

A photograph of a moose crossing a two-lane asphalt road. The moose is in the center of the frame, facing left. The road has yellow dashed lines and a white solid line on the right. In the background, there are several trucks, including a white semi-truck and a red truck, parked or moving. There are also some buildings and a sign that says "Kjerknesvågen". The scene is set in a rural area with hills and trees in the background.

Prosjekt WILDETECT

Presentasjon på Naturdatas viltkonferanse på Rica Hell
20. november 2025, Terje Moen



SINTEF

Avdeling Mobilitet: Vi forsker på mobilitet for mennesker og gods i transportsystemene til nytte for samfunnet





SINTEF

*Kan bruk av sensorer, data og maskinlæring
hjelp oss å beskytte både mennesker og dyr
– og gjøre transporten tryggere for alle?*

WILDETECT

Utforske forutsetninger for et integrert, trygt og smart trafikksystem
- for å unngå kollisjon med vilt

- Samarbeidsprosjekt
- Varighet 2023 - 2027



Støtta av
Forskringsrådet





Partnere



IMSA Knowledge Company AS



Statens vegvesen





SINTEF

Hvordan kan vi kombinere potensialet til stordata og tilgjengelige teknologier, med styrken til maskinlæring, for å unngå viltkollisjoner for et sikrere og mer naturvennlig transportsystem?

Dette skal undersøkes gjennom utforsking og testing innen:

- Datatilgang for konseptutvikling og evalueringsmetodikk
- Predikering av kollisjoner
- Utforske viltdeleksjon- og varslingsystemer ved bruk av sensordata fra bakke og drone, og vurdere integrasjonspotensialet
- Aksept og effekt av delløsninger i VR-lab og på veg



SINTEF

WILDETECT og FNs bærekraftsmål



Økonomisk bærekraft fordi vi jobber i samarbeid om nye løsninger og med norsk næringsliv

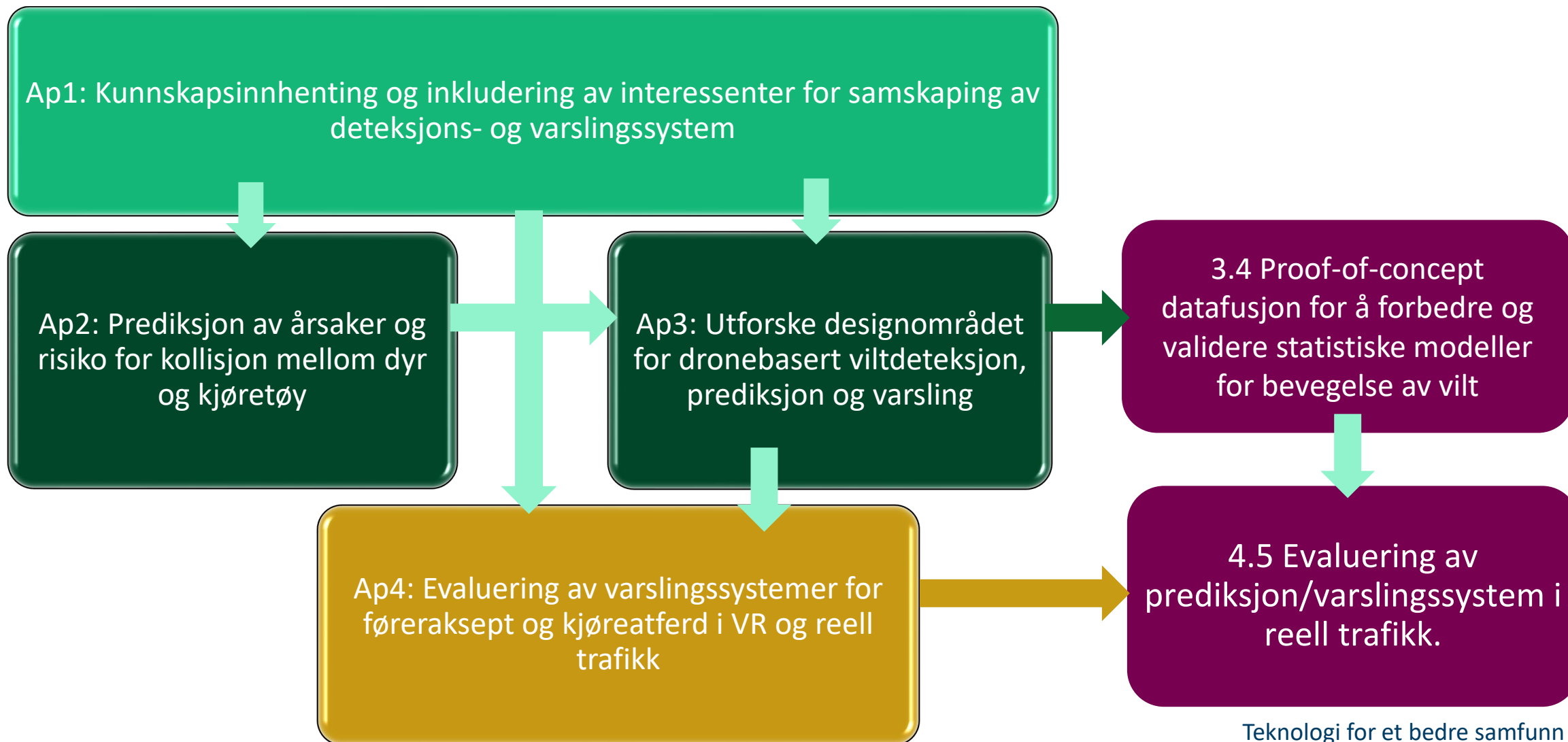


Grønn bærekraft gjennom hensynet til natur og leveområder til dyrene



Sosial bærekraft gjennom å ivareta trafikksikkerhet

Arbeidspakker og sentrale samarbeidsaktiviteter





SINTEF

**AP1 Kunnskapsinnhenting og inkludering av
interessenter for samskaping av deteksjons- og
varslingssystem**

Om AP1

Involvere stakeholdere og kunnskap i en felles innsats for å utnytte potensialet til eksisterende data

Forskningsspørsmål:

- A. Hvilke viltdeleksjons- og varslingsdata er tilgjengelige og hvordan kan de deles og brukes i et konseptuelt system for deteksjon og varsling på vei? (og bane)
- B. Og hvordan kan dette brukes til å utvikle et evalueringsoppsett for varslingsystemer?



