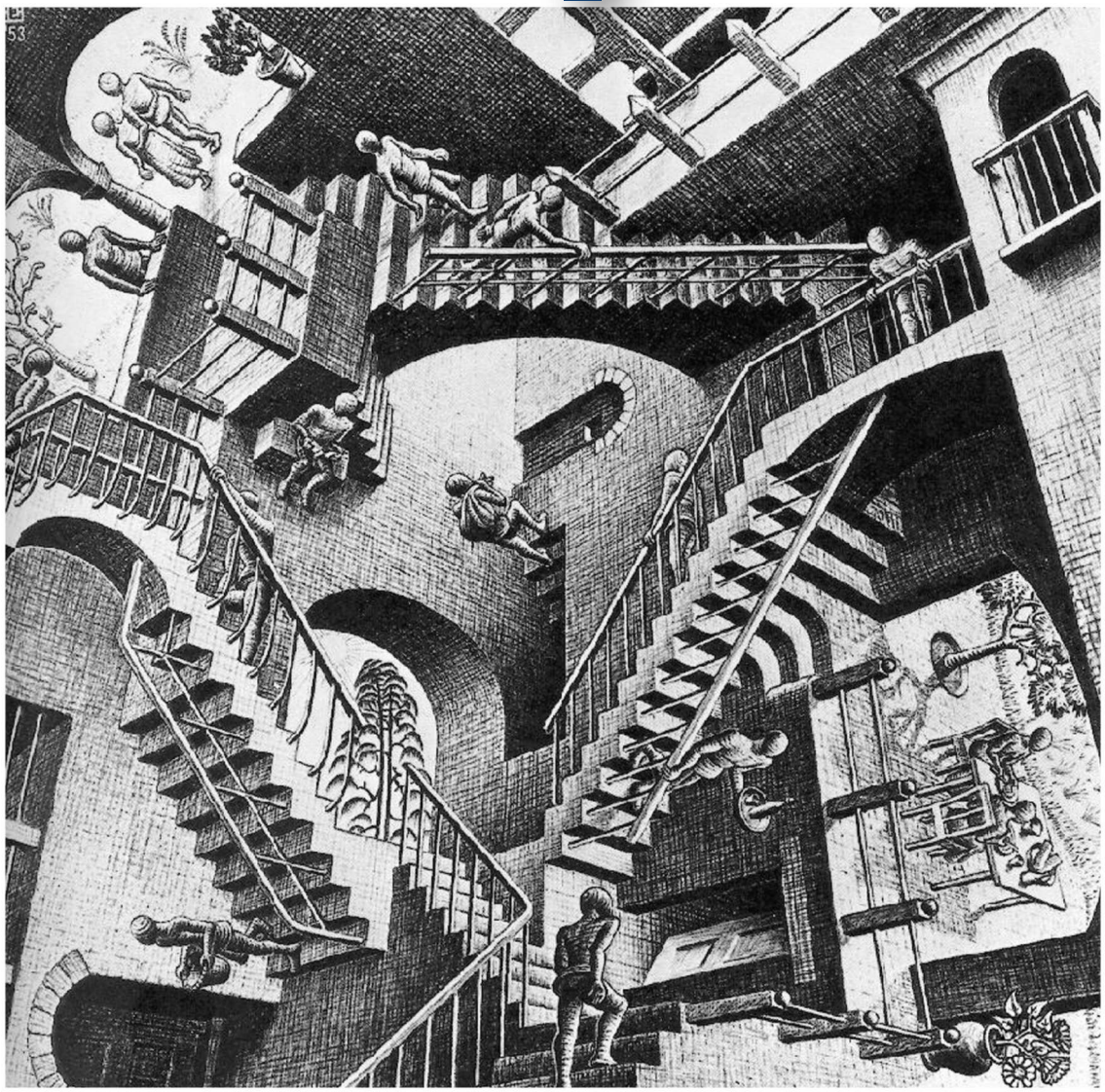
DATA SCIENCE

Ministerie van Infrastructuur en Waterstaat (IenW), Rijkswaterstaat

RWS DATALAB

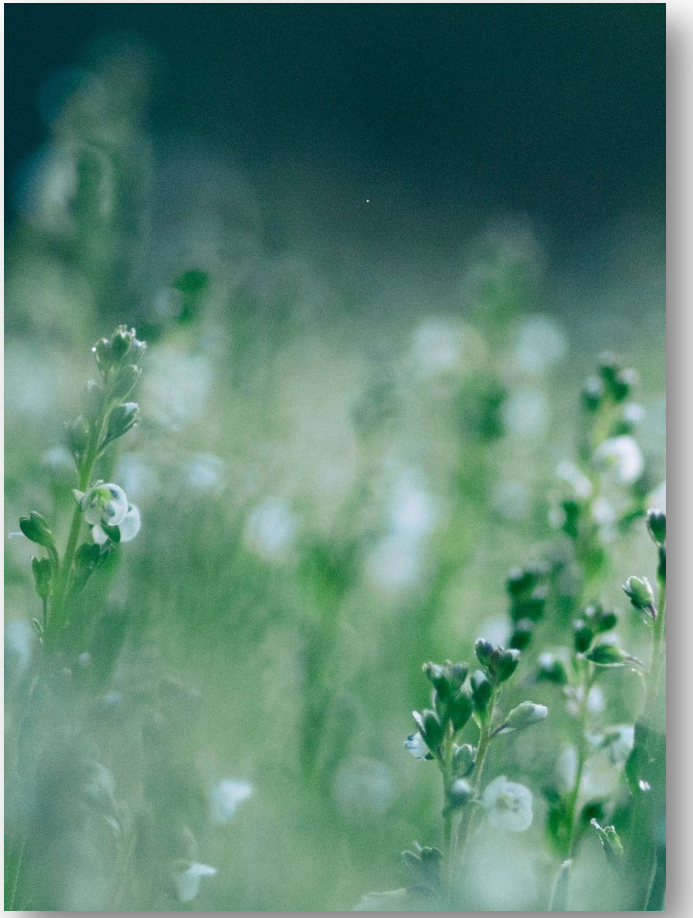


WIE BEN IK?

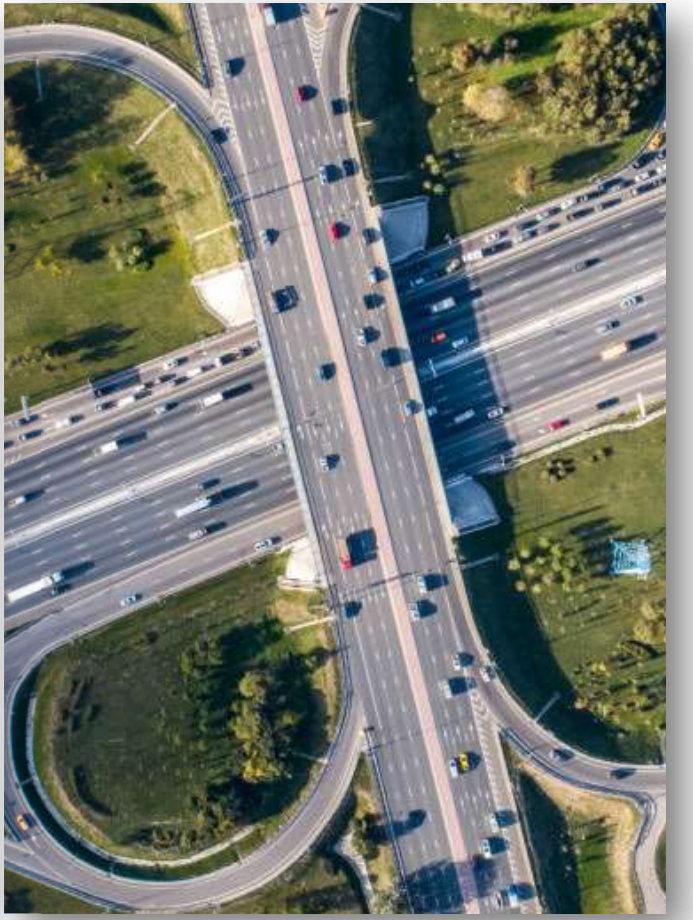
Erdogan Taskesen
Lead Data Scientist @ Datalab
Rijkswaterstaat

M.Sc in Statistics in Machine Learning and Pattern Recognition
Ph.D. in Statistical Approaches for Acute Myeloid Leukemias

