

Connected Quality in Manufacturing

"Επιχειρηματική ευφυΐα και Διαδίκτυο των Μηχανών"

29/03/2022

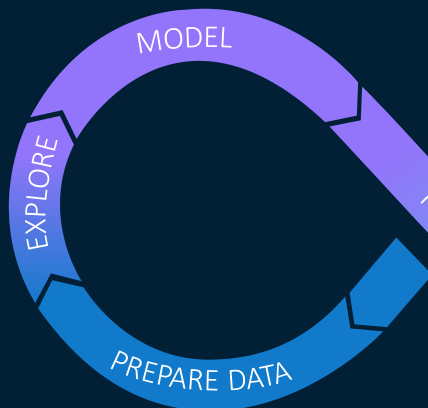
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SAS can support the **entire** Analytical Lifecycle

Where the **BUZZ** is

< 50% of advanced analytic models get deployed. And if they do, 44% take more than 7 months to get put into production.

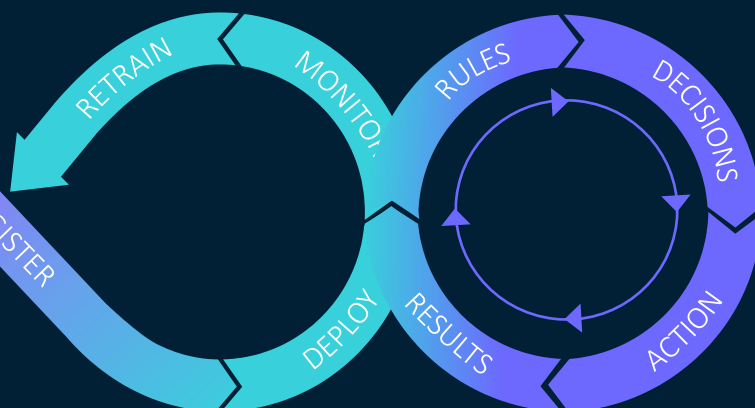


Model Development

A predictive algorithm has been build, either using open source or commercial software. The output of the model has an ad-hoc character and is shared in visualization tools or via MS Excel. Model only gives retrospective insights and is not operational.

Where the **MONEY** is

Analytics is much more than a fancy algorithm. Value is generated through **scaling data - discovery - deployment - people**.



Model Deployment

The model is put into production, meaning it is embedded into a business process or application. Every x seconds/minutes/hours the model is scored against new data and generates value through recommendations, alerts, triggers or workflows.

Intelligent Decisioning

New insights are delivered to business users via means of alerts, interactive reports, recommendations. E.g. a line operator could get alerts on machine parts likely to fail, based on a predictive maintenance algorithm.