SINTEF

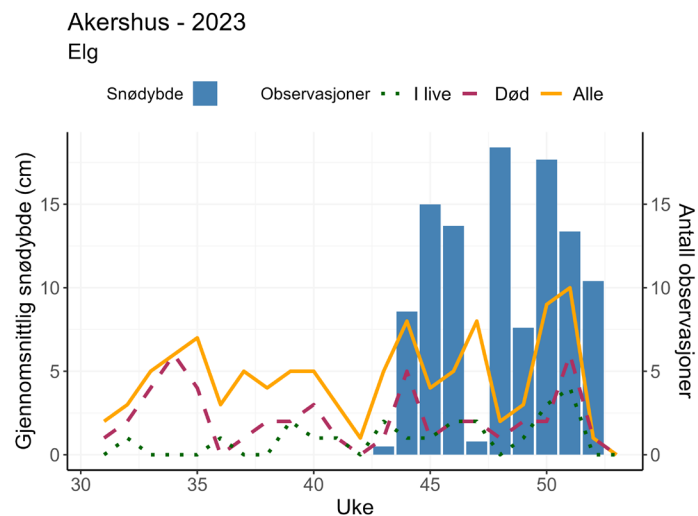


AP2: Prediksjon av årsaker og risiko for kollisjon mellom dyr og kjøretøy

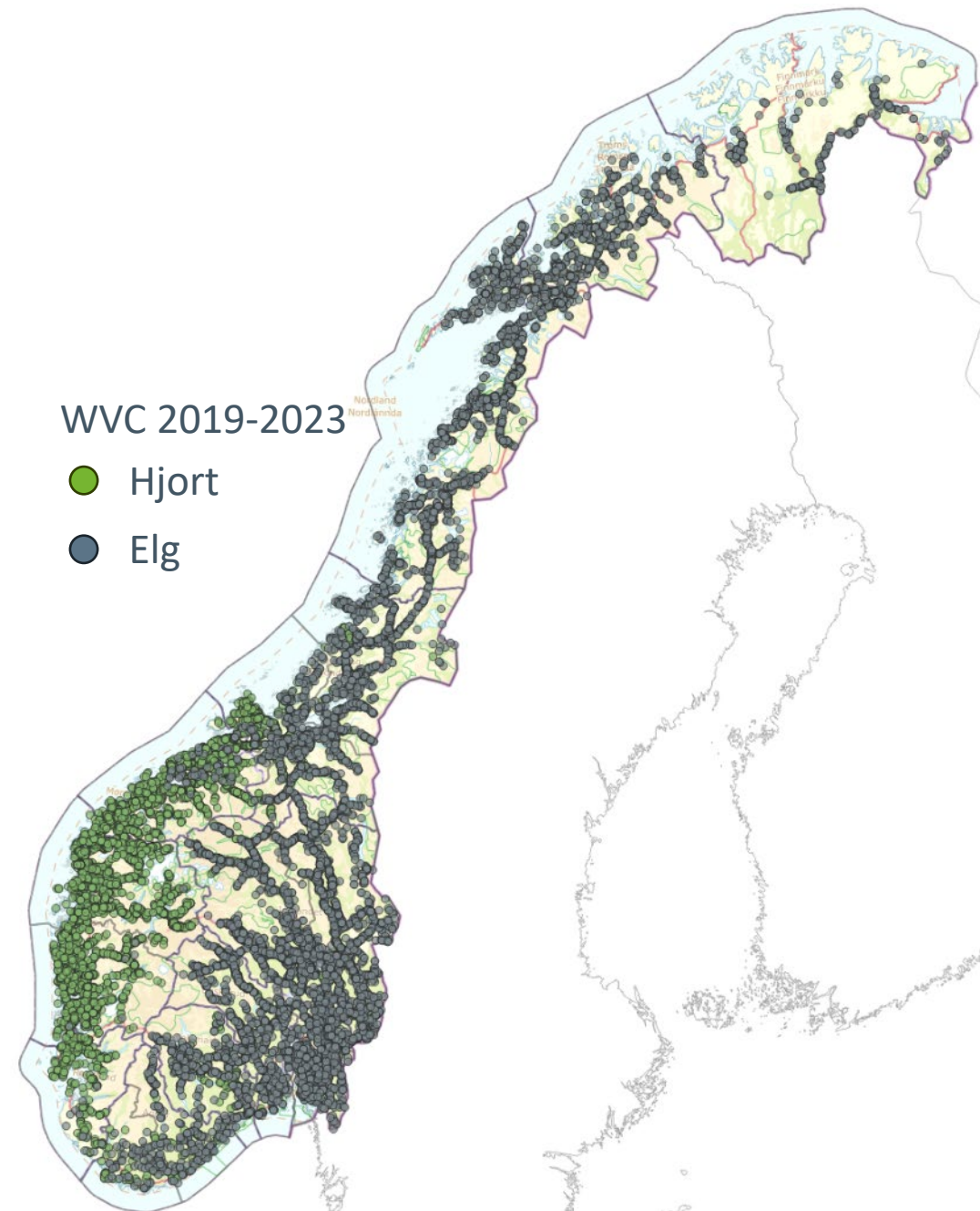


Status AP2

- Activity 2.1-2.2
 - ▶ Assembled and structured data
 - Collision data (2009-2024)
 - Road variables (from NVDB)
 - Climate variables (snow depth, temperatures)

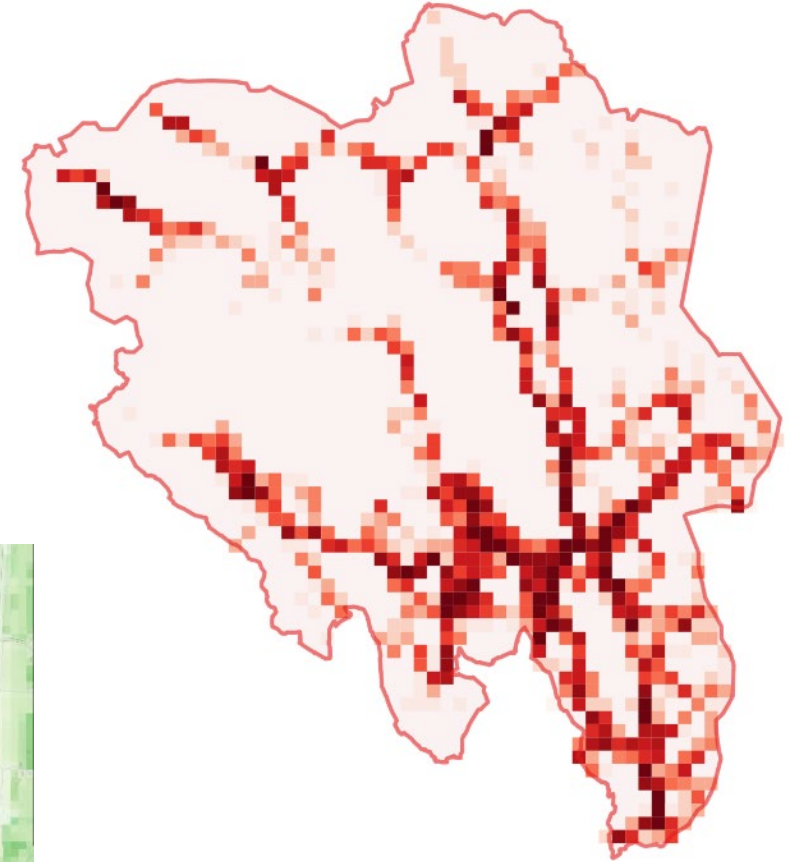
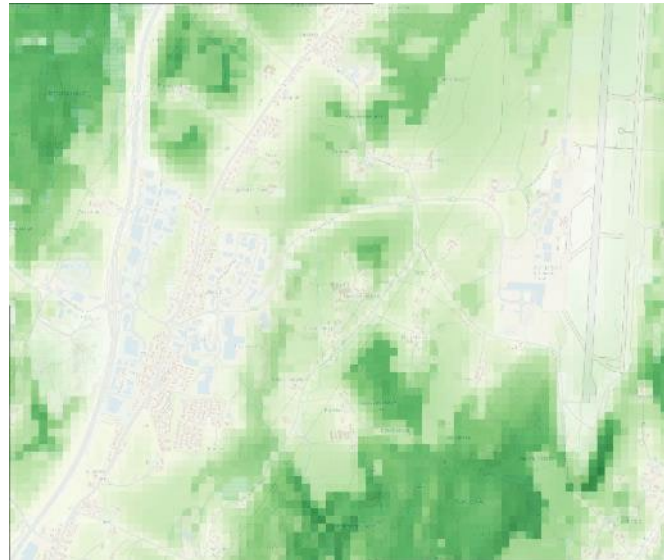


- ▶ Still work pertaining to spatial scales
 - Effects vary regionally and locally



Status AP2

- Activity 2.1-2.2
 - ▶ Started with hotspot analysis (example from previous work)
 - ▶ Kernel density estimates based on collision data
 - ▶ **Next step:** add relevant variables to hotspot analysis
 - ▶ Integration of functional habitat and corridor maps moose (available through project GreenPlan; Panzacchi et al. 2022)





SINTEF

04 PLANET
DATA# 2, 06655 · 10

60%



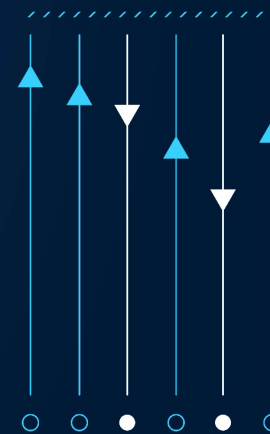
ON
OFF

LOREM IPSUM DOLOR SIT AMET, CONSECTETUR ADIPISCING ELIT. SED DO EIUSMOD TEMPOR INCIDidunt
UT LABORE ET DOLORE MAGNA ALIQUA. UT ENIM AD MINIM VENIAM, QUI NOSTRUD EXERCITATION
ULLAMCO LABORIS NISI UT ALIQUIP EX EA COMMODO CONSEQUAT.