AANDACHTSGEBIEDEN RIJKSWATERSTAAT



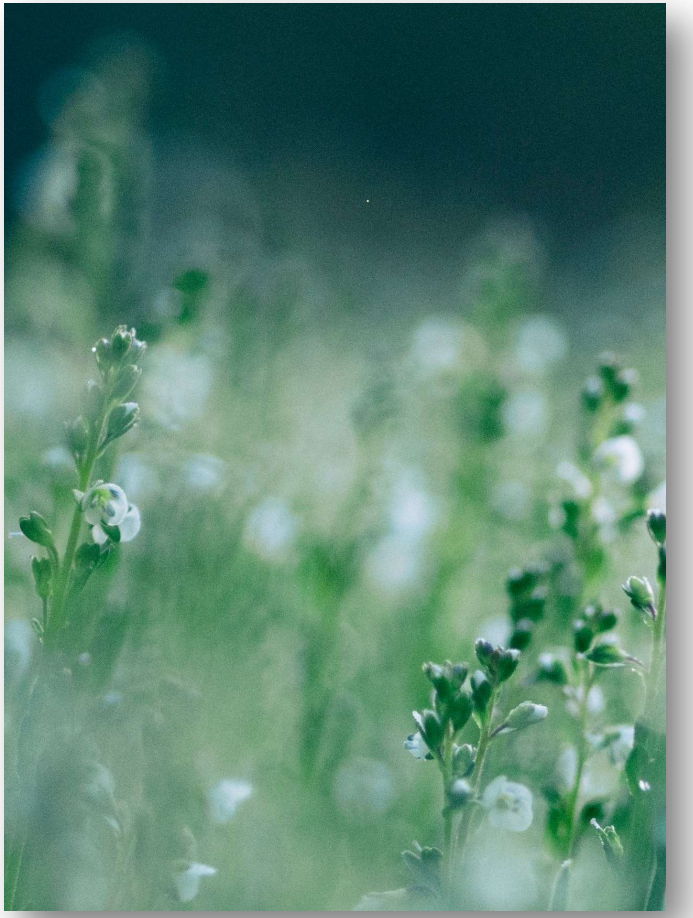
Leefbaarheid



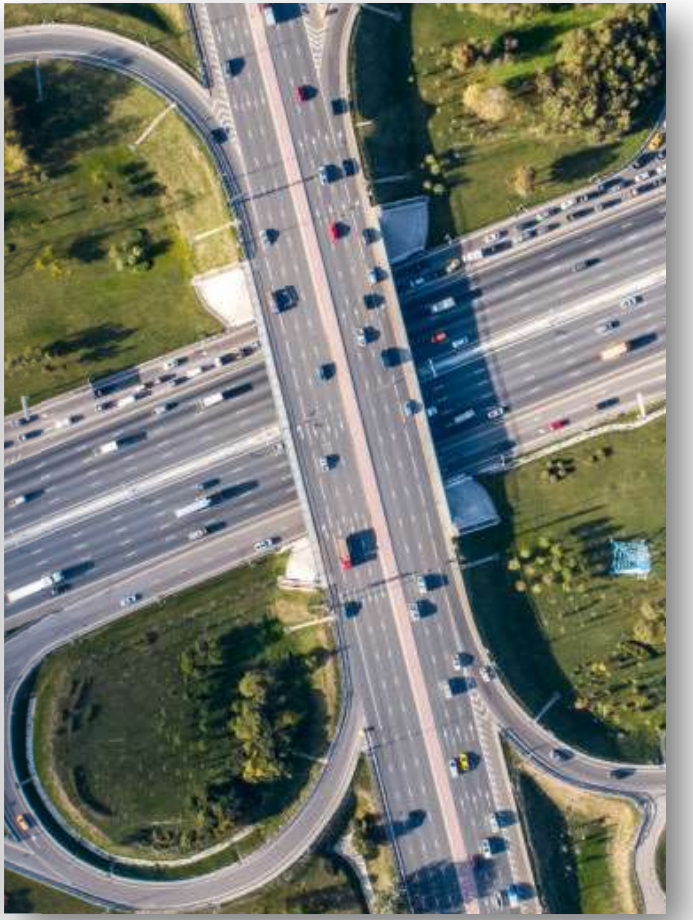
Bereikbaarheid

Veiligheid

AANDACHTSGEBIEDEN RIJKSWATERSTAAT



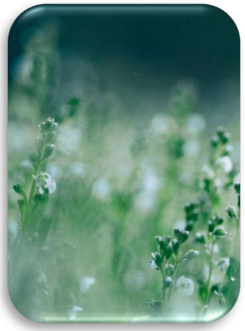
Leefbaarheid



Bereikbaarheid

Veiligheid

AANDACHTSGEBIEDEN DATALAB



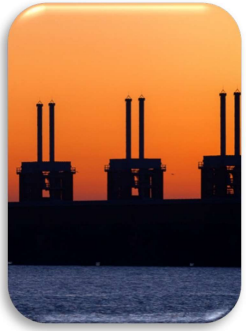
Leefbaarheid

Textmining/
categorical

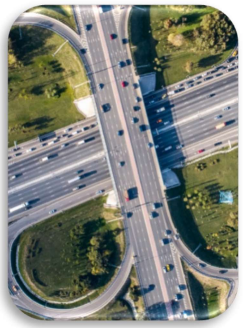
Beeldherkenning

← DATALAB →

Sensoring



Veiligheid



Bereikbaarheid

PROJECTEN MET EEN MACHINE LEARNING COMPONENT

Detectie zwerfafval

monitoring biologische waterQ

Directie Participatie

Beschikbaar ligplaatsen

Weeg-bonnen

Belevings-onderzoek

Leefbaarheid

Textmining/ categorical

Beeldherkenning

← DATALAB →

Sensoring

Cyber security

Malware detectie

Internet-gekoppelde systemen

Botnet detectie

URL analyse

Detectie gevaarlijke stoffen

Erosie & sediment patronen

Veiligheid

Digitaal schouwen

Detectie rotondes remote sensing

Grasland beheerkaart

Voorspelbaar onderhoud sluizen

Dashboard vitale assets

Filestaart bewegingen

Hotspots verkeers-ongelukken

Restduur ongevallen

Bereikbaarheid

Rijkswaterstaat
Ministerie van Infrastructuur en Waterstaat

Contact Servicedesk Data
088 79 739 99
servicedesk-data@rws.nl

Home Zoeken Kaart Inloggen

Dataregister Rijkswaterstaat

Vind **1631** datasets, services en kaarten, ...

Welk onderwerp?

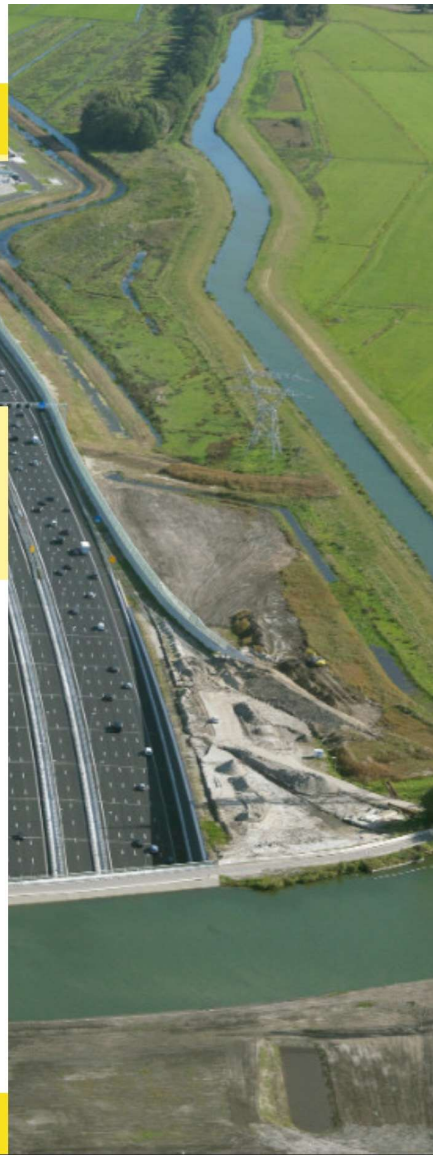
Zoeken

Op welke locatie?

Zoeken

Bekijk één van de categorieën

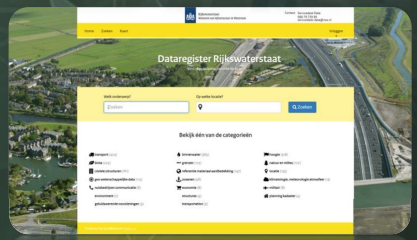
- transport (474)
- biota (225)
- (civiele) structuren (161)
- geo wetenschappelijke data (115)
- nutsbedrijven communicatie (8)
- environment (7)
- geluidswerende voorzieningen (3)
- binnenwater (365)
- grenzen (175)
- referentie materiaal aardbedekking (147)
- oceanen (56)
- economie (8)
- structures (4)
- transportation (3)
- hoogte (318)
- natuur en milieu (172)
- locatie (135)
- klimatologie, meteorologie atmosfeer (13)
- militair (8)
- planning kadaster (4)

