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Scaling machine learning applications

Creating value and scale from the world's hottest technology



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Artificial intelligence and machine learning as a strategic competitive advantage

How to link an AI/ML strategy to corporate strategy

Machine learning and artificial intelligence

Machine learning is the science of helping computers discover patterns and relationships in the data instead of being manually programmed.

Machine learning is a subfield of artificial intelligence. It is at the heart of the most advanced technologies such as self-driving cars.

We believe artificial intelligence is key to giving us a competitive advantage by turning our data and knowledge into a business driver.



We established a data science team that brings advanced machine learning skills. We invest in acquiring and developing technology that will bring us to best in class AI/ML users in the industry.



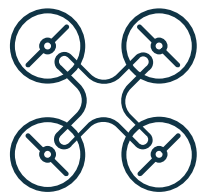
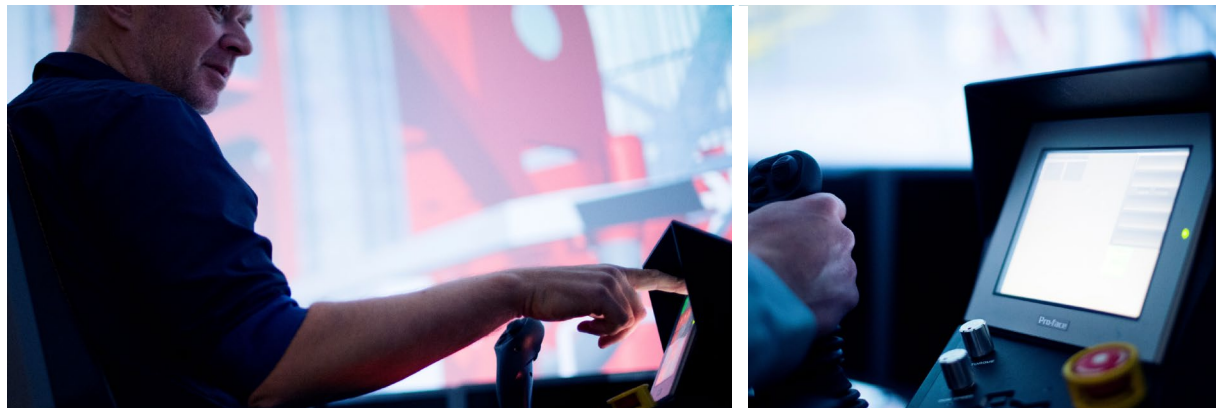
What ML should you do? Competitive Advantage

The future is robotised, automated and connected

The future is robotized, autonomous and connected.

We want to be actors in the change, and turn it into a competitive advantage.

So where should our ML/AI investment go to?



Our solutions for energy production in the future will be lighter, more subsea and remotely controlled. This is not only much safer, but the emissions are close to half compared to conventional solutions. What is AI/ML's role?

Creating a competitive advantage

We focus on the confluence between propriety data, propriety knowledge and re-imagined business processes

We are developing machine learning technology that builds on what is unique to us: our data, our knowledge, and that target re-imagined business models. The sum total will give us a unique edge.




We have deep expertise in the energy sector, we should be agents of change not subject to it.



We have several years of proprietary data produced. We also have a lot interpretations of it.



Our business is changing, our strategy is changing. We must enable a transformation of our own.

A photograph of an offshore wind farm. The image shows several white wind turbines with three blades each, situated in a blue sea under a clear sky. The perspective is from a low angle, looking up at the nacelle and blades of a turbine in the foreground, with other turbines receding into the distance.

Digitilisation ,
including
AI/ML, supports our
strategy to
transform into an
energy company

Always safe

Reduce exposure

Enhance learning

Low carbon

Increased energy efficiency

Enable electrification

High value

USD 2 bn value creation potential for existing fields

Automated drilling – 15% cost reduction

Future fields – 30% capex reduction

The AI/ML energy company

Always safe

High value

Low carbon



Capture and open our vast knowledge

Knowledge AI



Predicting and preventing incidents

Insights, Knowledge AI



Maximise production, reduce carbon footprint

Machine data AI



Reduce CAPEX with autonomy

Autonomy AI

Four key investment areas With a global impact



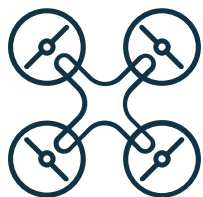
Insights: a team focused on the development of insights products to optimize decisions across our value chain. A driver towards the data driven company.