3. 141592653589

```
INT MAIN (INT ARG, CHAR **ARGV) {  
  VECTOR<CHAR> ACC;  
  CHAR CH;  
  IFSTREAM INFILE ( ARGV(1));
```

SAT
01/6



2. 71828818228

```
INT MAIN (INT ARG, CHAR **ARGV) {  
INT MAIN (INT ARG, CHAR **ARGV) {
```

Ap3: Utforske designområdet for dronebasert
vilteteksjon, prediksjon og varsling

Høgskulen
på Vestlandet



About MD Abdul Momin

-PhD researcher in HVL Robotics lab

-PhD project title:

Image-based deep learning for wild animal detection and alert system using ground and UAV images

-Project Supervisors:

Associate Professor Martin Fodstad Stølen

Professor Reza Arghandeh

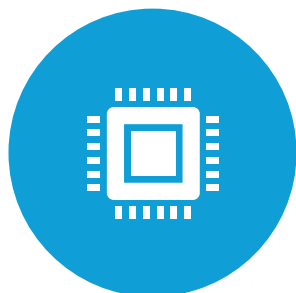
Technology and Wildlife detection



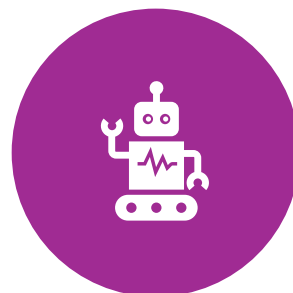
Technological advancements in artificial intelligence and sensors have led researchers to integrate technology and animal research for the betterment of the environment.



Animal monitoring applications using artificial intelligence can be used for the economic and production of livestock as well as wildlife animal recognition (Cabezas et al., 2022).

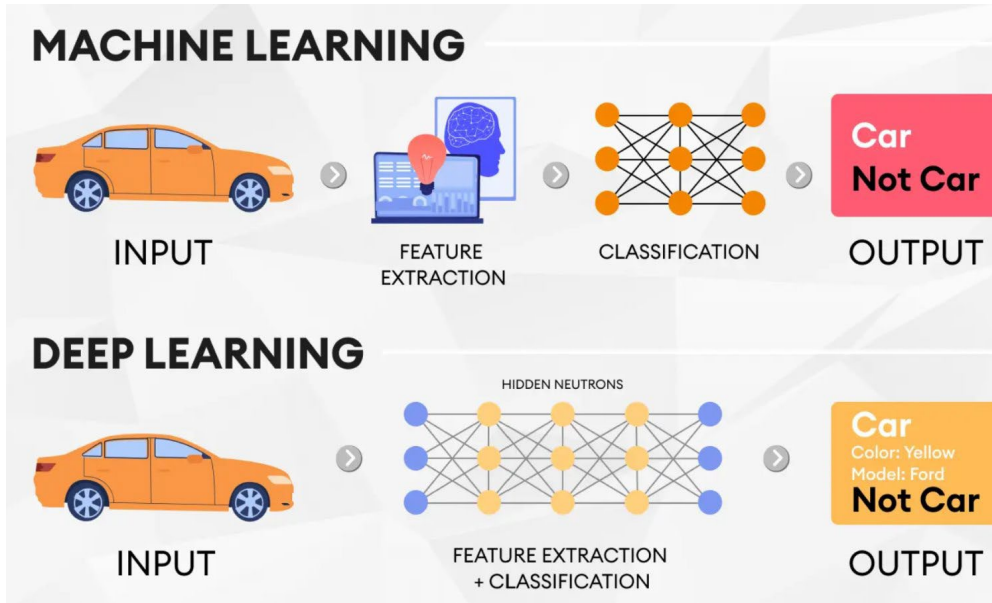


Animal detection and monitoring systems work as sensor networks consisting of multiple sensors, data collection systems with wireless modules, processing algorithms, and warning devices.



Machine learning and data fusion techniques improve object detection and classification for animal recognition (Jin et al., 2022).

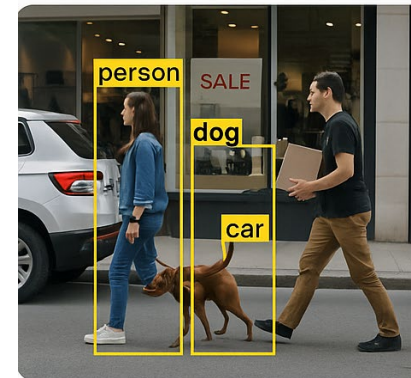
Object detection



Deep learning uses **Convolutional Neural Networks (CNNs)** to:

- **Extract features** from images (edges, shapes, textures).
- **Classify** objects within an image.
- **Predict bounding boxes** around detected objects.

Difference between YOLOv11 and SAM2



YOLOv11
Object Detection



SAM2
Image Segmentation

A photograph of a deer with large, dark antlers standing in a snowy field. The deer is facing the camera, and its fur is a mix of brown and grey. The background is a soft, out-of-focus blue-grey, suggesting a winter sky. Snowflakes are visible in the air, creating a sense of movement. The text "Deer detection" is overlaid in the center of the image in a white, sans-serif font.

Deer detection

Deer detection using ground-based sensor



More suitable for Western Norway since there are more deer in this region



The cameras can be put near the fence gap around the road to monitor deer



Deer image sample dataset from Svanøy



Svanøy deer dataset

The dataset consists of a single class of deer, and the images were captured using 60 cameras on Svanøy Island (61.49061° , 5.1451796°) in Norway.

There are 3183 images, where the number of RGB images is 1432 and the number of night vision images is 1751.

The dataset was split into three parts, with ratios of 80, 10, and 10 percent for training, validation, and testing, respectively.

Images	Train	Valid	Test	Total
RGB	1141	157	134	1432
Night	1405	162	184	1751
Total	2546	319	318	3183





Sample deer



YOLOv11n



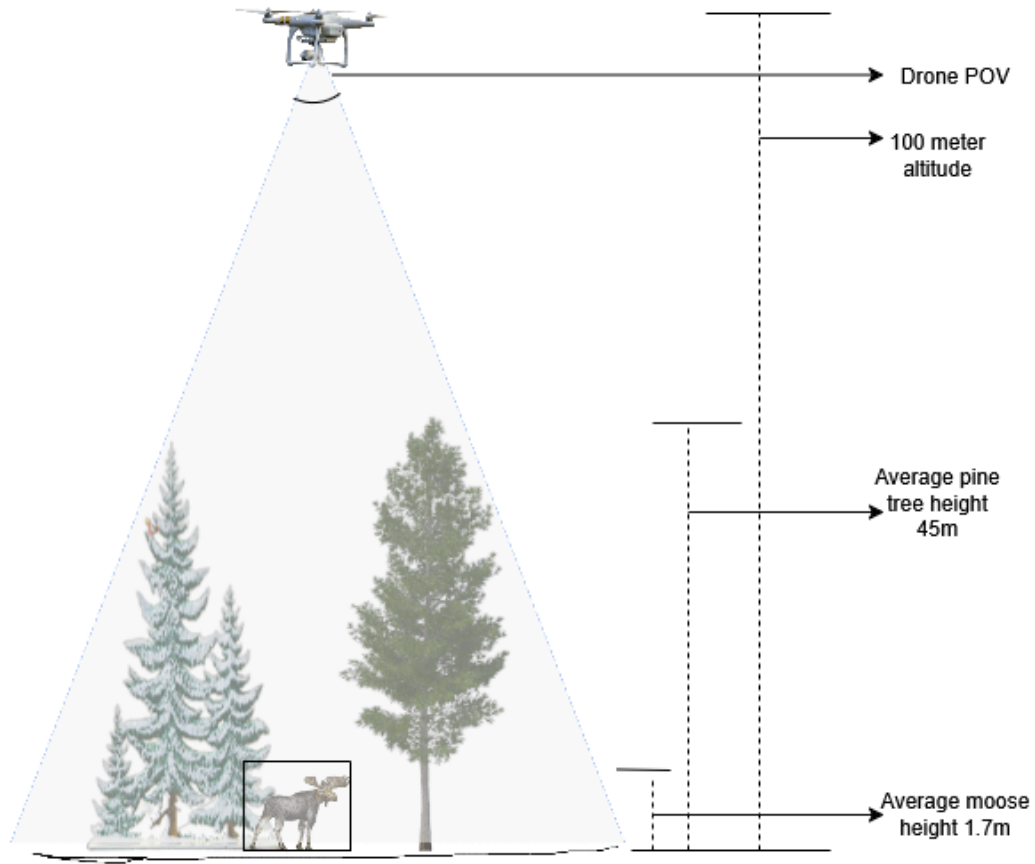
Enhanced YOLOv11n



A photograph of a moose running through a snowy landscape. The moose is dark brown and is captured in mid-stride, moving from left to right. The ground is covered in a thick layer of snow, and the background consists of a dense forest of snow-covered trees. The scene is brightly lit, suggesting a sunny day in winter. The text "Moose detection" is overlaid in a blue, sans-serif font across the middle of the image.