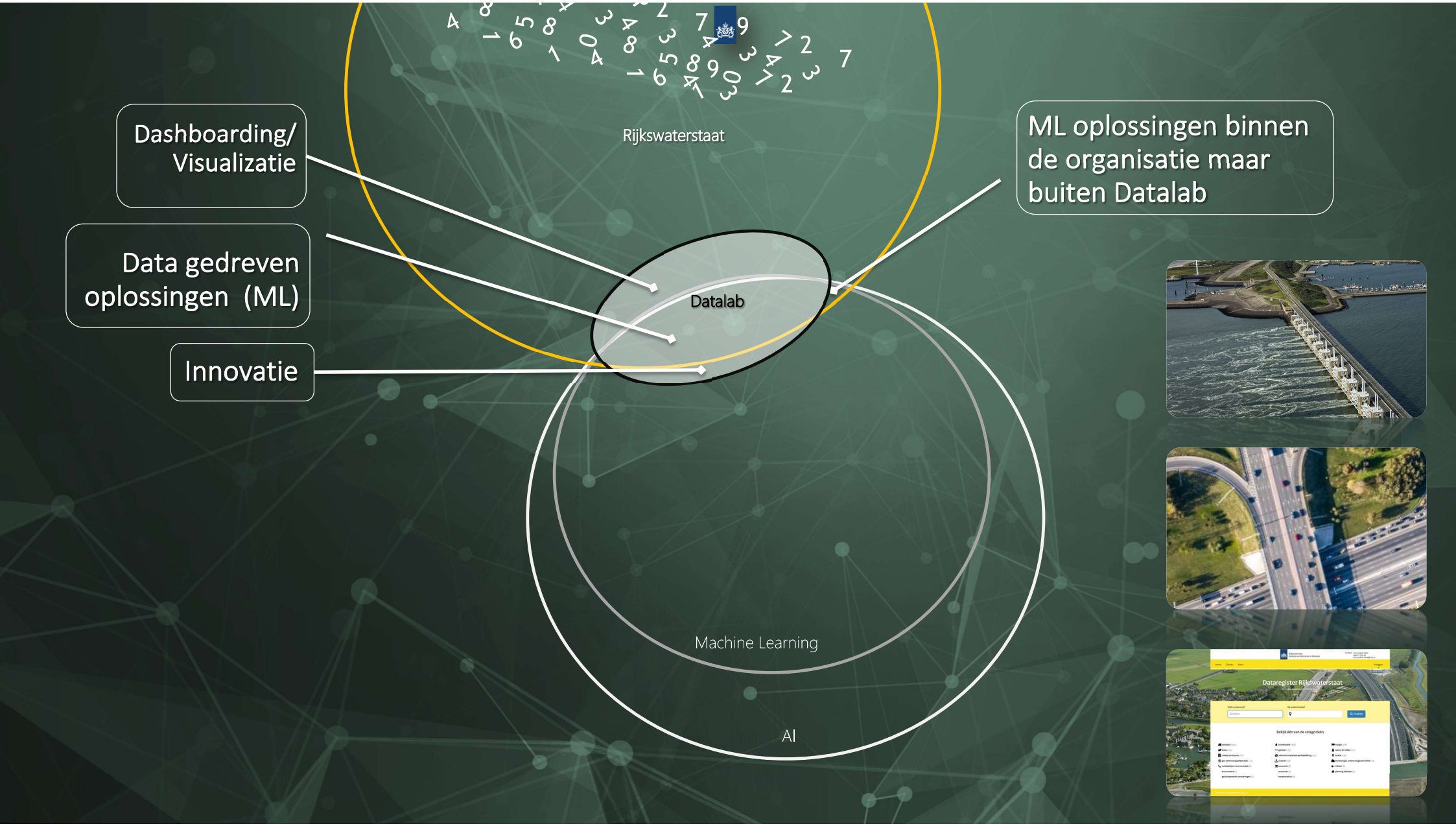


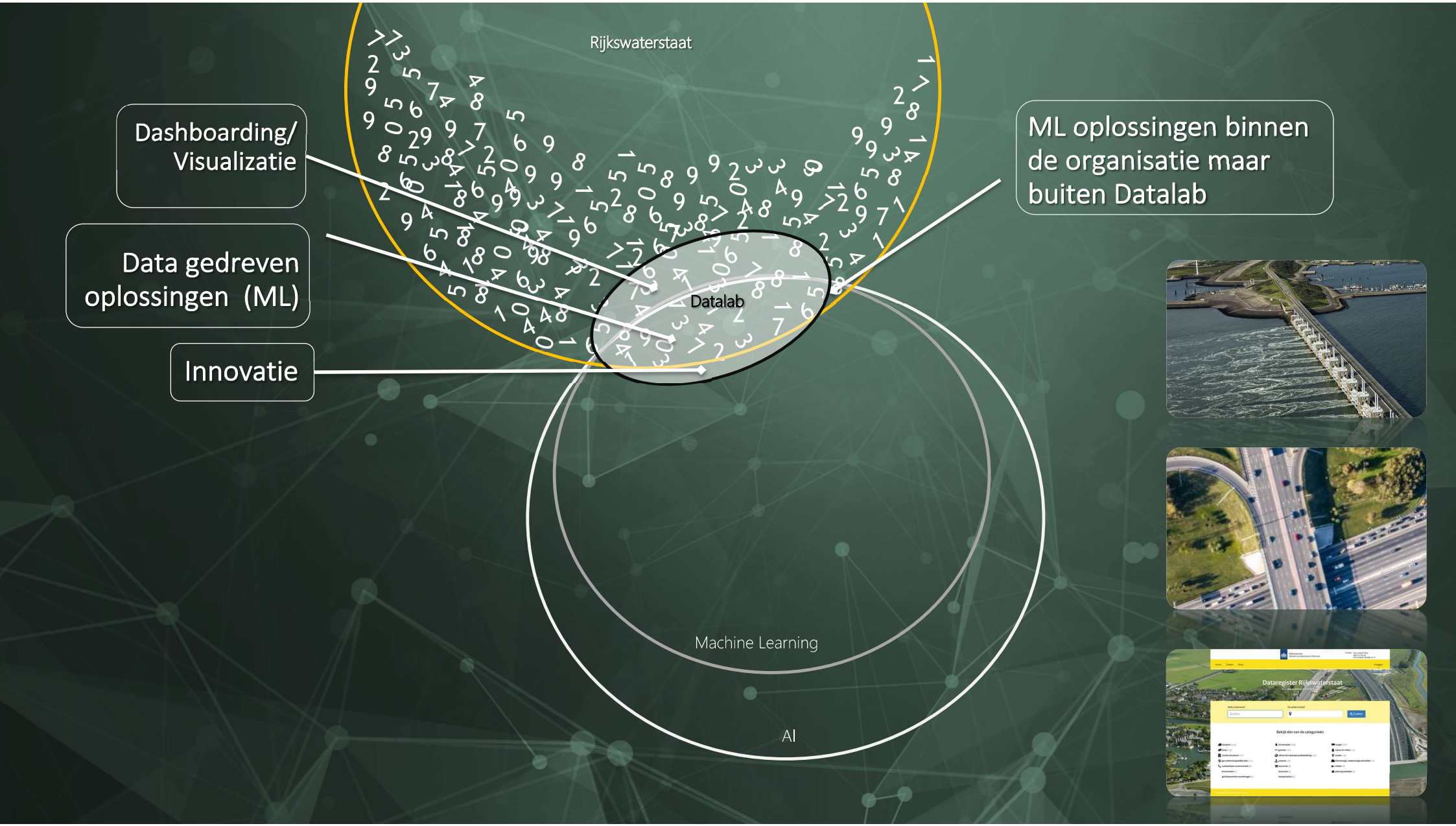
Powered by GeoNetwork 3.10.5.0

POSITIONERING IN DE ORGANISATIE

Rijkswaterstaat



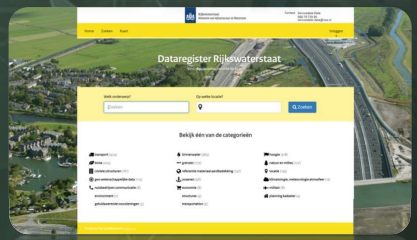

Dashboarding/
Visualizatie
Data gedreven
oplossingen (ML)
Innovatie
Rijkswaterstaat
Datalab
Machine Learning
AI
ML oplossingen binnen
de organisatie maar
buiten Datalab
Dataregister Rijkswaterstaat


Rijkswaterstaat
Dashboarding/ Visualizatie
Data gedreven oplossingen (ML)
Innovatie
Datalab
Machine Learning
AI
ML oplossingen binnen de organisatie maar buiten Datalab
Dataregister Rijkswaterstaat

Dashboarding/
Visualizatie

Data gedreven
oplossingen (ML)

Innovatie?



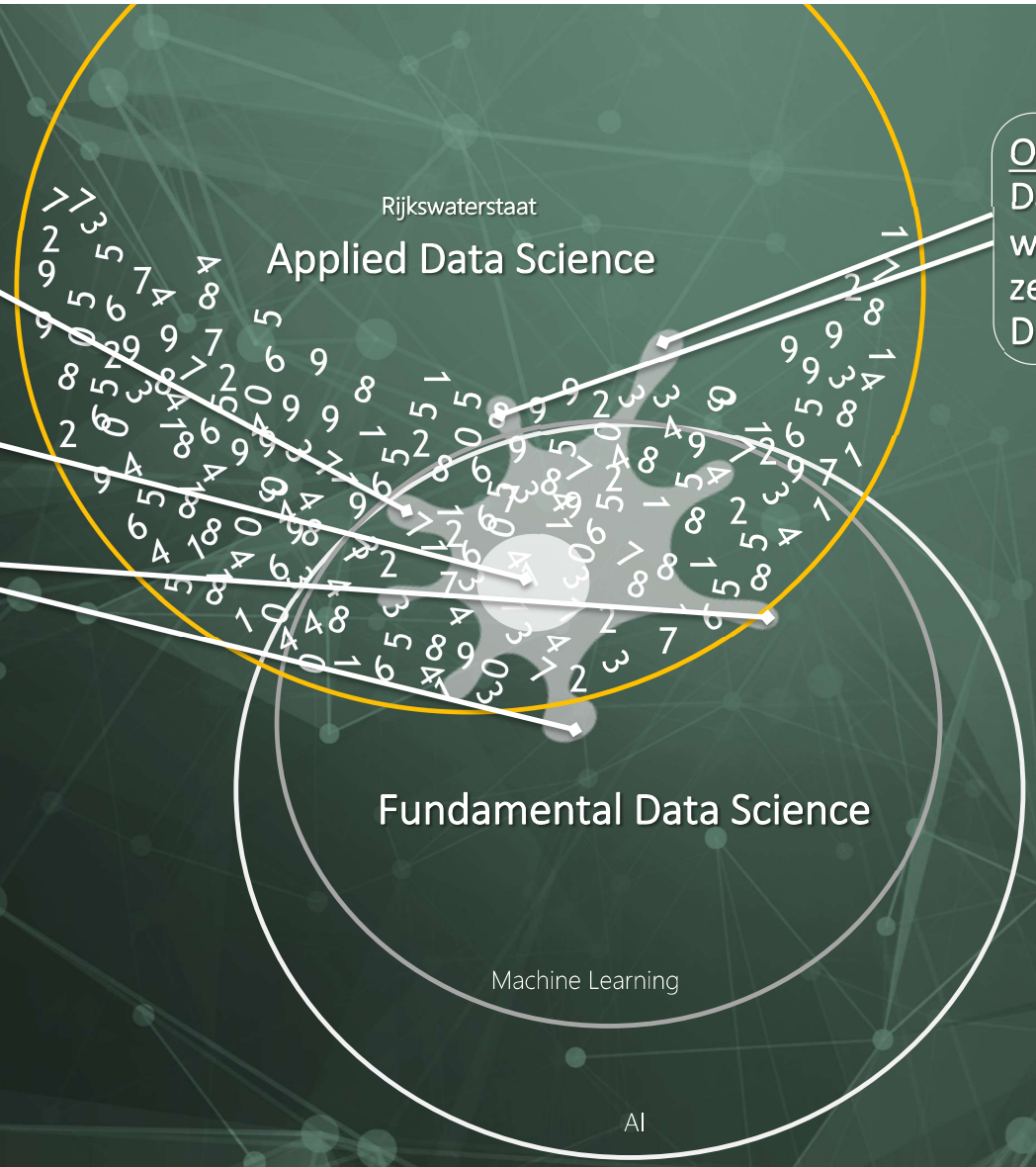
- De vraag naar data-gedreven oplossingen neemt toe.
- Geen ruimte meer voor innovatie.
- Afdelingen gaan zelf cowboyen met ML en producten kunnen niet landen.

DOORONTWIKKELING

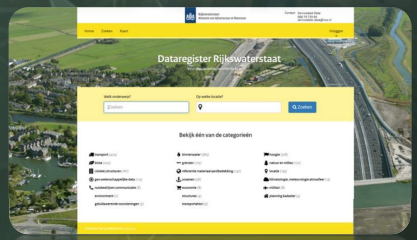
VR/AR/
Visualizatie

MVPs met een hoge
complexiteit

Innovatie op
deelgebieden



Opleiden en ondersteunen.
Data gedreven oplossingen worden door de afdelingen zelf ontwikkeld. Opzetten van Datalab hubs