Knowledge AI: a team focused on the development of natural language understanding products focused on capturing and sharing knowledge.



Machine Data ML: a team focused on the development of equipment monitoring and optimization algorithms using sensor data.



Autonomy AI: a team focused on the development of autonomous systems using a mixture of techniques including computer vision, deep learning and reinforcement learning.





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Machine learning at scale

Example: predicting machine failure



The return on investment fallacy in machine learning

Most traditional organisations consider machine learning as delivering a model in a linear case by case fashion.

Building models a use case at a time doesn't deliver value as the time and cost of model building exceeds most returns from deploying them.

We need to build non linearities in the way we deliver AI/ML in a large complex organisation.



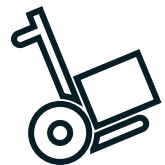
Transforming our business requires ubiquitous AI/ML driving intelligent machines everywhere. To succeed, we must scale fast. This is an organizational, ML and technological challenge.

Creating non-linearity ϵ -cost scaling

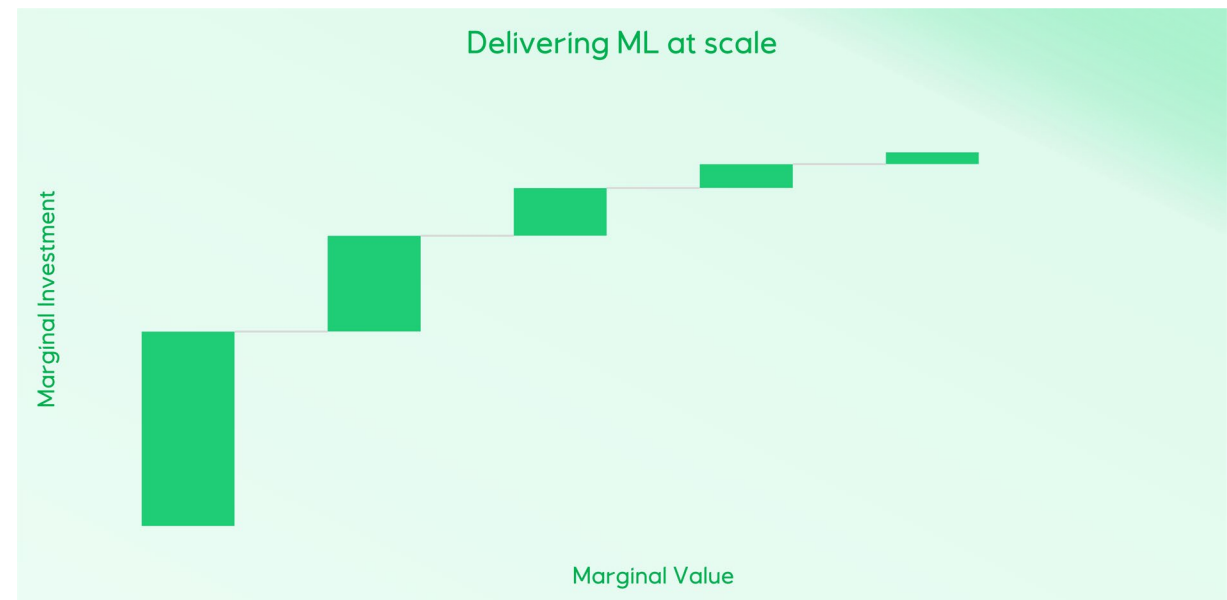
Solving classes of problems once, deploy the solution several times.

When we tackle problems across our 4 key strategic AI/ML investment areas, we solve classes of problems that can be deployed several times at a very low marginal cost.

This allows us to generate an ever increasing value for an ever decreasing cost.



Our focus is on delivering products not service. This allows us to vastly scale our impact across the organization without needing an overblown AI/ML team that is always a bottleneck to value creation.