Moose detection

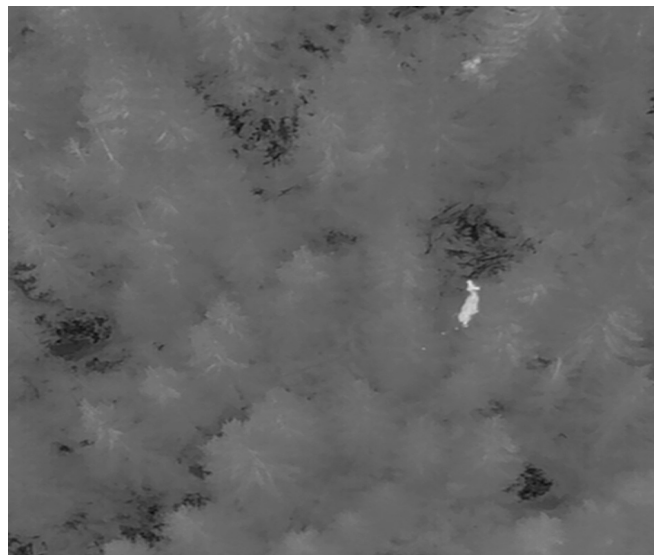
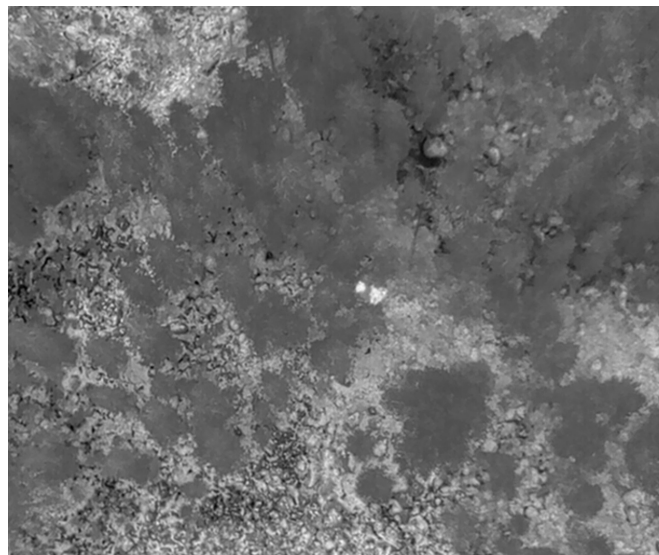
Datasets



- Moose Dataset
 - Collected at the University of Inland Norway (INN) using DJI Matrice 300 RTK + Zenmuse H20T camera.
 - Images were captured from 100m altitude.

Dataset type	Length of video (minutes)	Number of images (5 frames per second)	Number of images (10 fps)	Number of images (frame 15)
RGB	4:29:15	1346	2692	4038
Thermal	4.27:97	1340	2680	4020

Collected Moose image samples from INN



Moose detection using UAV based RGB/Thermal sensor

- More suitable for the area near the Swedish border of Norway and Innland
- We have plan to cover larger area to detect Moose
- This image is from one of the Report of “Høgskolen i Innlandets” on Moose detection



Fig. 5: Example of a thermal image taken by the DJI Matrice 300 RTK Combo drone equipped with a dual camera that recorded both thermal infrared TIR and color RGB (DJI ZenMuse H20T). The small image shows an image taken with the zoom camera (500 mm) from a different moose cow and calf. Pictures: Thomas Vogler.

Goals

- To create dataset for moose and deer using thermal and RGB sensors based on UAV and ground images
- To enhance a deep learning algorithm for detecting deer and moose using ground and UAV cameras
- To create an alert system after wild animal detection



SINTEF

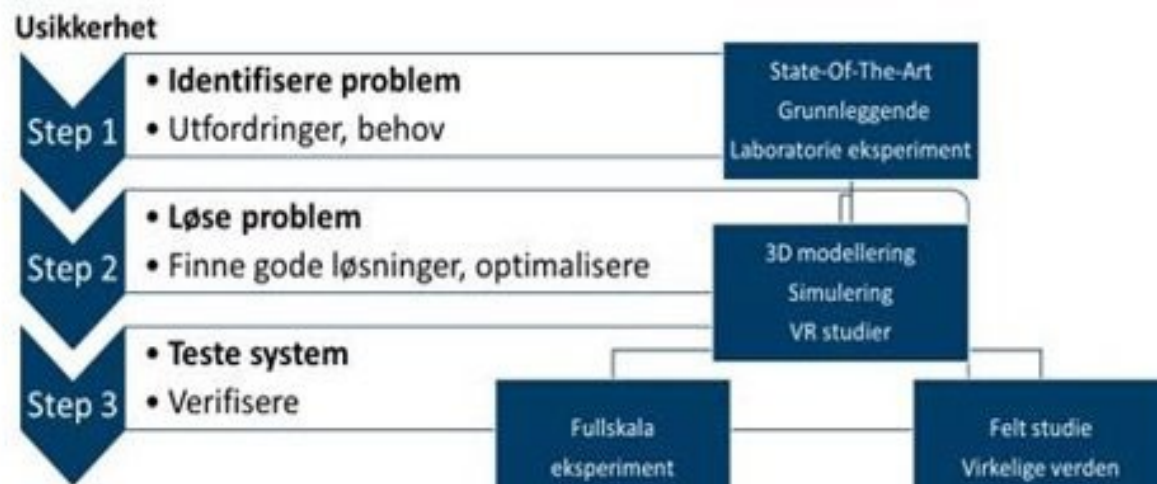
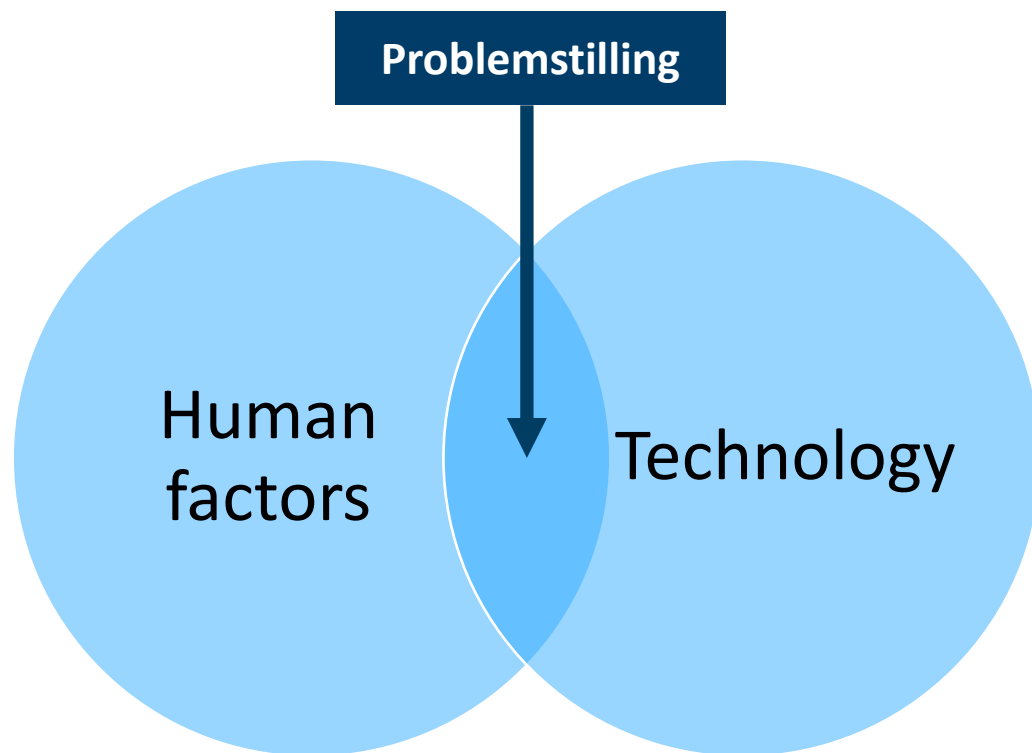
Ap4: Evaluering av varslingsystemer for føreraksept og kjøreatferd i VR og reell trafikk



SINTEF

— 75 år —

Forskningsstrategi i VR-lab



Mennesket i sentrum

- Prøver å forstå hvorfor mennesket gjør de valg de gjør, og hva som påvirker dette.
 - Tolkning av eye-tracking (øyesporing) data
- Human-Environment Interaction (HEI) model
 - Eksempel – gruppedynamikk i kritisk situasjon (tunnelbrann).
- Mind, Brain, and Education (MBE) teori
 - Neuroscience in the context of education.