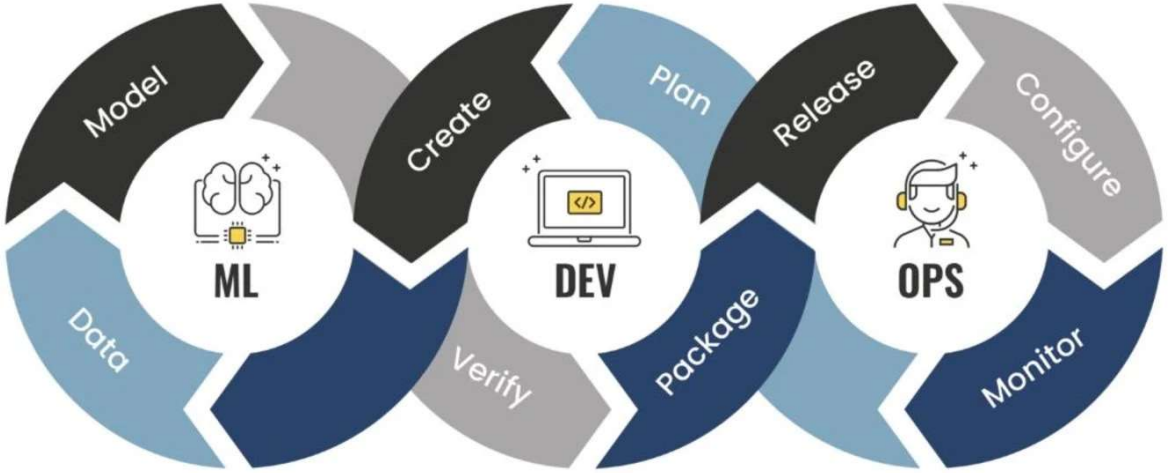


Datalab als expertise
center voor data gedreven
(ML) oplossingen

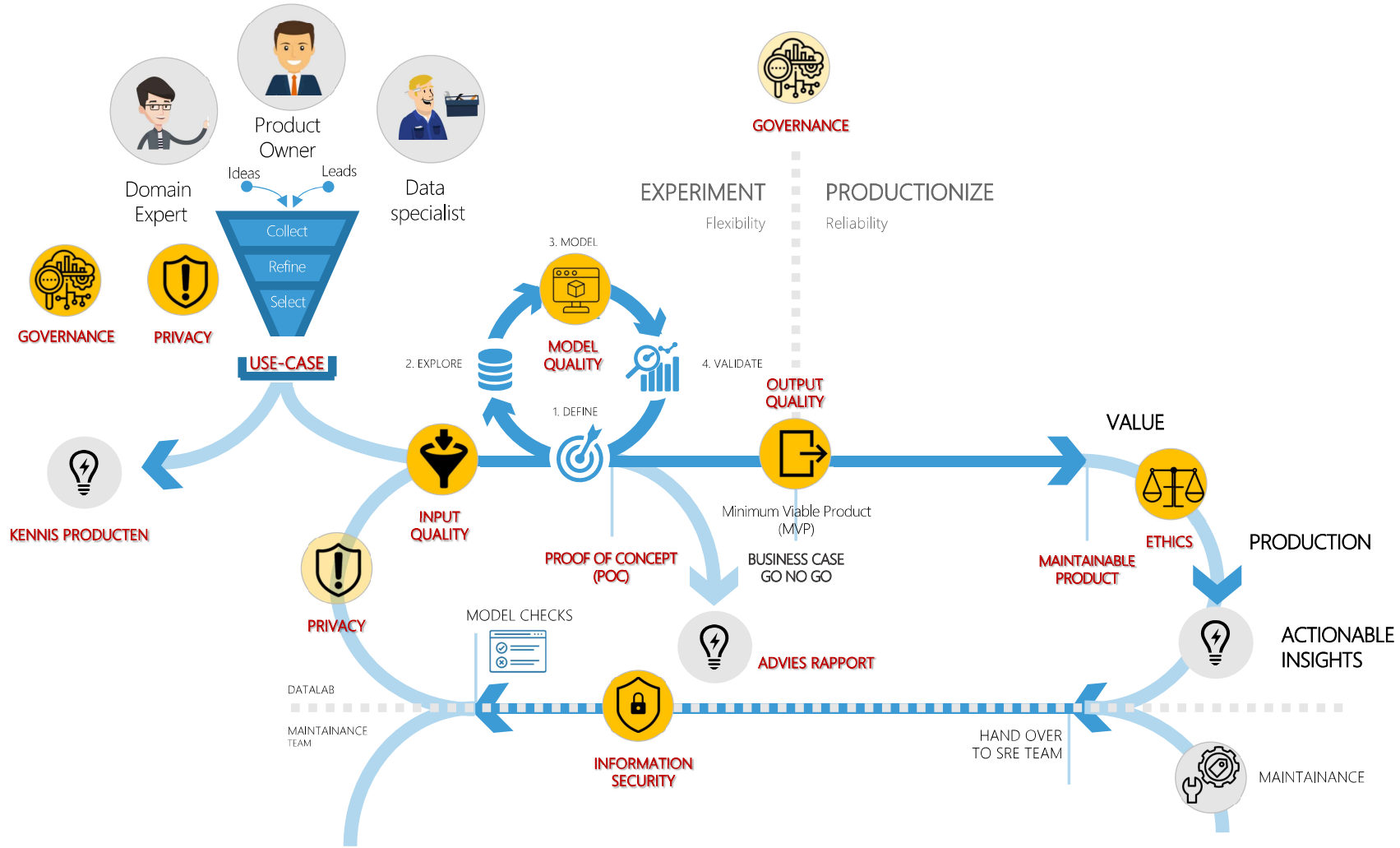
VAN VRAAG NAAR PRODUCT

Photo by Ant Rozetsky on Unsplash

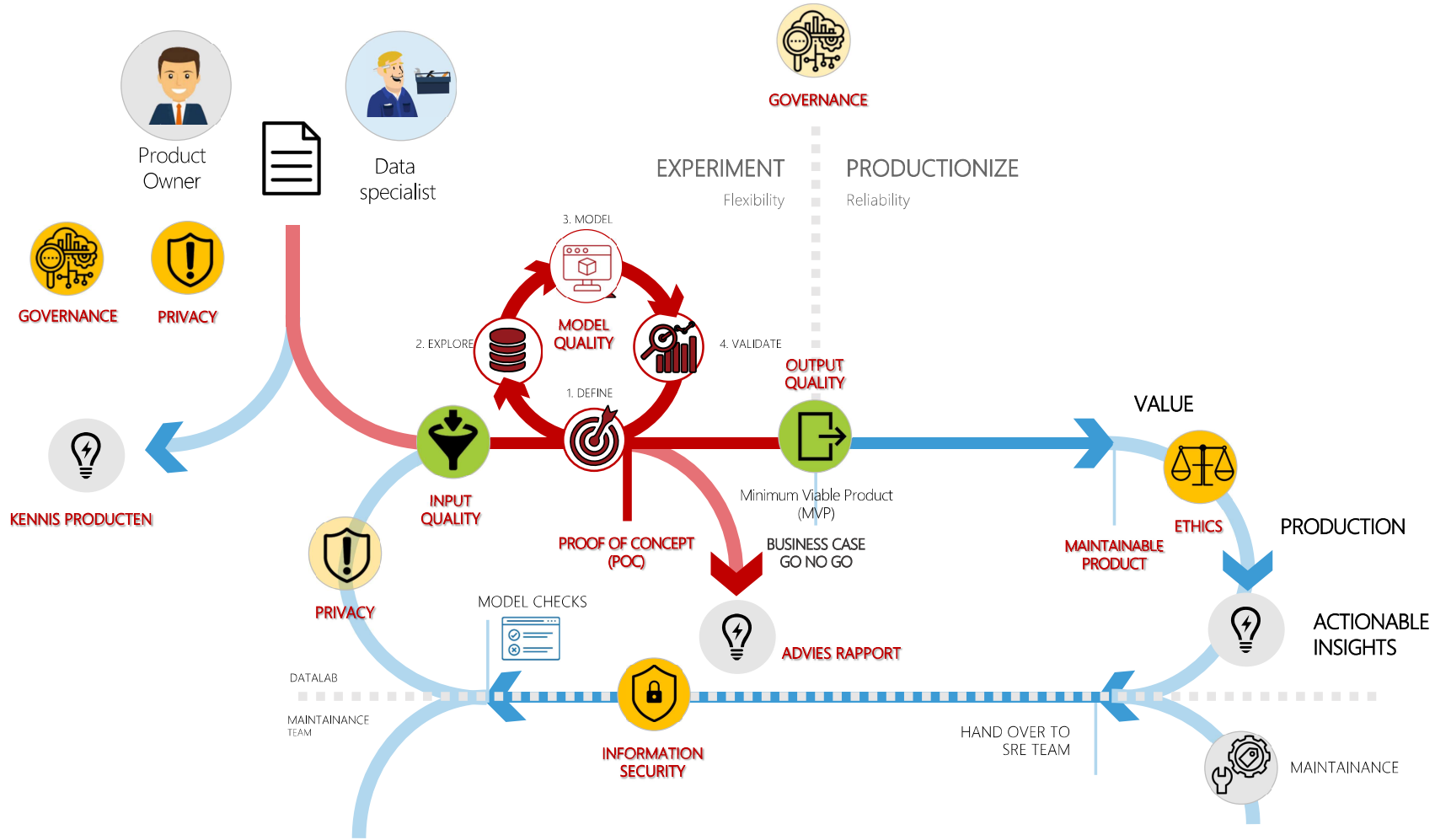
WAARDE LEVEREN IN DE ORGANISATIE



WAARDE LEVEREN IN DE ORGANISATIE

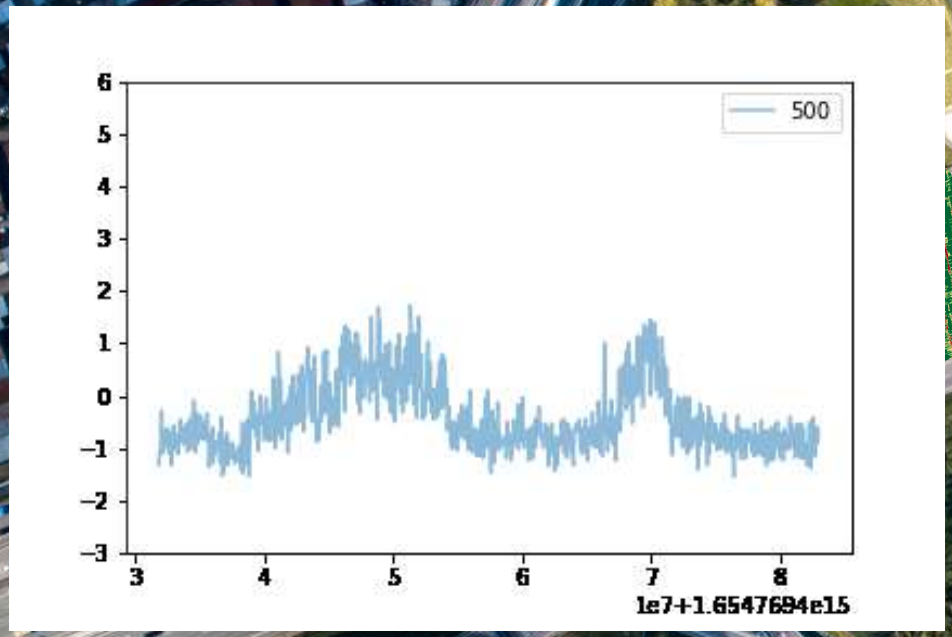


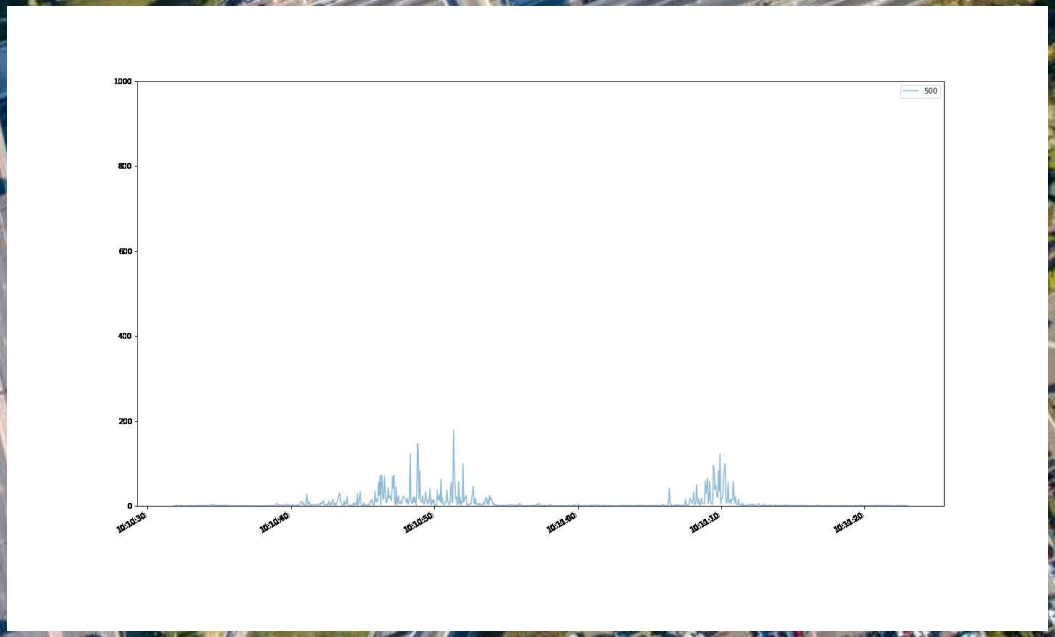
WAARDE LEVEREN IN DE ORGANISATIE



PROOF OF CONCEPT EN ADVIES RAPPORT

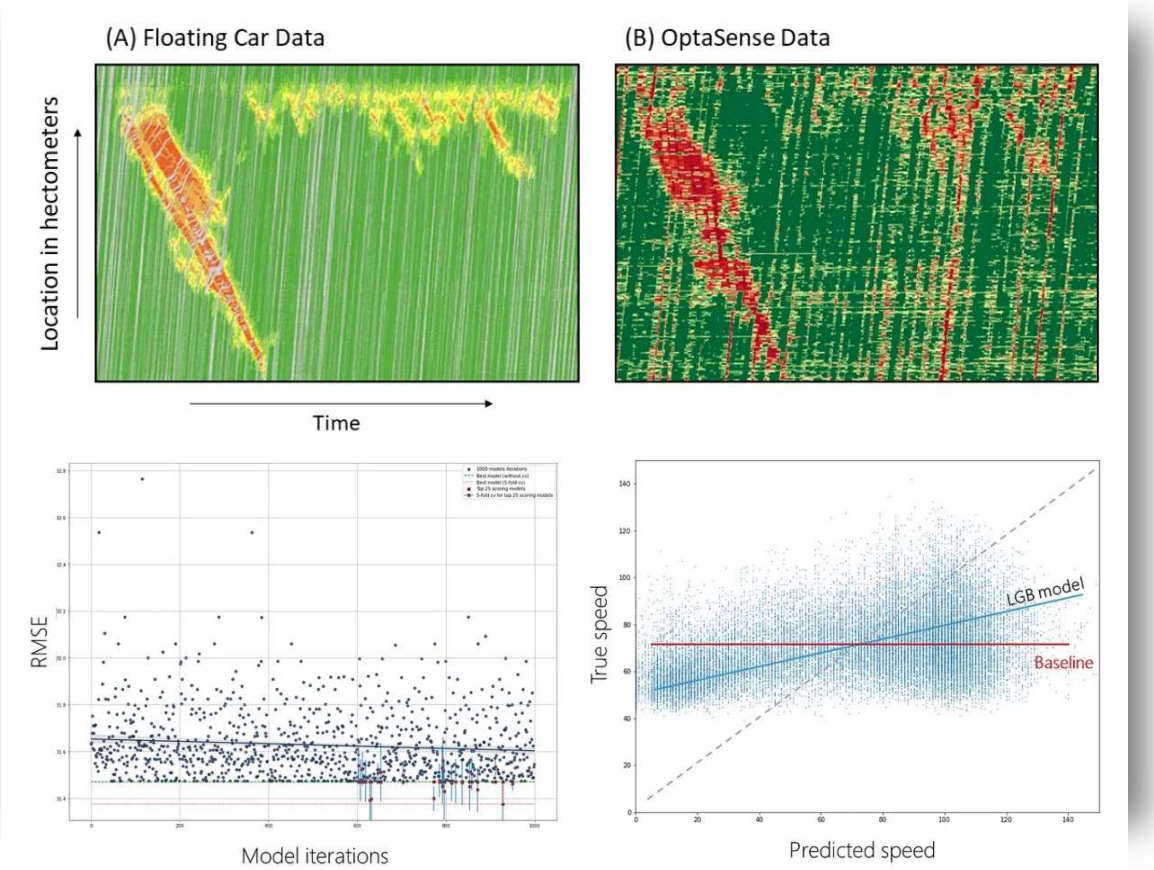
- Samen met de klant de mogelijkheden onderzoeken
- Zonder de beperkingen van de organisatie maar binnen wet en regelgeving
- Het rapport adviseert de mogelijkheden en potentiele vervolg stappen

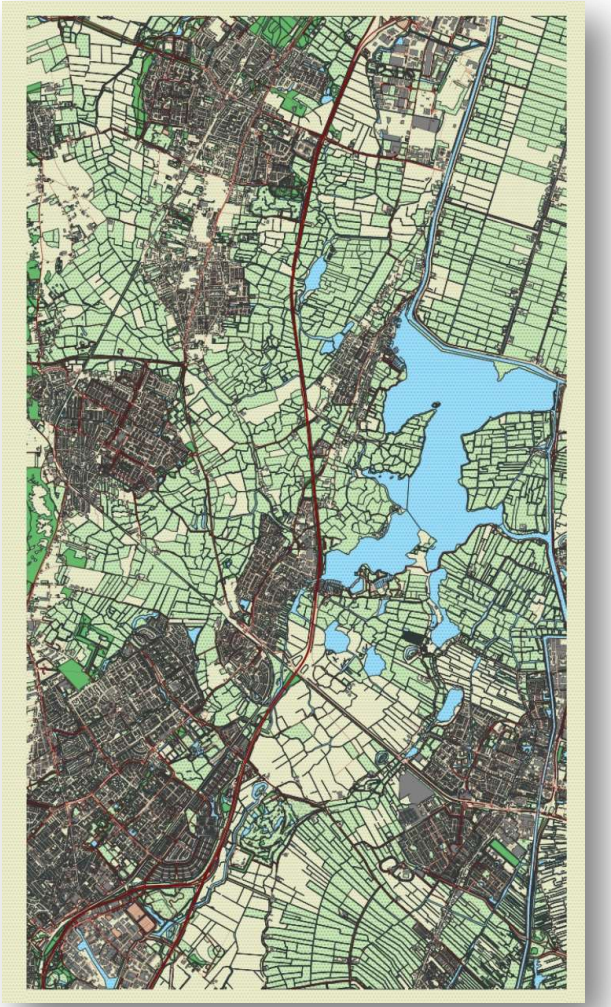




- Vraag: kunnen andere sesnoren zoals Fiber Optic Acoustic Sensors (FOAS) deze taak overnemen?

VOORKOMEN VAN FILE-STAART ONGELUKKEN





ADVIES RAPPORT

Advisory Report

Investigating the application of OptaSense Fiber Optic Acoustic Sensors for jam tail protection.

RWS Datalab

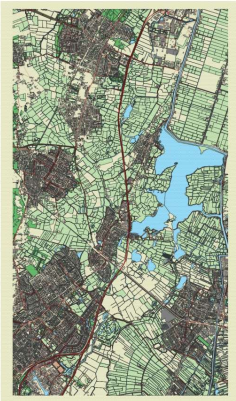
[1] *RWS Datalab, Rijkwaterstaat, 5th floor, Derde Wereldreef 1, 2622 HA Delft. Contact: rws.datalab@rws.nl*
[2] *WVL department of Wegverkeer en Benutten, Rijkswaterstaat, Lange Kleiweg 34, 2288 GK Rijswijk.*

Project duration: September 2022 — February 2023

Abstract
The impact of jam-tail collisions can be catastrophic, both in terms of safety and the economy. Proper jam tail protection alleviates this problem. However, this is a challenging task that involves many sensors with detection loops in the road surface, which are consequently monitored by the Matrix Traffic Management algorithm. This algorithm activates the matrix signs overhead in response to traffic congestion, protecting against jam-tail collisions. A drawback of this system is the cost and disruption associated with maintaining the detection loops. To overcome this limitation, we investigated the feasibility of using fiber optic acoustic sensors to detect traffic congestion. Data was collected from the OptaSense OLA2.1 located on highway A9R. We applied a knowledge-driven and data-driven approach to evaluate the utility of OptaSense and its performance. For the knowledge-driven approach, we created a modified version of the elliptical method developed by ModelIT. In the data-driven approach, features were engineered, on which a classifier was trained. Results were evaluated using the independent Floating Car Data set. Our results showed that background noise hindered both approaches, resulting in low predictive power for jam tail prediction.

