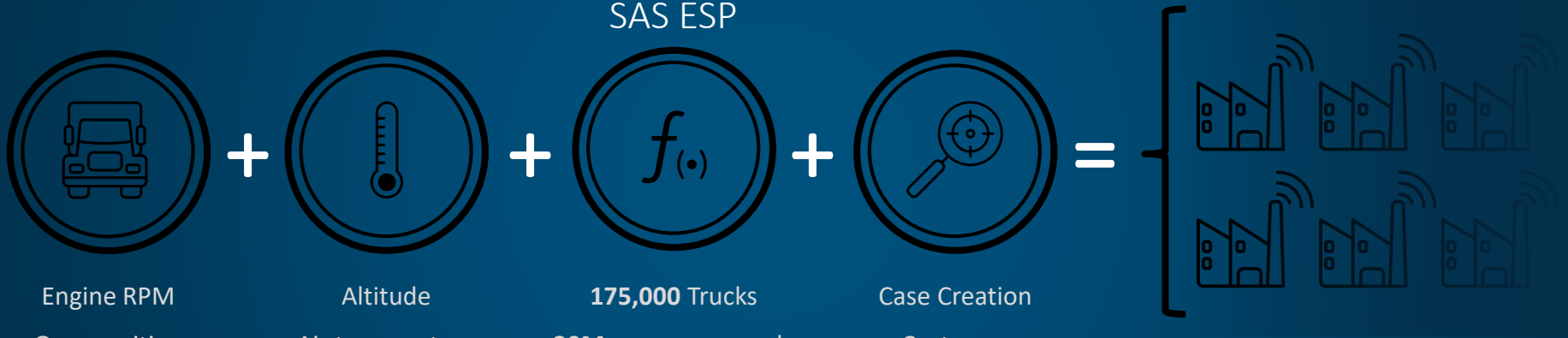
Volvo Group Telematics (VGT)

Case Creation

Customer

Notification

Field Maintenance Shops



Results

25%

Reduction in repair time

Voice of the Customer

Natural Language Processing

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Results

£5m p.a.

Savings from identifying likelihood to leave with 90% accuracy at FNOC

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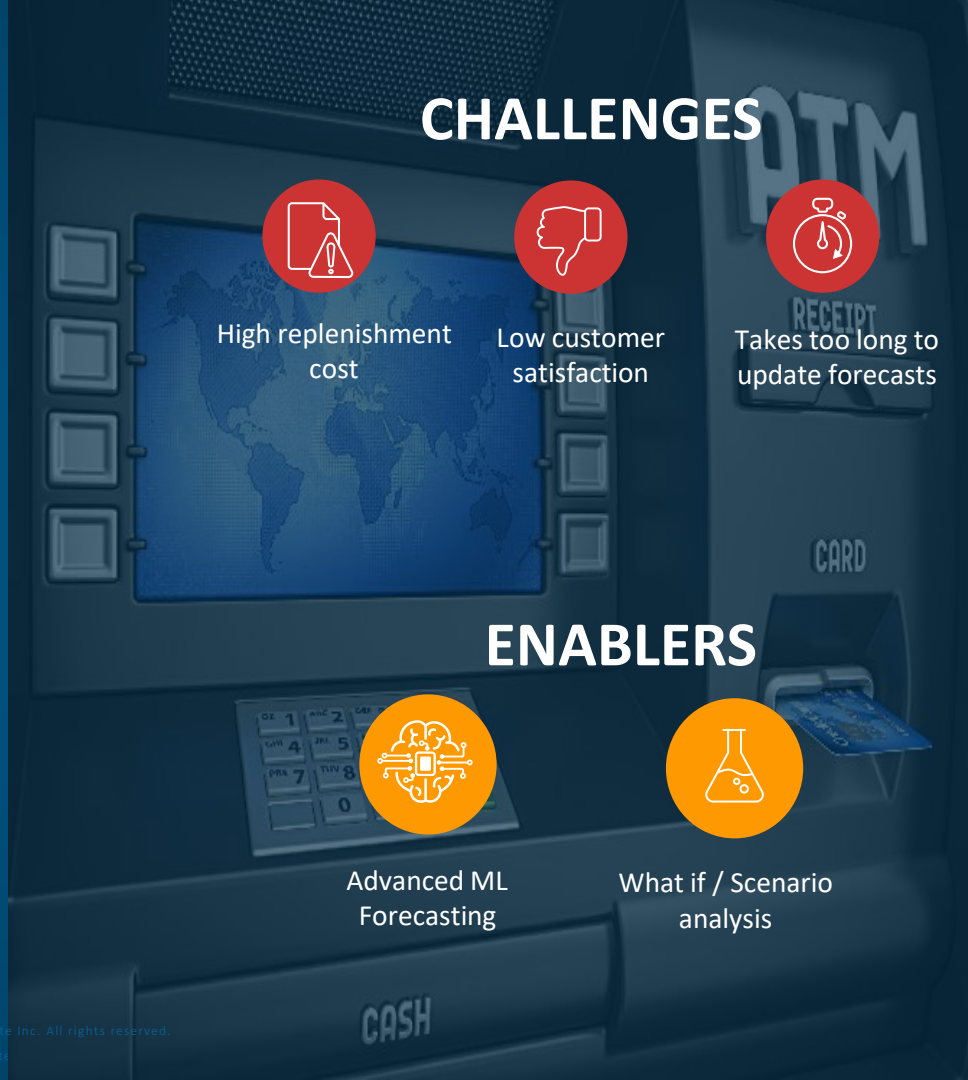
ATM Forecasting