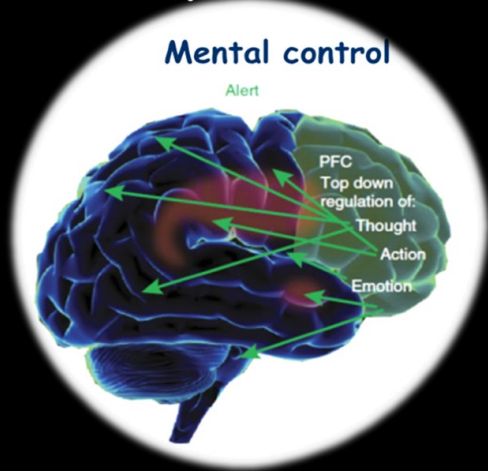
Eyetracker.

Bilde: <https://www.tobii.com/products/eye-trackers/wearables/tobii-pro-glasses-3#how-they-work>

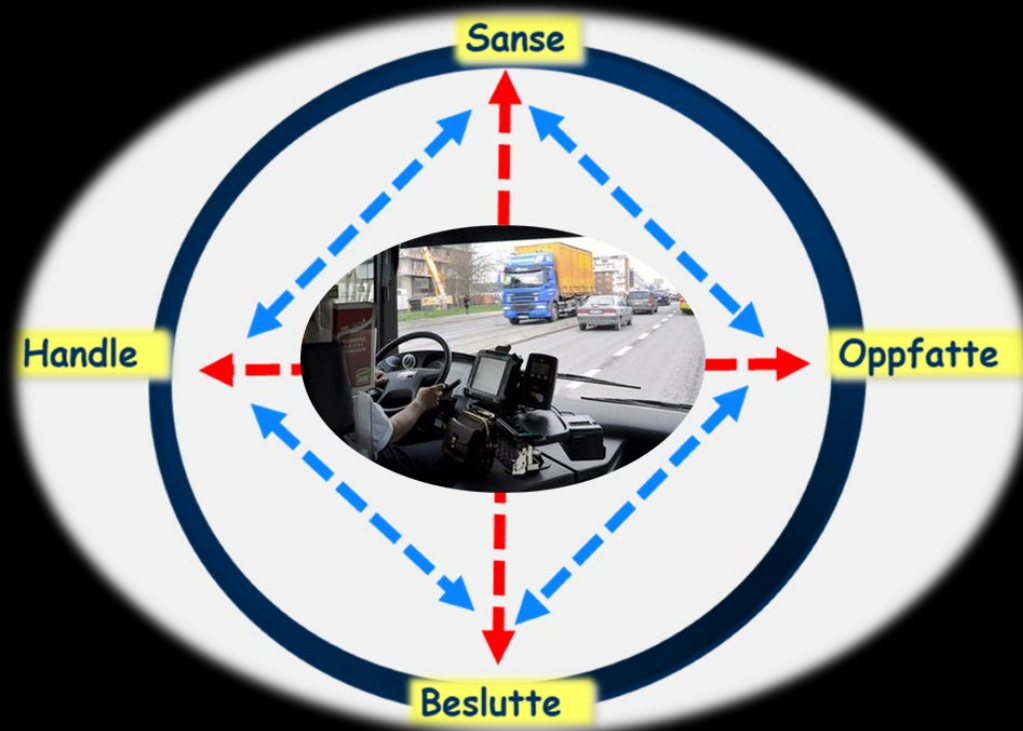
KJØREPROSESSEN

“handlingsorientert, **kognitiv** og **affektiv** prosess”

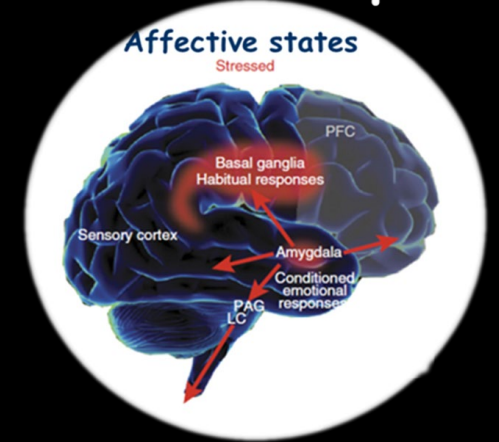
top-down



reaktiv-prediktiv
“avoid surprises and last longer”



bottom-up



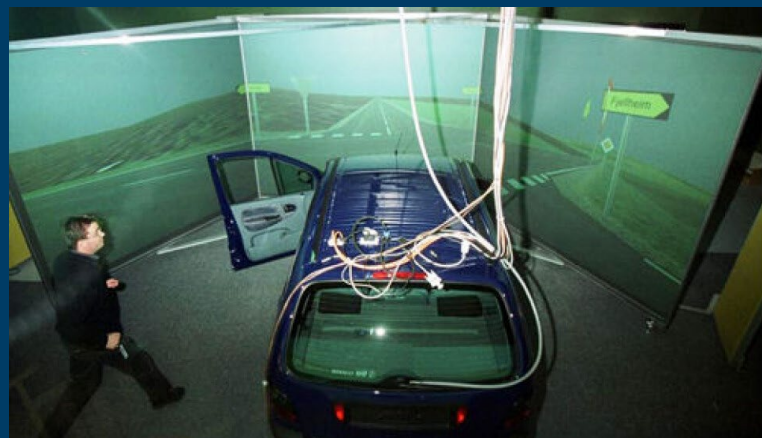
Fra SINTEFs kjøresimulator til VR

SINTEF kjøresimulator

- Opplæring
- Test av infrastruktur/
veinormaler/osv.
- Trafikksikkerhet
- Medisinsk testing

Utfaset i 2018

- Overgang til VR
- Åpnet for flere
anvendelsesområder



VR i WILDETECT

- Driving simulator trial
 - Digital twin of Oppdal test site
 - Better detection and notification of possible game hazard situations
 - In-vehicle HMI
 - New road sign designs/impact
 - Note: low PPI – only “toward” good enough.
 - Use of eye-tracking in VR as data source for evaluation
 - Mental fatigue – next step and SOTA