Contents

1. Introduction



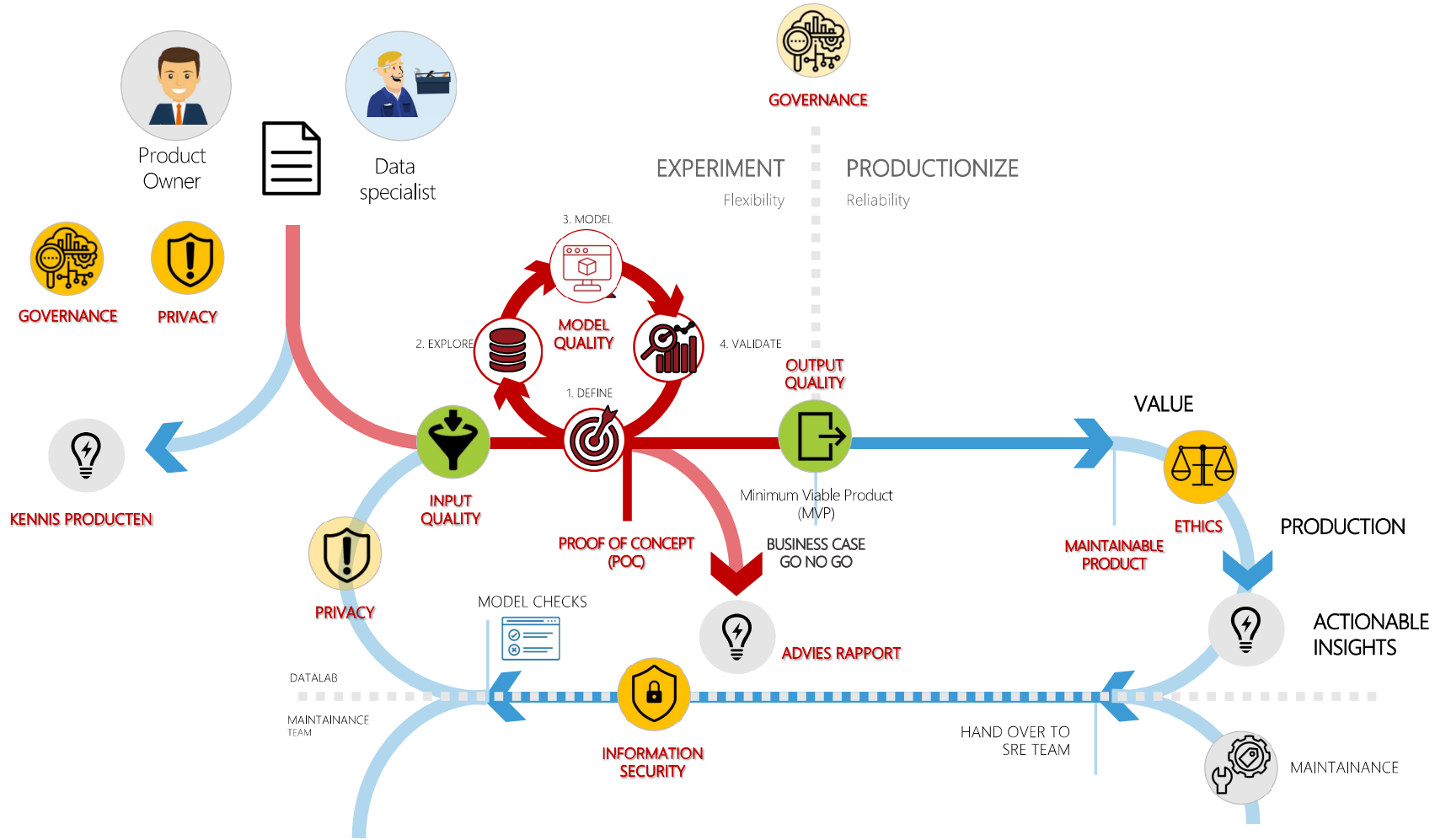
Jam tail collisions are accidents caused by sudden or unexpected traffic holdups. The impact of these can be catastrophic, resulting in injury, lost lives, economic costs and traffic delays. A proper warning system aleviates this problem by protecting the jam tail. Currently, the jam tail protection system in use is based on detection loops embedded in the road surface.
The MTM (Matrix Traffic Management) algorithm is a critical component of the jam tail protection system. It utilizes the information gathered from detection loops embedded in the road surface to monitor traffic conditions and regulate the matrix signs mounted above the roadway. The matrix signs are equipped with dynamic displays that can change color and display different messages, providing drivers with real-time information and alerts about traffic conditions. This helps to prevent congestion buildup and reduce the risk of accidents. Detection loops, also known as induction loops, are wire-based sensors embedded in the road surface. They generate an electromagnetic field that is disturbed by metal objects passing over the loops, such as vehicles. The MTM algorithm uses these disturbances to calculate the speed, direction, and traffic volume, allowing it to adjust the matrix signs in real-time to reflect changes in traffic conditions. The loops are strategically placed (at intervals between 500–700 meters) and at key locations along the road to provide comprehensive coverage of the traffic conditions. This forms a crucial part of the traffic management infrastructure and provides real-time information to drivers, allowing them to make informed decisions while on the road. However, the maintenance of the detection loops is both costly and disruptive, as it requires road closures to access the induction loops. Therefore, new developments in the technology and information sectors are constantly being investigated to find alternative solutions to manage traffic and improve road safety.