Recognized Advanced Technology

SAS is a leader along the entire Analytics Lifecycle

Gartner Magic Quadrant for Data Integration Tools



Gartner 2020 Magic Quadrant for Data Science and Machine Learning Platforms



SAS is a Leader in The Forrester Wave™: Enterprise Insight Platforms, Q1 2019



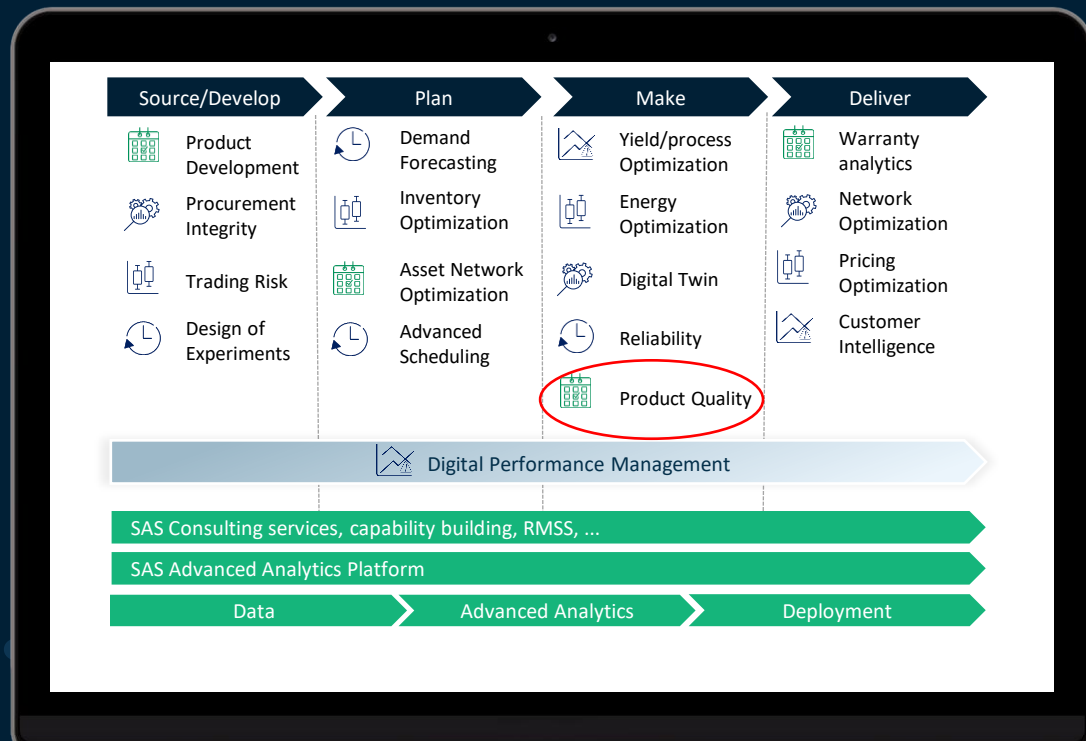
SAS is a Leader in The Forrester Wave™ Digital Decisioning Platforms, Q4 2020



[Link: List of SAS Analyst Evaluation](#)

A catalog of deployable and scalable AA use cases

Covering the entire value chain



Leverage repeatable use case assets into new applications to ensure **time to value**:

- Data engineering
- Advanced analytics models
- Dashboards and other UI's

Accelerate roll-out and adoption of the use cases by SMEs without the need for extensive data science capabilities

Capture feedback in order to **continuously improve** and make it easily and readily **available to a large user community**

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CONNECTED QUALITY: Pharma 4.0 Manufacturing

Image Analysis / Artificial Intelligence / Machine Learning



Pharmaceutical Manufacturer

100% automated visual quality inspection

CHALLENGES

- Asthma inhalers need to have a very quality to ensure patient safety.
- Camera systems capture an image of each device
- Each assembly line produces about 2 devices per second.
- Quality control inspected a sample of 3 every 45 minutes.
- Highly regulated production process

WHY SAS?

- Build a computer vision models **to detect known and unknown defects.**
- To minimize the number of false alarms, models were developed for all known defects and for a perfect device.
- Decisioning:
 - Every hour **all images are automatically analyzed** for defects.
 - Images of **detected defects are sent to quality reviewers for final decision.**
 - Defect devices are scrapped.

RESULTS

- **99% detection accuracy.**
- **100% inspection** leads to increased patient safety.



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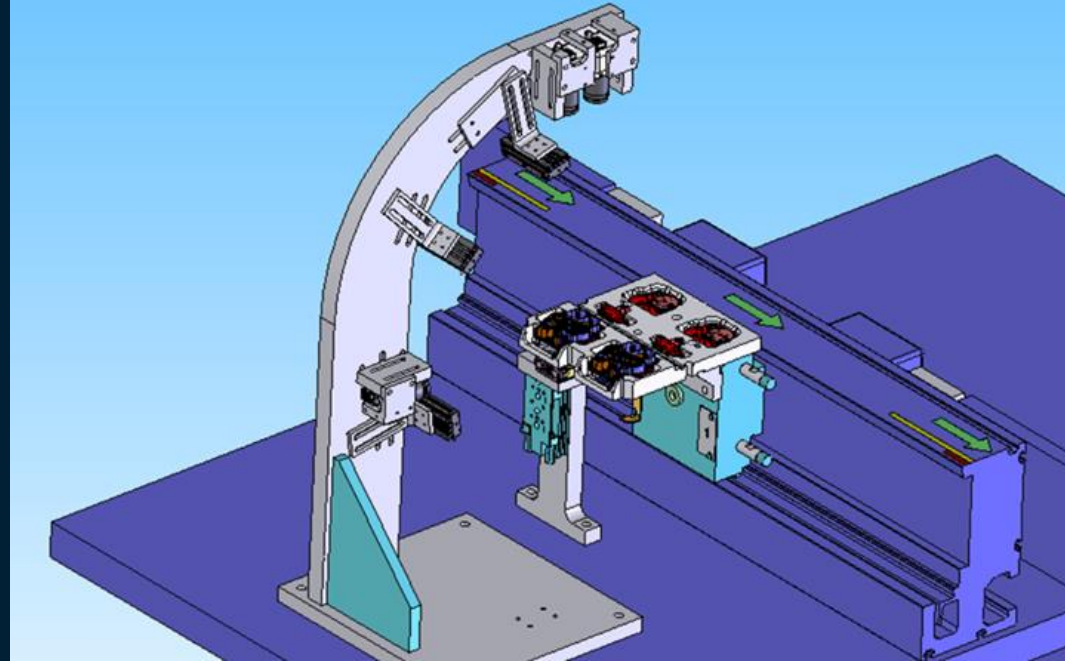
Episode 1