SINTEF

— 75 år —





SINTEF

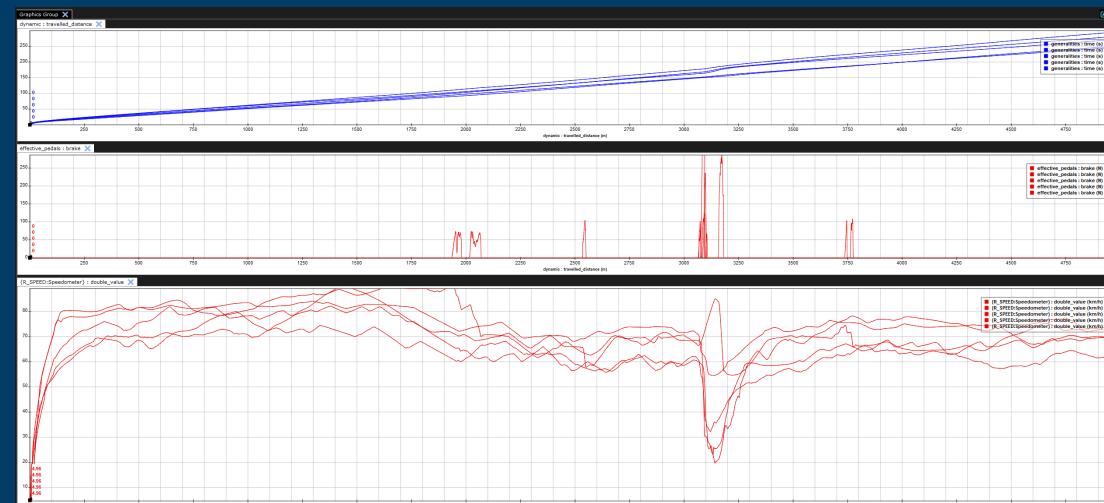
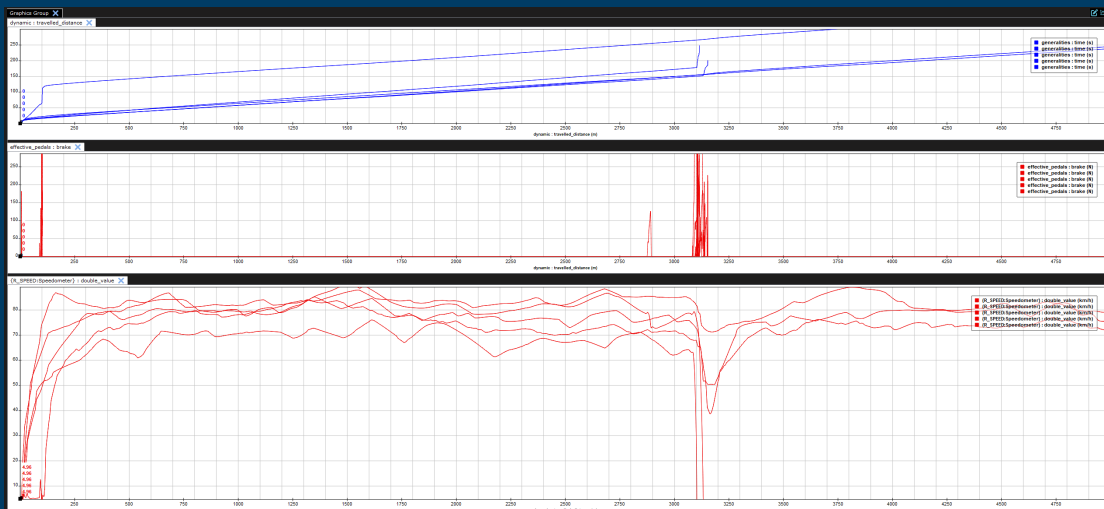
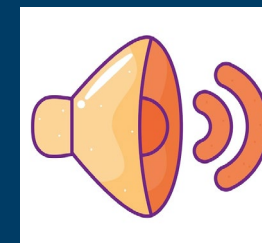
— 75 år —

WILDETECT study - Preliminary data (1)

- Eksisterende skilting vs in-vehicle warning



+



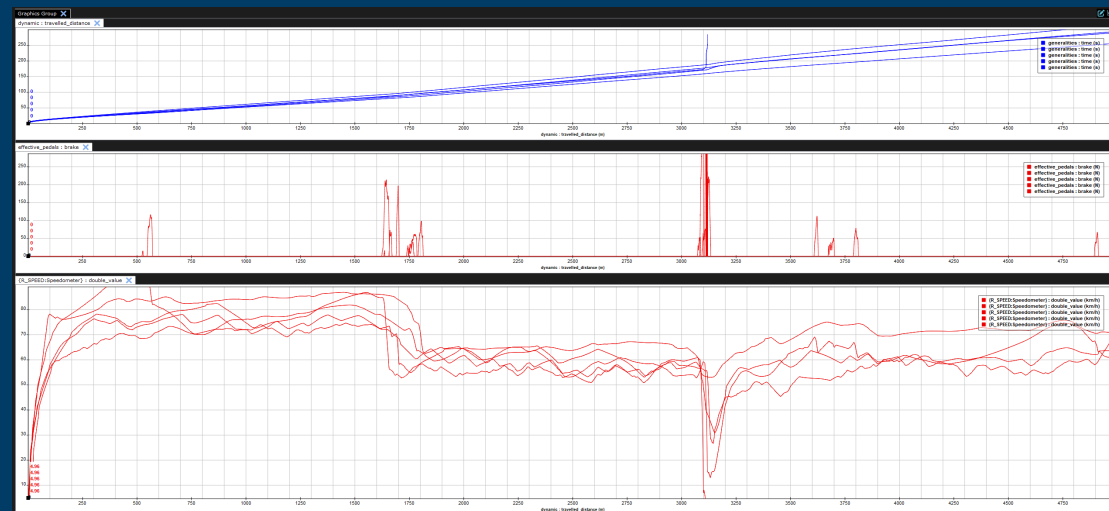
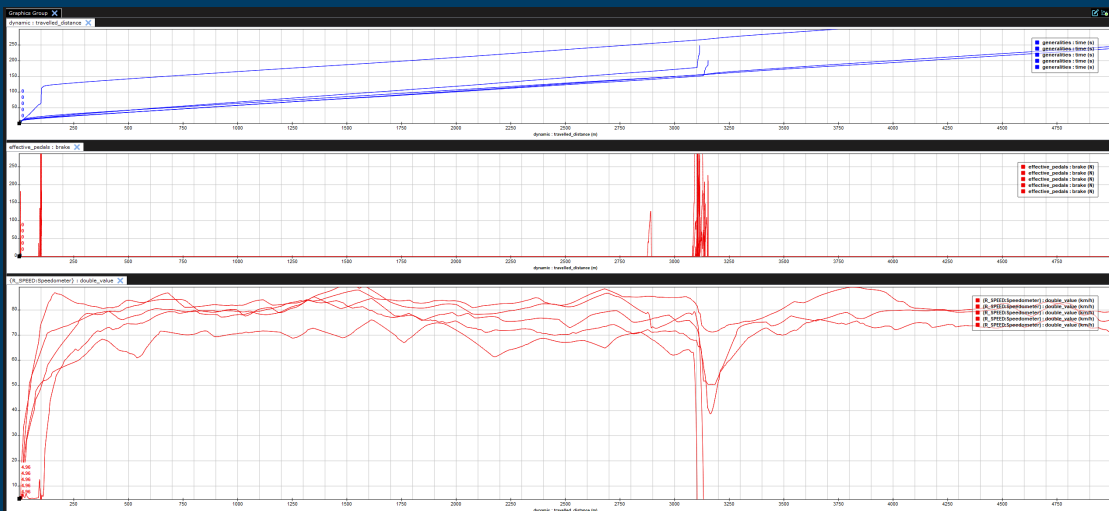


SINTEF

75 år

WILDETECT study - Preliminary data (2)