For example, Floating Car Data (FCD) has emerged as a new source of information for traffic management, providing valuable insights into traffic conditions. However, it has its own limitations that must be considered when relying on this technology for jam tail protection. One major limitation of FCD is that it requires a significant density of vehicles equipped with GPS sensors to generate accurate data. This results in limited coverage of the road network and a lack of representation of traffic conditions in less densely populated areas. Additionally, GPS-based sensors can be subject to interference, leading to inaccuracies in the data.

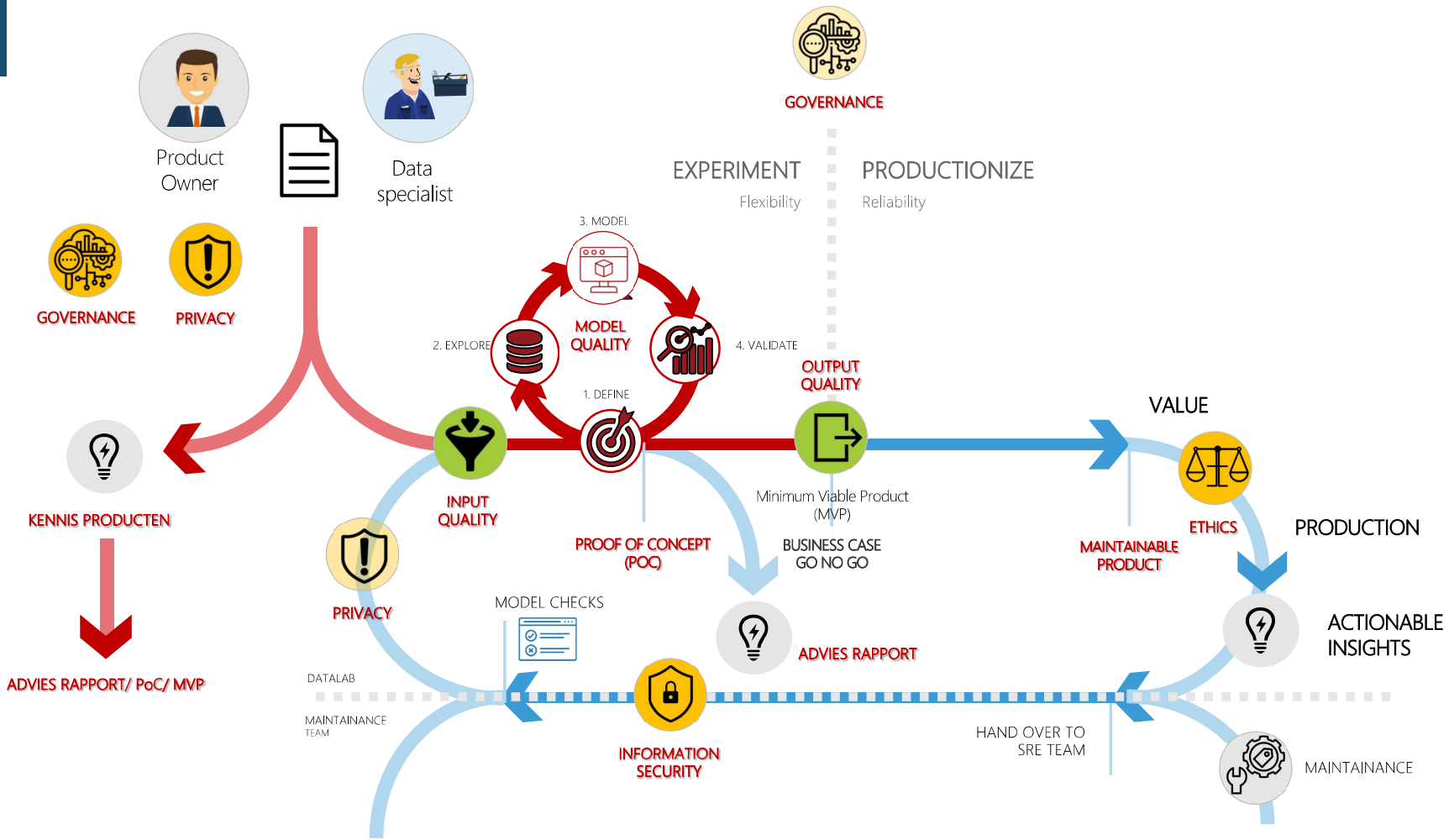
To diversify current data sources, new technologies such as fiber optic acoustic sensors (FOAS) have been proposed as an alternative means of detecting traffic congestion and protecting against jam tails. FOAS are equipped with high-precision sensors capable of detecting changes in the acoustic environment, allowing them to monitor live traffic conditions. However, these sensors are sensitive to interference, thereby raising the question whether the collected data can be used. An advantage of FOAS is that it can be installed in existing fibre optic cable gutters along the road network, providing comprehensive coverage of traffic conditions without incurring roadway disruption or closures during maintenance. New technologies such as FOAS may offer a more effective solution for detecting traffic congestion and protecting against jam tails. However, the accuracy and reliability of FOAS for road safety, traffic management, and real-time information for drivers are unknown.

This research aims to assess the feasibility of using fiber optic acoustic sensing technology, specifically OptaSense's, to predict traffic jam tails and evaluate its performance relative to other traffic monitoring techniques. We applied two independent approaches: a knowledge-driven and a data-driven approach. Each has its own (dis)advantages that are described in the following sections.