Getting To Know the challenge



Image Capture From The Production Line

- Pictures from current production line facility provide images from a very consistent angle, with constant lighting and framing and are well suited to Image Analysis
- These images occasionally show defects that can easily be seen by a human but are difficult to detect with any of the standard computer vision techniques which typically rely on measurement



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Episode 2

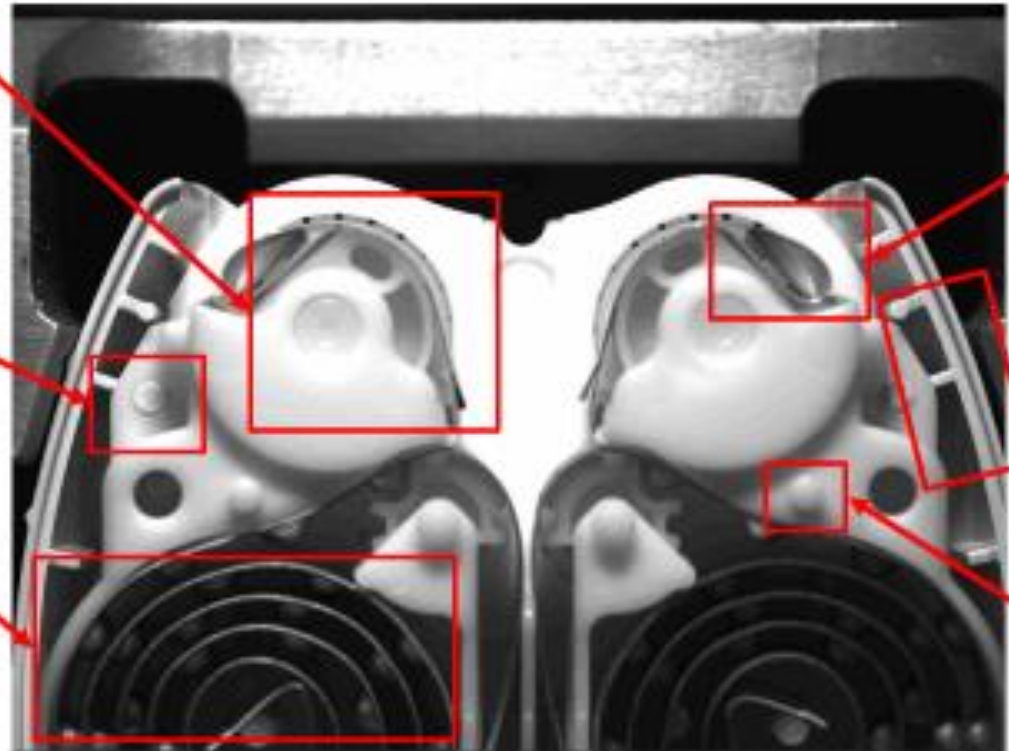
Prove It !



Folded/dented/split

Recessed bolts
either side of the
image

Marks in the
blister coil



Marks in the coil
which feeds in at
the top

Missing
plastic?