- Eksisterende skilting vs ny skilting





SINTEF

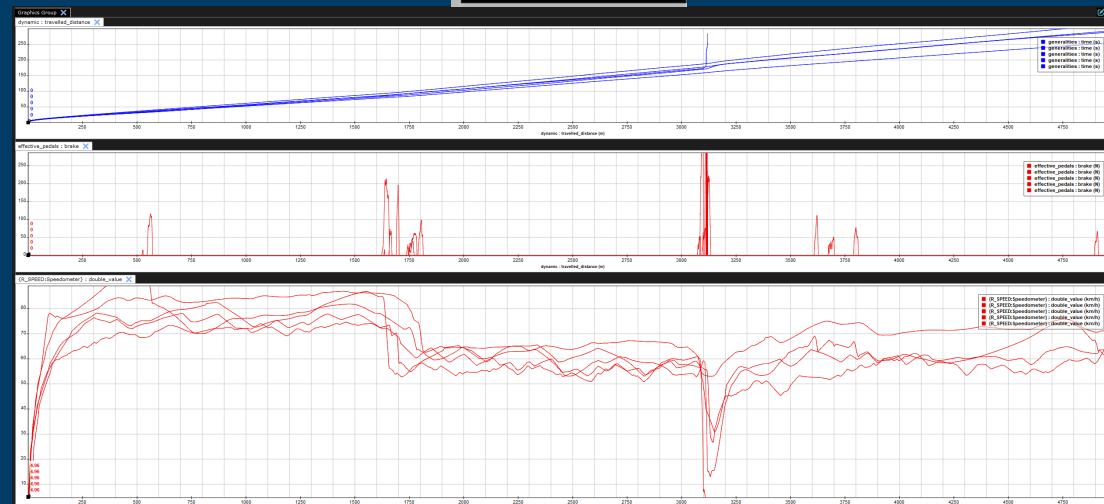
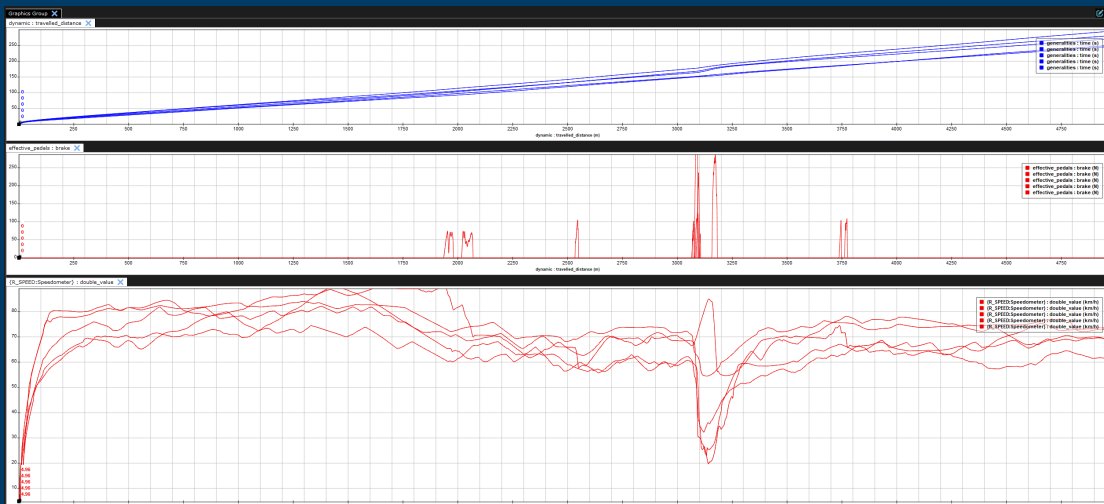
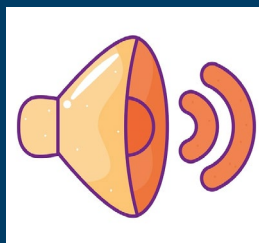
— 75 år —

WILDETECT study - Preliminary data (3)

- In vehicle vs ny skilting



+





SINTEF

Test av trafikanters adferd ved nedsatt fartsgrense

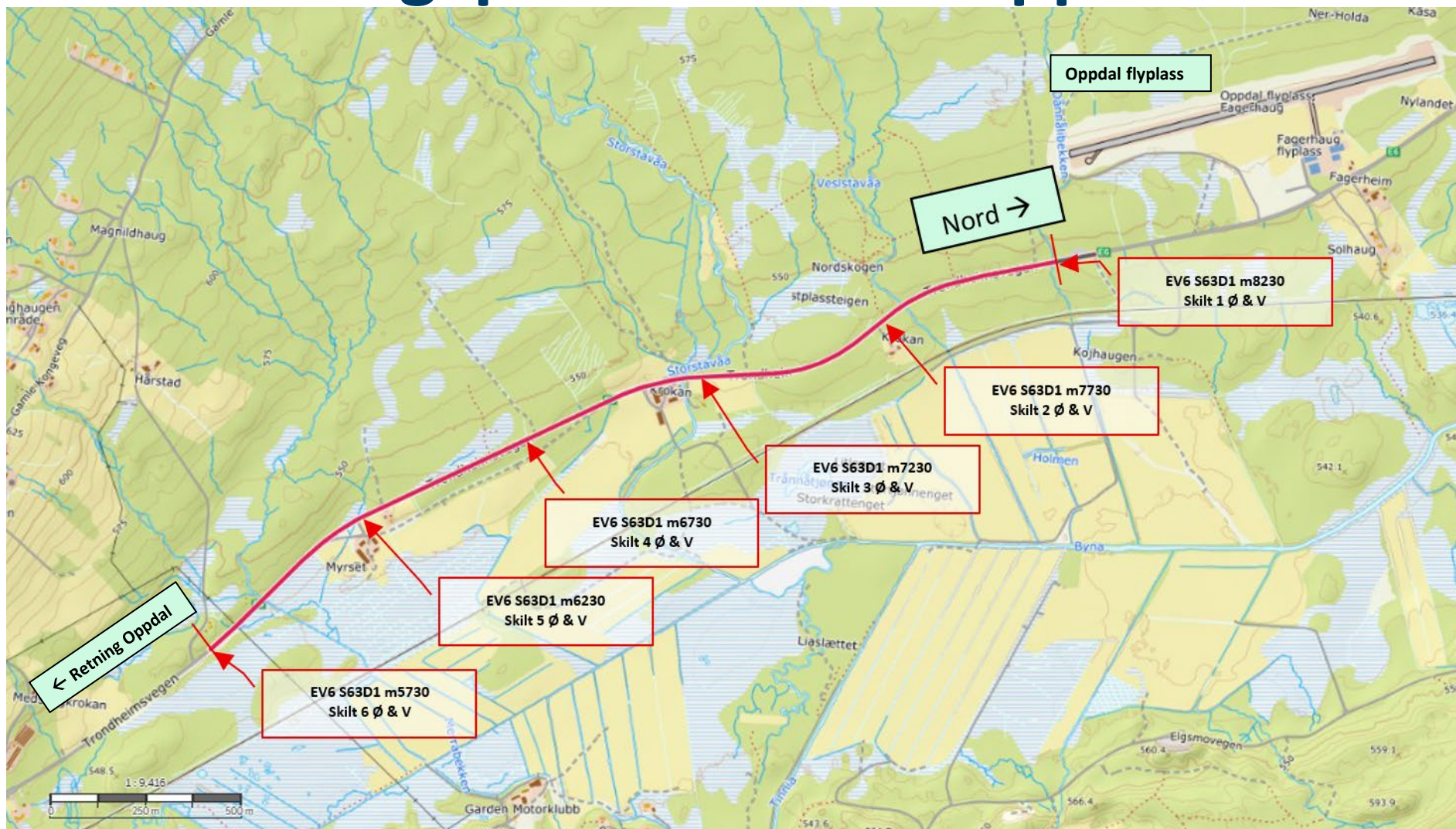
Sideprosjekt til WILDETECT, finansiert av
Statens vegvesen