WAARDE LEVEREN IN DE ORGANISATIE



WAARDE LEVEREN IN DE ORGANISATIE



KENNISPRODUCTEN

Photo by Jez Timms on Unsplash

KENNISPRODUCTEN

Master Classes

Bereik: Lokaal

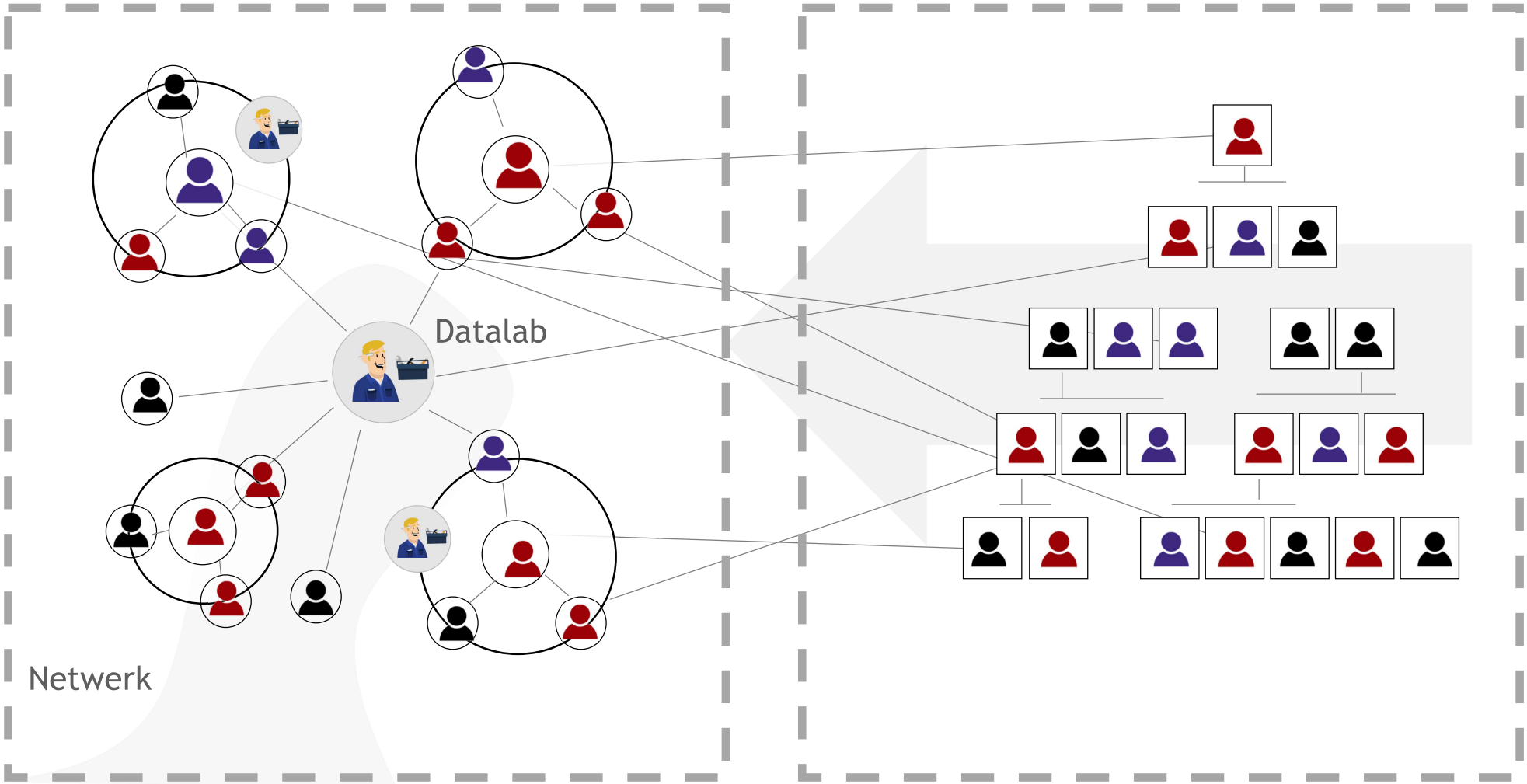
Datalab Academy

Bereik: Talent binnen RWS

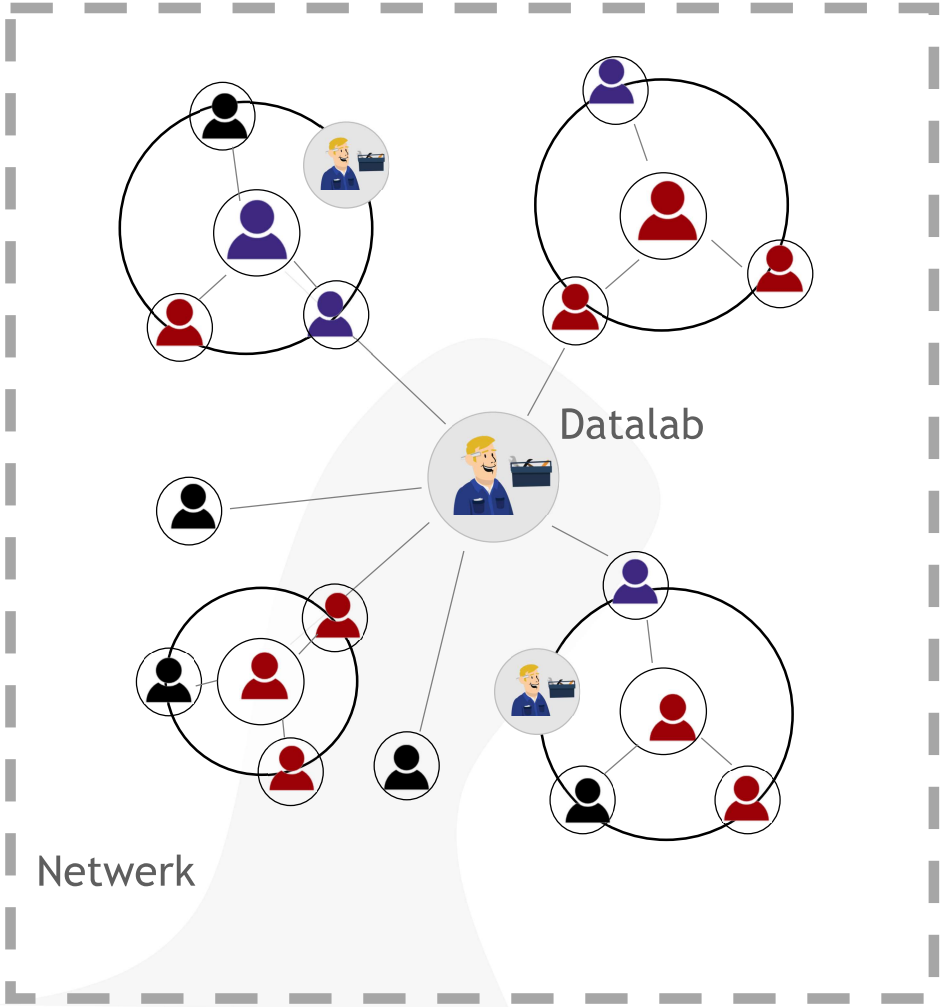
Open Thursdays

Bereik: Binnen en buiten RWS

DATALAB ACADEMY

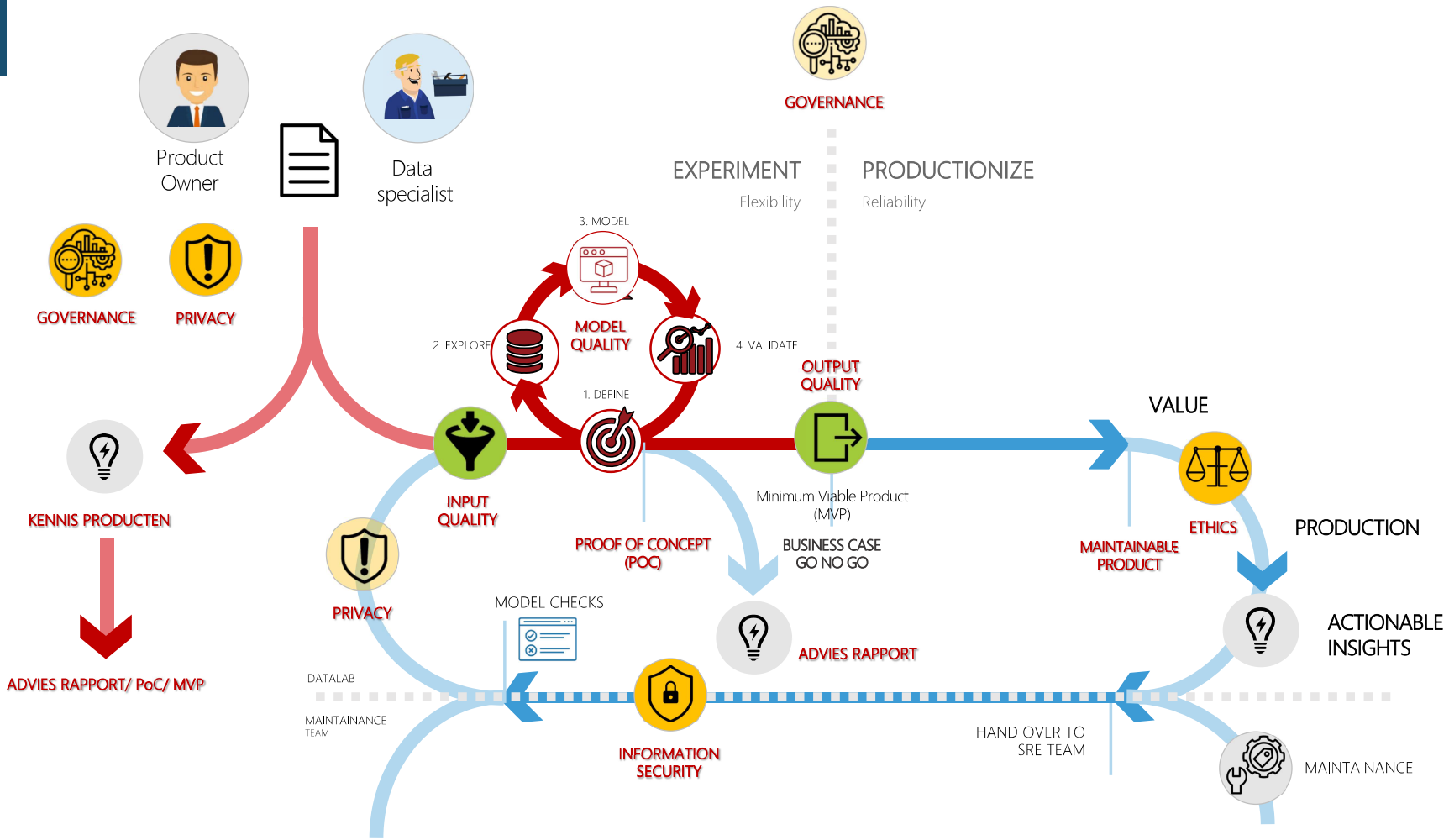


DATALAB ACADEMY

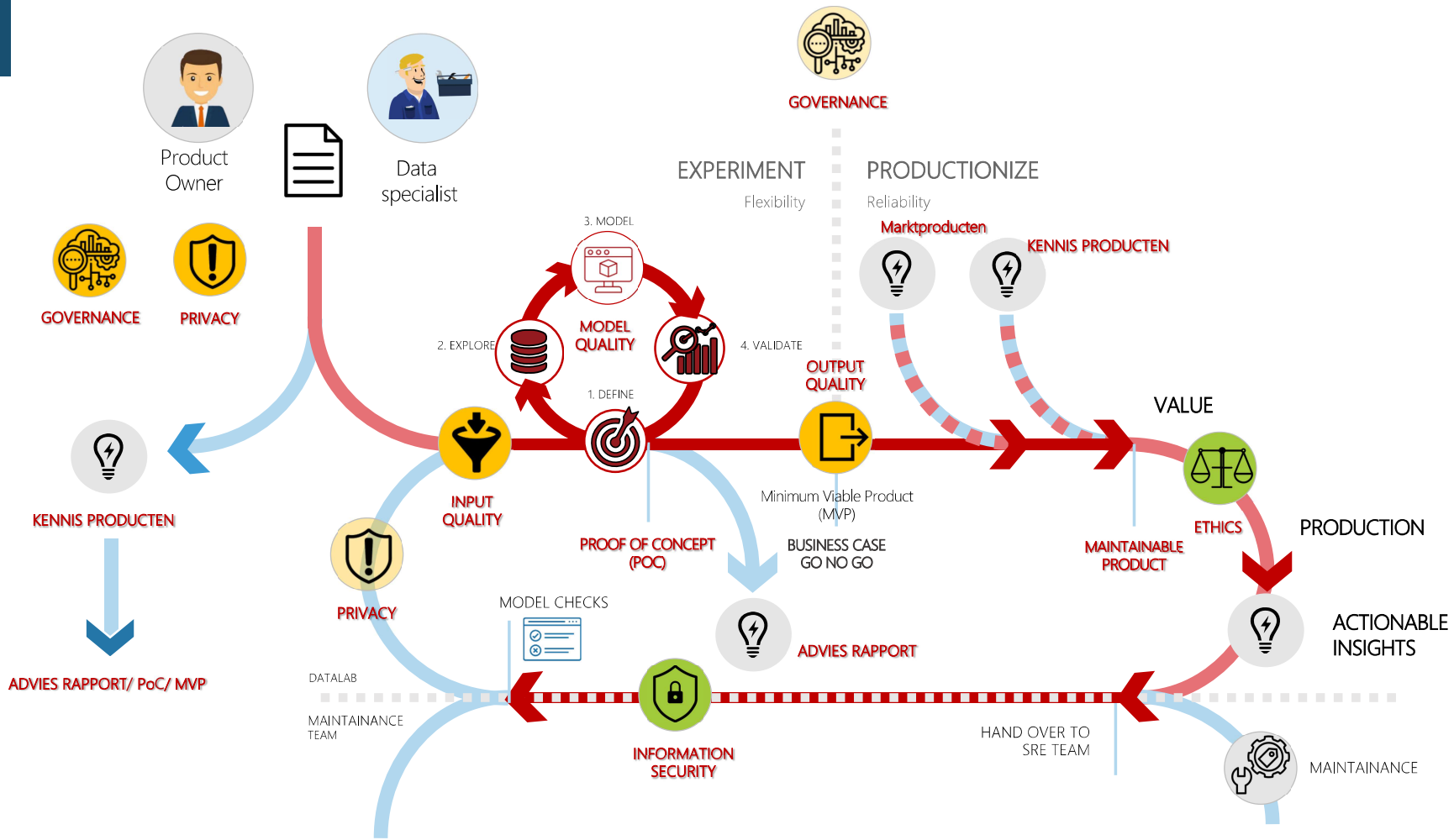


- Geen prestatie doel maar een ontwikkeldoel
- Opleiden “on the job” in het data gedreven werken.
- Multidisciplinair: samen met verschillende afdelingen/organisatie
- Gedurende 6 maanden*
- 1 vaste dag per twee weken bij het Datalab
  - Ochtend: Theorie.
  - Middag: Werken aan eigen usecase met ondersteuning.
  - Persoonlijk ontwikkelplan
- Kennis stroomt terug de organisatie in
- Een veelvoud aan use-cases zouden op deze manier opgelost kunnen worden met dezelfde capaciteit.