What is an Equinor AI/ML product?

Like the automotive industry, our ML teams build one chassis on which end users design and build several models.

We build the AI/ML framework, a general pipeline and a technology infrastructure that allows business teams to build several models and deploy them easily.

We build the chassis and design principles, the business deploys models at scale across the business.



The core idea we have is that ML experts need to automate their work if they are to achieve the economic impact that is expected of AI/ML. Industry revolutions start with cottage industries. Individuals and small workshops trying new tech. Their full impact is captured when the workshop becomes a large factory that consumes fewer and fewer resources as it grows. We are leading that path for AI/ML.

OMNIA.prevent: predicting machine failures early

Our business is about extracting / capturing resources and processing them. Wells, machines and processes are fundamental to continuous production and value generation.

We have thousands of «machines» that are the backbone of our business. When they deteriorate or breakdown, we lose production.

We monitor them using 1.5 million sensor and other signals.

Can we create a user friendly system that detects performance deterioration for any machine? Can we avoid running one project per machine?



Machine data is a key competitive advantage for us. It captures the history of our engineering decisions and operating modes. Being the best in the industry at utilizing machine data in the cloud or at the edge is a key competitive advantage as it gives us higher production, leading to higher ROACE.

Our AI/ML design principles

Objective : build a high quality model that base lines current and future performance of any machine.

Models must automatically capture auto-correlation within and cross-correlations between sensors

Strong representation learning

Models need to be variance insensitive

Strong generalisation

Sensor data are signals

Strong signal processing

Robust deep learning techniques

Building a repetitive robust process that can be used by end users in an abstract way is key to scaling ML.

Our method relies on combining signal processing, deep learning auto-encoders and customised user experience.

The entire ML pipeline is automated based on an end user configuration.





Our UX and technical design principles

Objective : allow engineers to deploy their own models for a number of machines they monitor.

Model building must be simple and flexible

Declarative configuration

Models building must be fast, robust and easily reversible

Strong distributed computing, abstraction, versioning

Model deployment must be automated

Strong backend automated DevOps processes

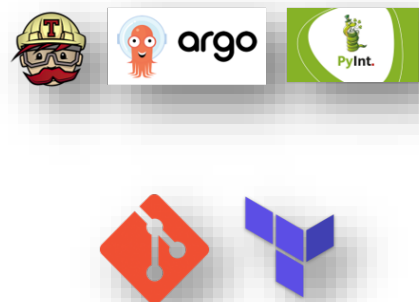
OMNIA.Aurora allows us to scale fast

Our technology stack is designed to deliver scale and products rapidly reducing time to value.

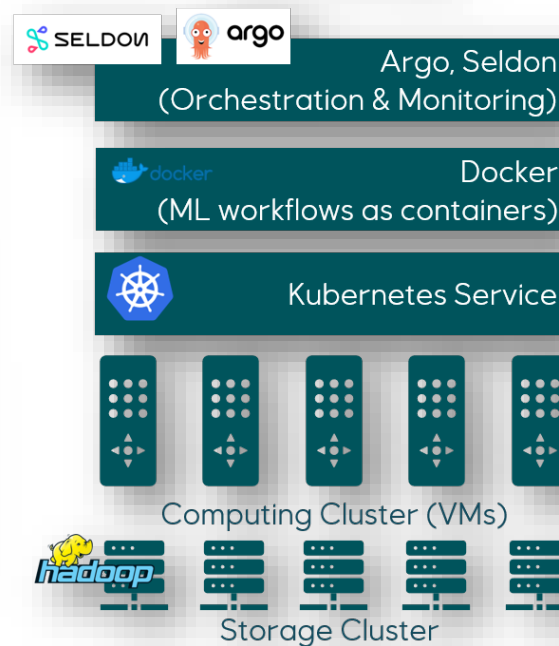
Key attributes:

1. Code in development works in production
2. Everything is version controlled
3. Everything is built by deploying small microservices woven together flexibly
4. Everything is cloud native

Core Ops Stack



Core Tech Stack



Core Dev Stack





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Demo

OMNIA.PREVENT v0 1

Scaling machine learning applications

Dr Ahmed Khamassi
VP Data Science

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