SINTEF

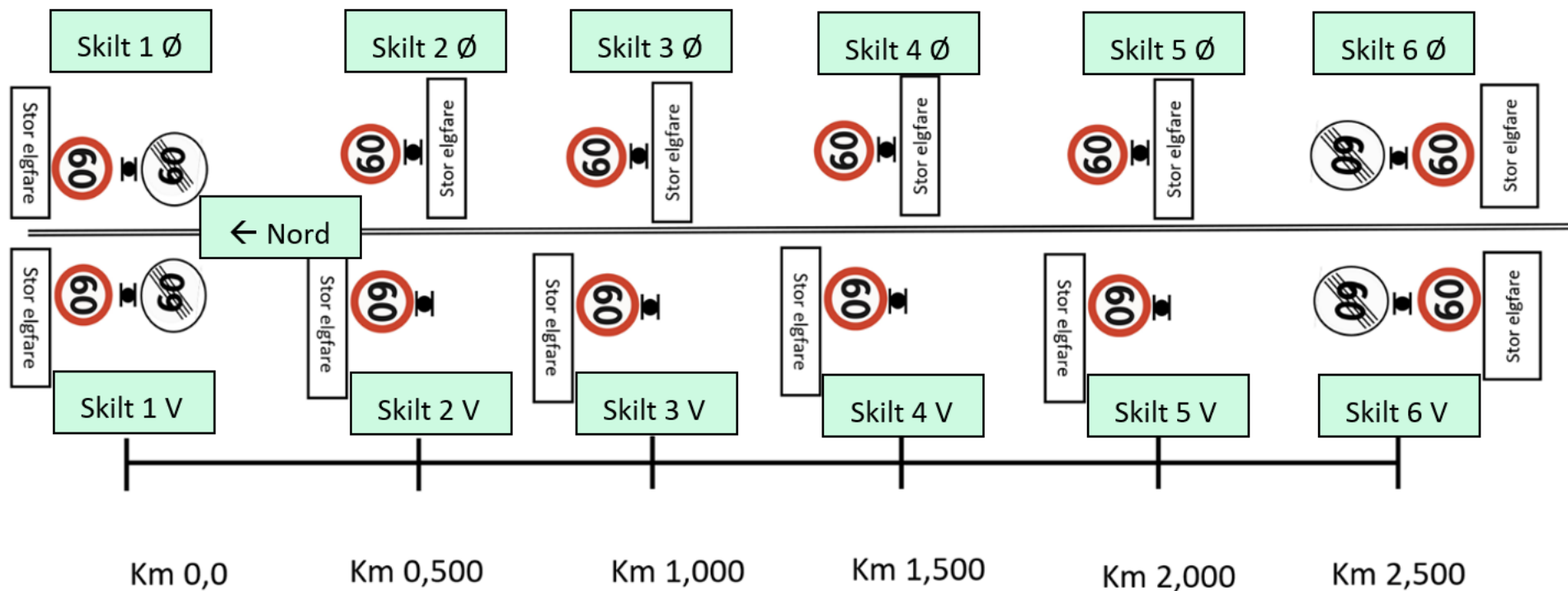
Variabel fartsgrense langs en 2,5 km lang teststrekning på E6 nord for Oppdal.





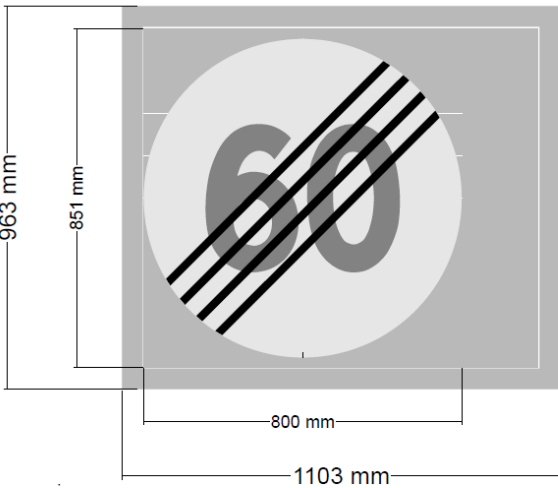
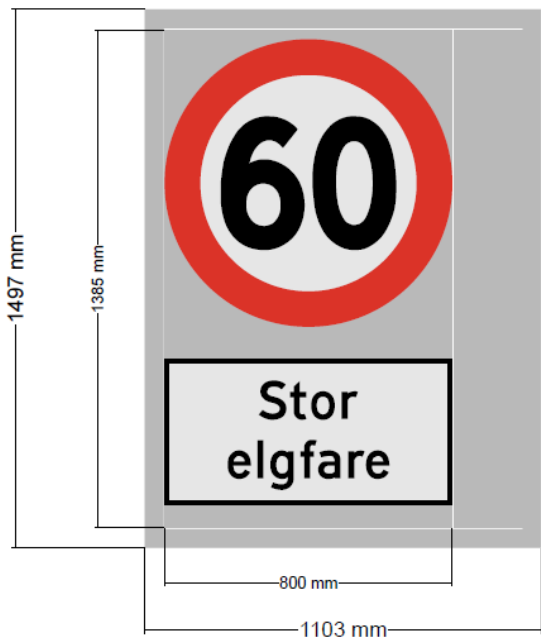
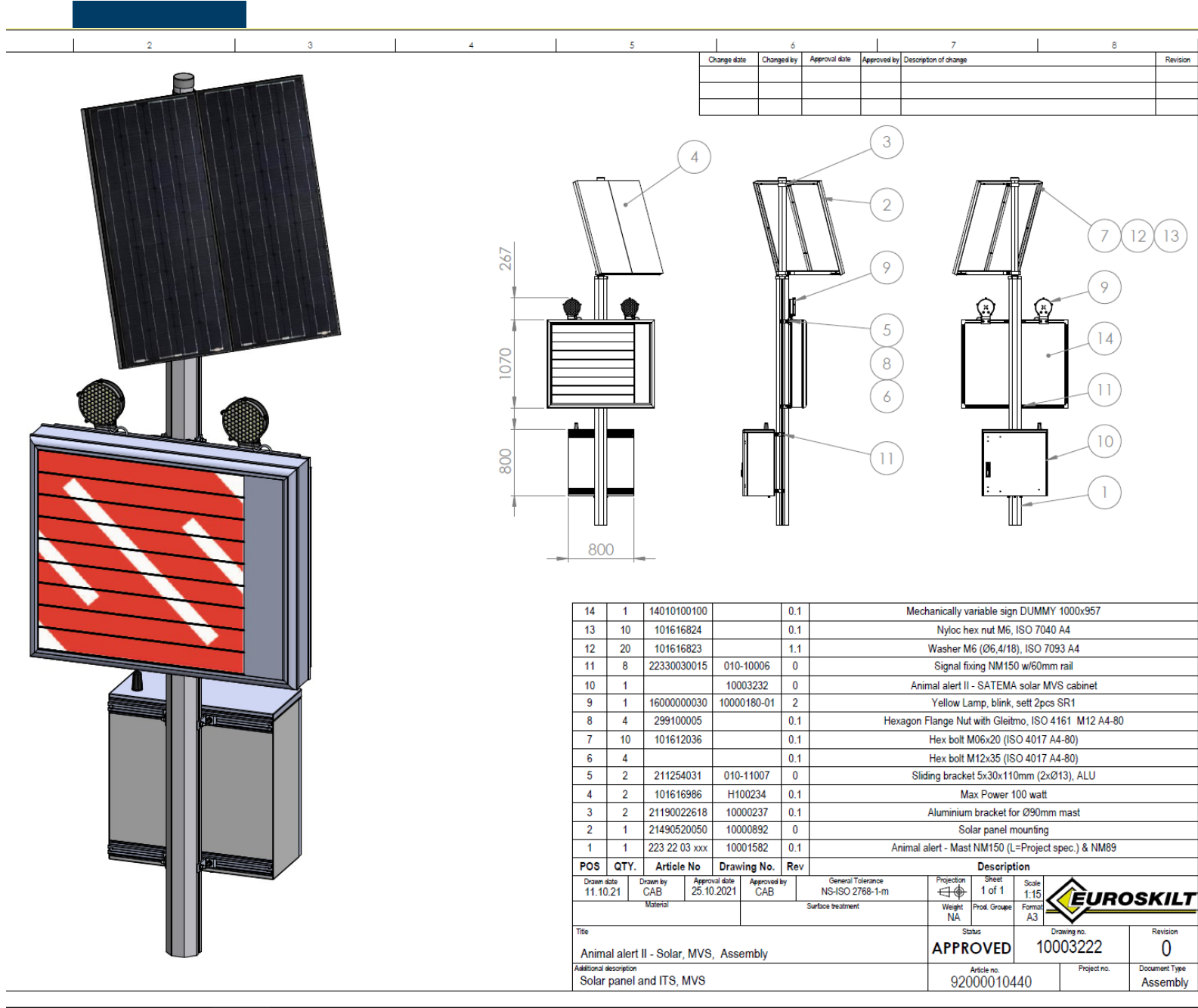
SINTEF

Skilting hver 500 meter



Variabel fartsgrense skilt





Halvor Hoel
leder, fallviltgruppa, Oppdal

Det er så enkelt som en app på telefonen.
Vi setter av og på når det er stor elgfare.

Status på teststrekningen

- Ble startet opp 23. oktober 2025
- Skiltene styres via app kontrollert av Fallviltnemda i Oppdal
- Data og skiltene posisjon logges kontinuerlig
- Data om fartsnivået på strekningen logges på tre punkter
- Analyse av data skal gjøres
- Skal stå i alle fall frem til 2027
- Dersom den blir en suksess, så vil Statens vegvesen vurdere denne løsningen ellers i Norge



SINTEF

Teknologi for et bedre samfunn

terje.moen@sintef.no