Missing
welds

Image Analytics PoC

4 Week PoC

Built a virtual team

Loaded over 6Tb of images to AWS

Supervised Learning

Through SAS image analysis and machine learning, we have been able to predict 99% of images being good or bad correctly

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Episode 3

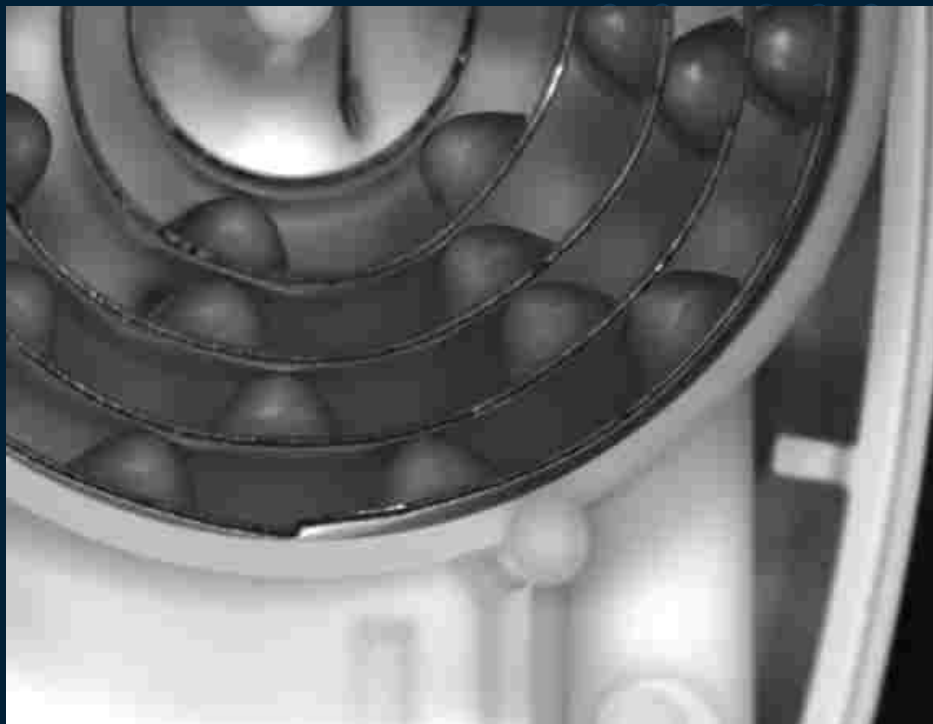
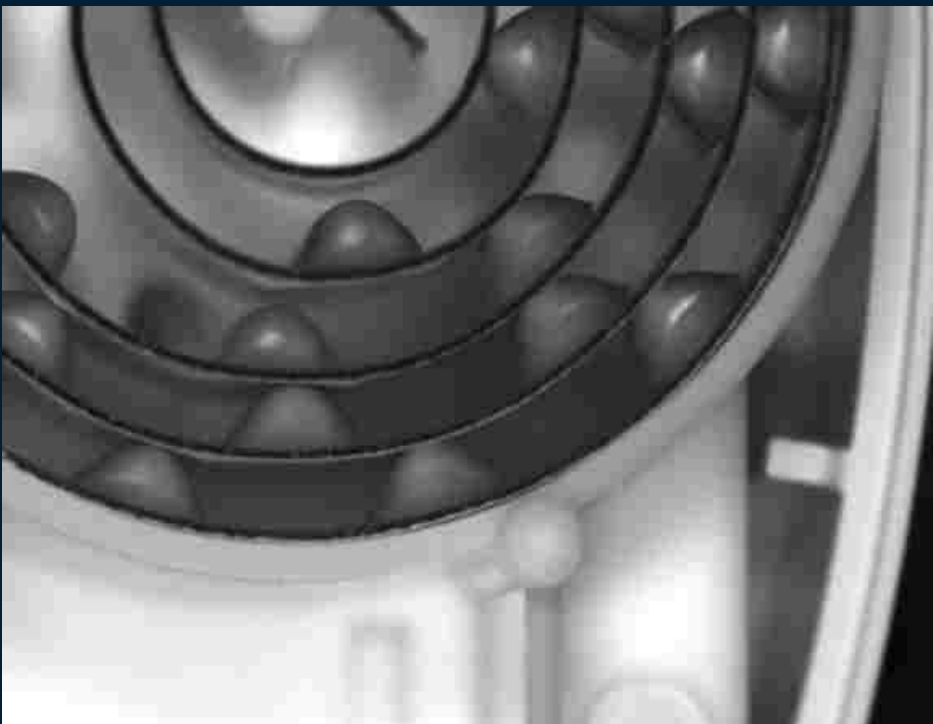
Great, Now Can You Help With This?