Machine Learning

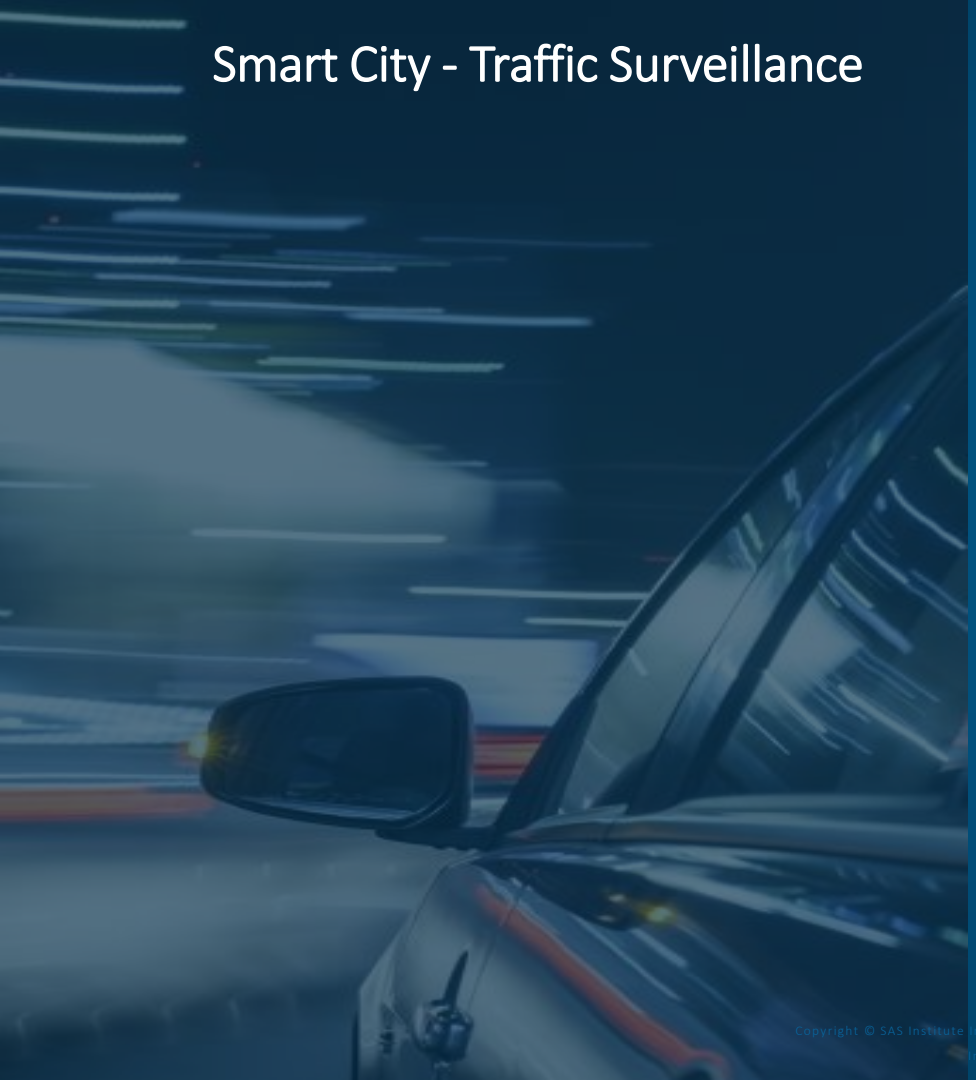


Results

33%

improvement in daily *cash brought back*. 20% reduction in daily *cash out* events. 10% reduction in *replenishment* trips.

Smart City - Traffic Surveillance



Detect ‘auto-rickshaws’ through traffic intersections

Track their movement and speed through the traffic lights

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Train Model Offline

Score Online

Automate the detection of risk on the utility lines at scale and optimize maintenance

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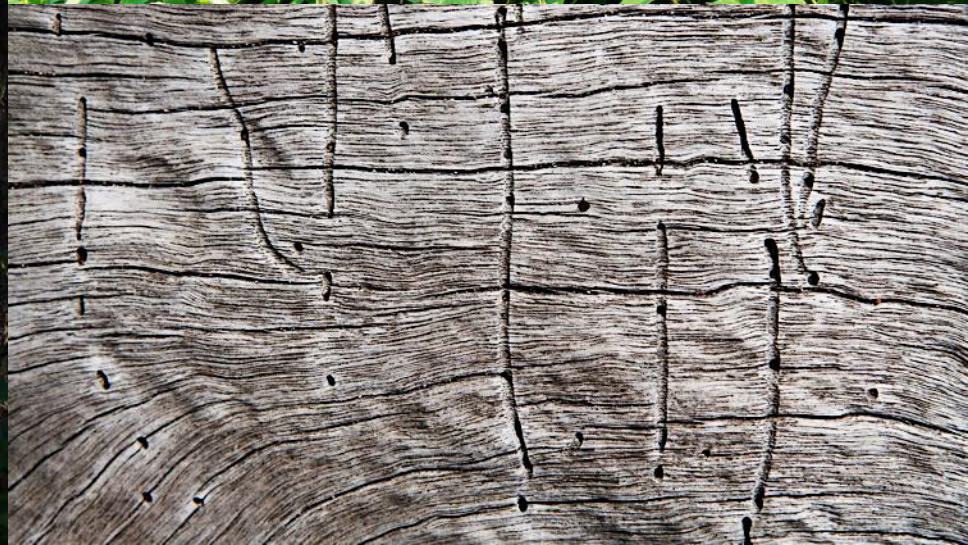


```
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vents in a block in 22.298000 milliseconds
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vents in a block in 71.007000 milliseconds
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Pcontquery::runMT() window <<esp>::<detectionProject>::<contquery>::<resized>> processed
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```


DroneSafe
SAMSUNG


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