WAARDE LEVEREN IN DE ORGANISATIE

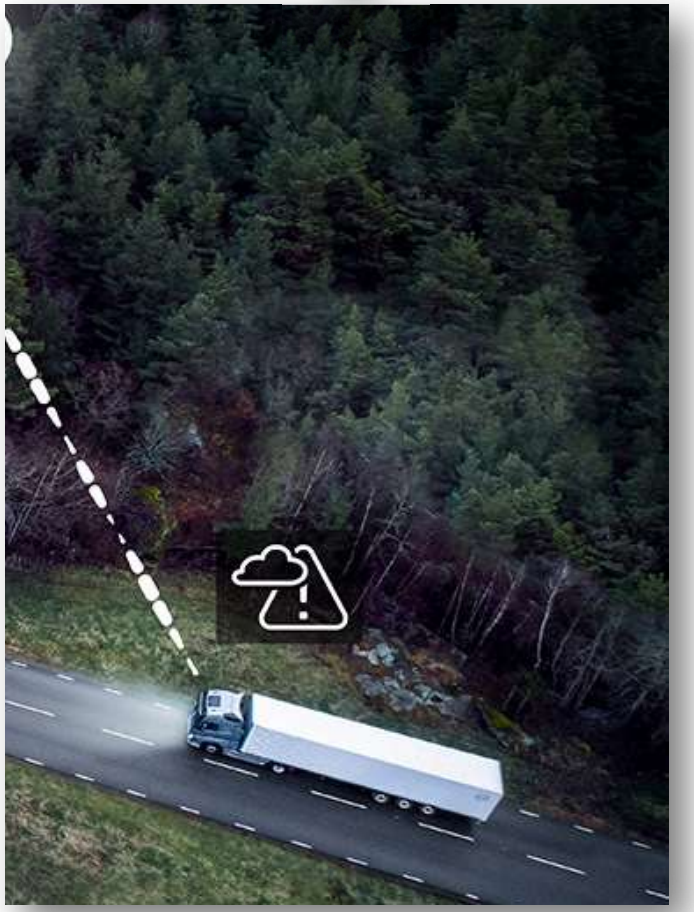


WAARDE LEVEREN IN DE ORGANISATIE



Sattelietbeelden

Veranderingen infrastructuur



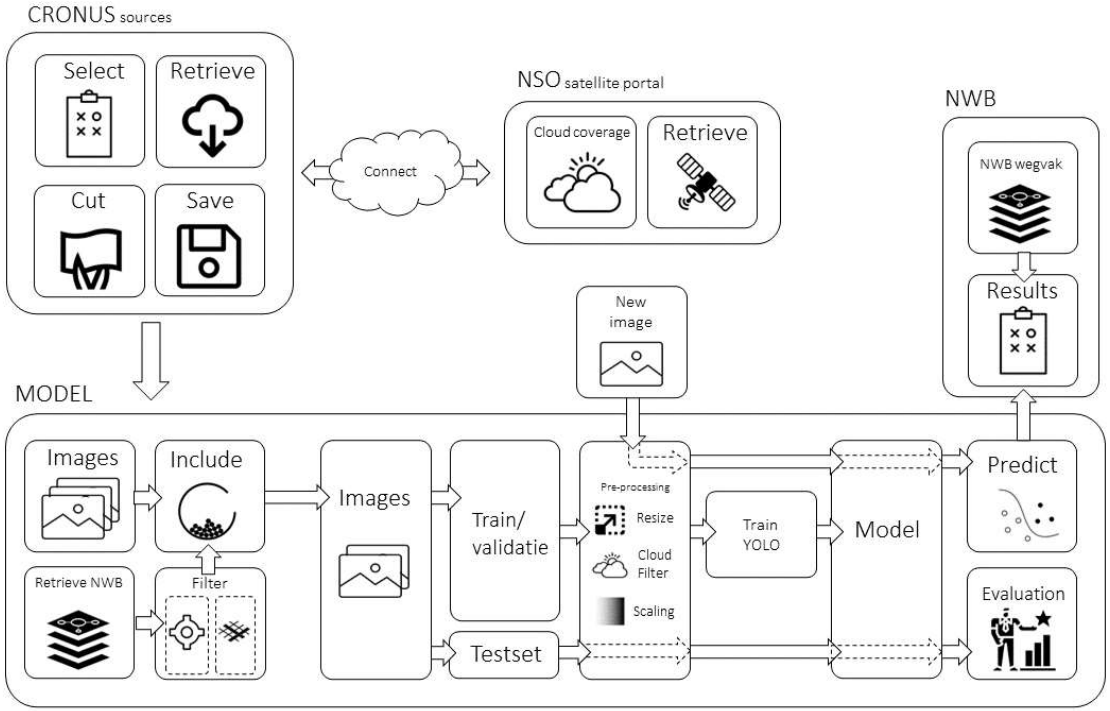
Verkeerscamera's

Sonar

Object detective zeebodem

ONTWIKKELEN VAN BEHEER PRODUCTEN

- Een product laten landen in een grote organisatie is uitdagend.
- Met 10K collega's wil je niet 10K verschillende tools/applicaties/dashboard beheren.
- Uniformeren en gebruik maken van de bestaande bouwstenen (RIVA).
- Voldoen aan de AI-normenkader, algorithme register.
- Governance, ethiek, privacy, input/model/output kwaliteit



ONTWIKKELEN VAN BEHEER PRODUCTEN

Rotondes

Wegverharding

Afbeelding 7: Voorspellingen (oranje) en de situatie volgens de BGT (geel) met de overlap hiertussen (paars). Hier presteert het model goed.

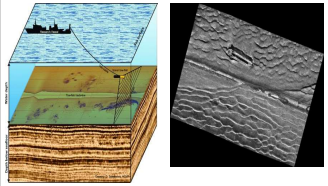
Transport

Oevererosie

Zeedieren

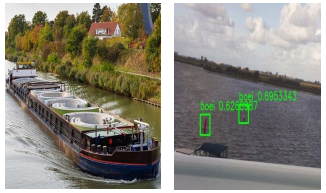
Zwerfafval

Sonar



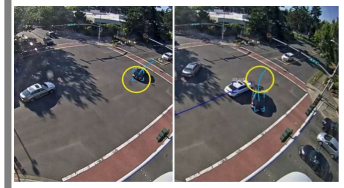
Verkeersborden

Digitaal Schouwen



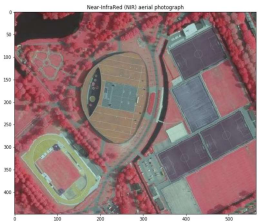
Inspectie kunstwerken

Slimme cameras

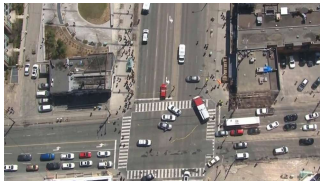


Ongewenste Situaties brug/sluis

Vegetate monitor

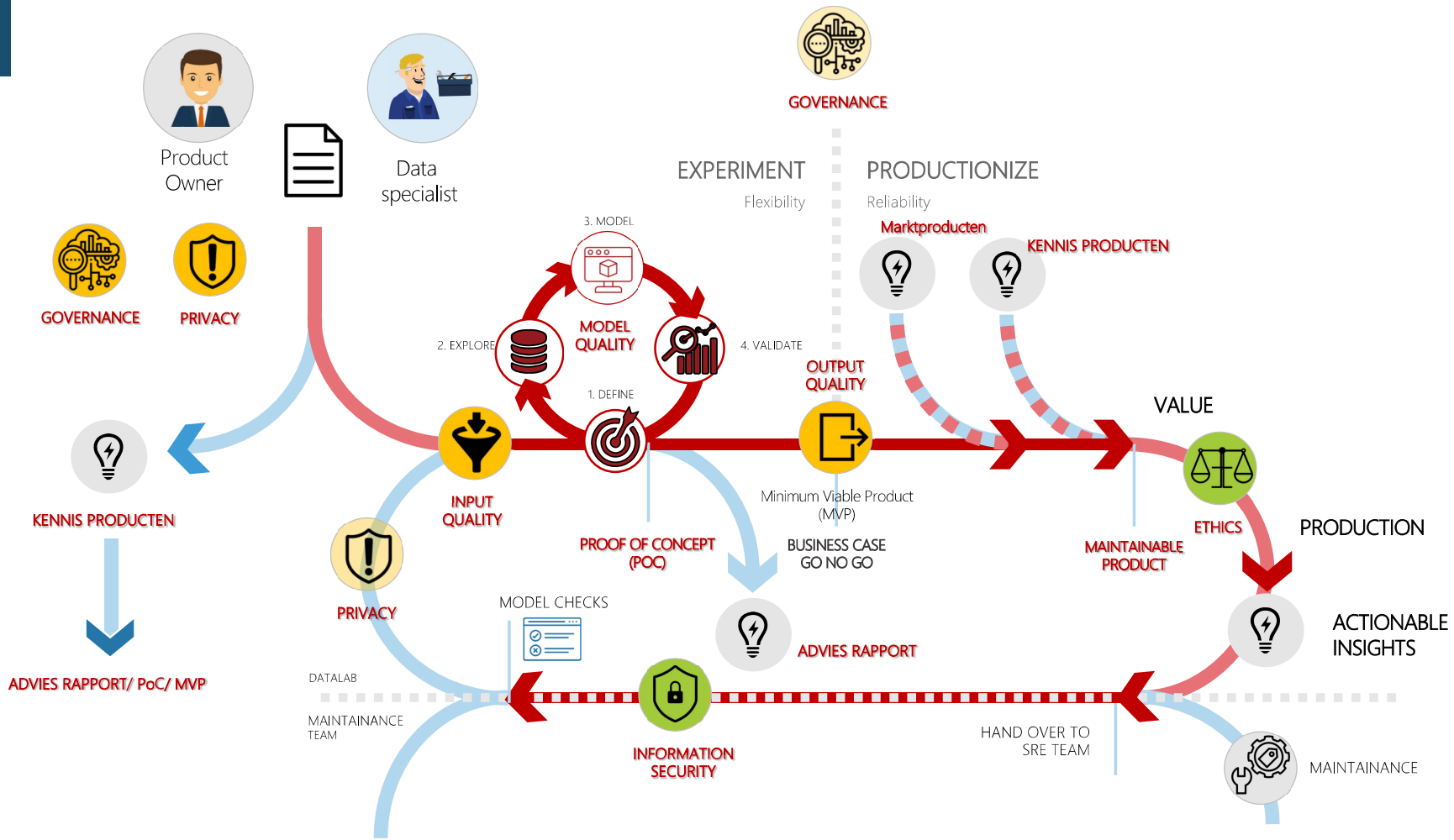


Gevaarlijke oversteekplaatsen



Privacy-by-design

WAARDE LEVEREN IN DE ORGANISATIE



Datalab @ Rijkswaterstaat