Customer Unaware Defect Investigation

Investigation

- Potential defect on 975,000 devices
- Pharma knows exactly what the problem and it can be clearly seen in the images
- Can we help identify if the devices are defective from the existing images



How Well Can You Do ?

Results - 2 week period

Loaded 975,000 images to
AWS

Created a new set of
predictive models to scored
all images

Scored all 975,000

- Rejected
10,000 devices
- Saved the remaining
965,000 devices
- Material Saving
£2m

**Built trust in with site
Manufacturing and Quality
Team**

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Episode 4

Thanks - But Can You Do It Everyday?



Can You Do It Everyday?

Can you deploy this along side the current manufacturing production lines

- Replace standard operation processes
 - Reviewing 1,000 the from the start of a batch
 - Reviewing 3 images every 45 minutes
- Maintain level of accuracy
- Deliver a reliable solution next to the production line
 - One the operators can use to review every batch and every suspect device
- 100% Visual Inspection

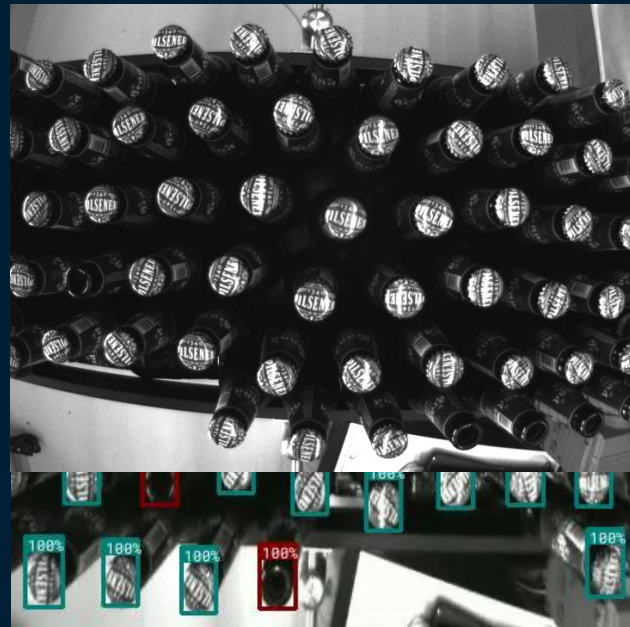


Visual Line Monitoring

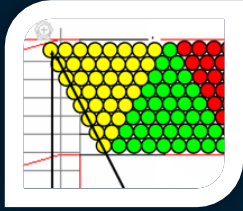
Mountain View

Why Visual Line Monitoring?

- Traditionally, pressure sensors are used
- Hard to interpret data
- Operator needs to go to the line to see what's going on
- **› Visual Line Monitoring**
 - Cameras above the lines
 - Computer Vision to generate alerts (meaningful work)
 - Improve safety



Visual Line Monitoring use cases



Optimal packing density
Are bottles ordered?



Speed variations between machines
Leads to falling bottles



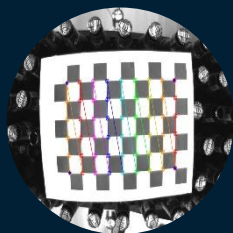
Detecting anomalies - missing caps
Causes machine crashes

Main focus

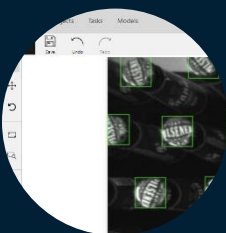
How?



Setup & data
collection



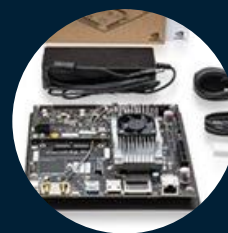
Calibration



Labeling



Model training



Deployment



Dashboard

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Thank you