

Making public transportation safer for Vulnerable Road Users (VRUs)

using Thermal Imaging Technology

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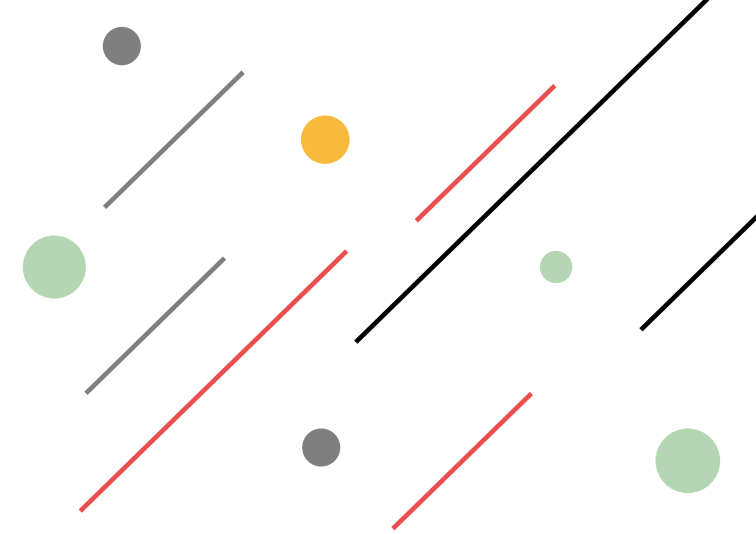
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VRU Fatalities

Night-time is a major problem

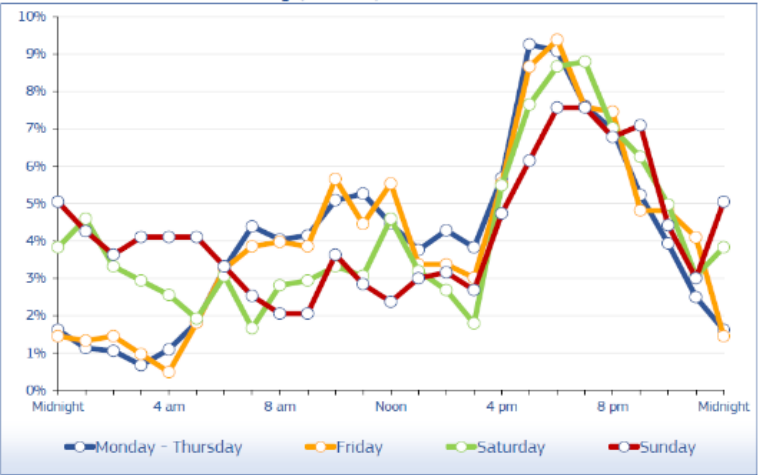
Pedestrians fatalities happens in low visibility conditions...

... when driver responsiveness may be compromised and current AEB systems are ineffective



Pedestrians fatalities on **Advanced light** &/or **Advanced weather** conditions:

80% in the US
70% in Europe



Source: CARE database, data available in May 2017



More than **50%** of all pedestrian fatalities occurred between **4pm and midnight** in the EU



US rulemaking proposition and EU objectives

NHTSA published
rulemaking proposal to
integrate Automatic
Emergency Braking
and Pedestrian AEB
working at night and
higher speed

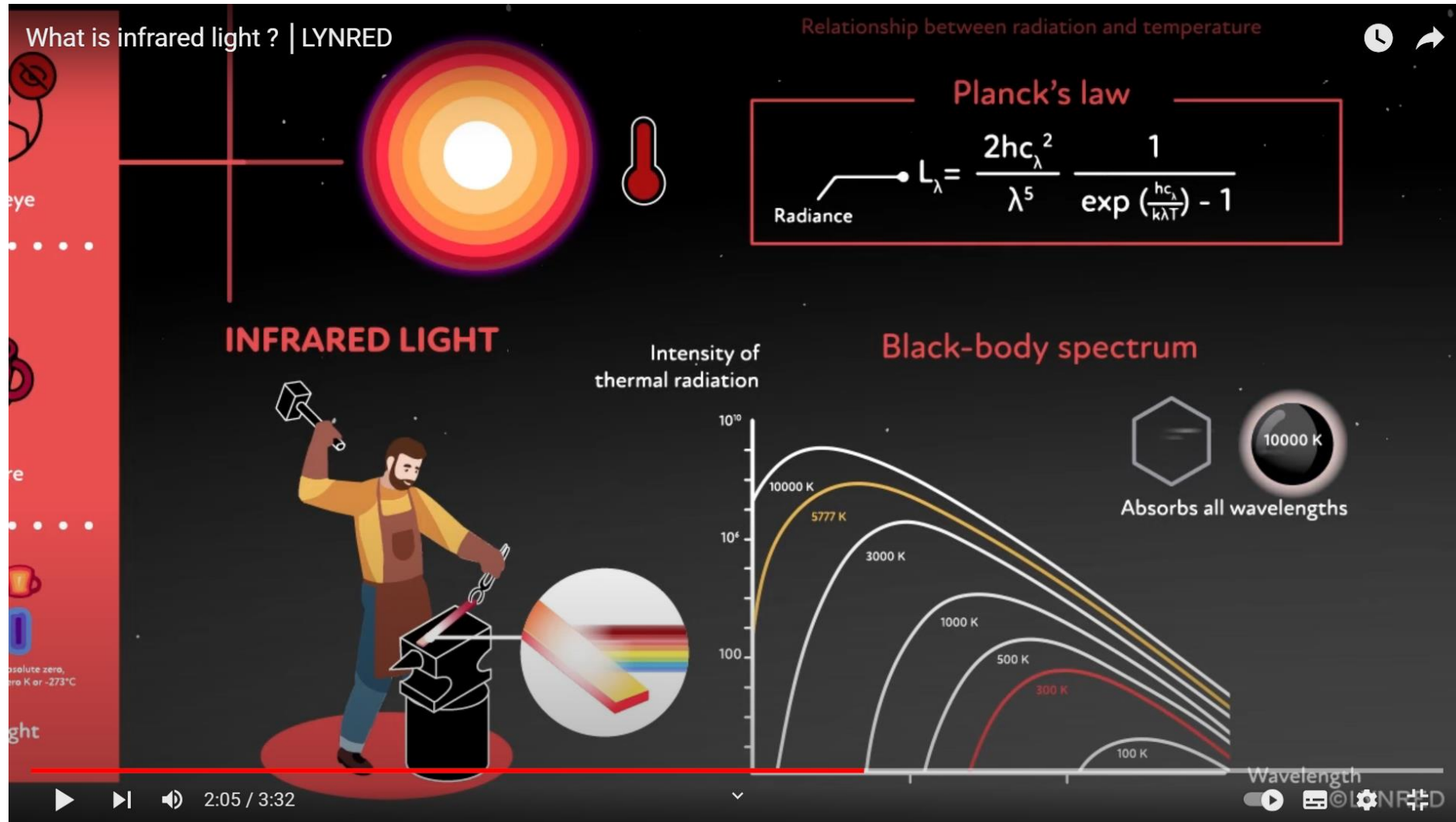


EU Vision Zero
ambitions to reduce by
half the number of
fatalities by 2030 and
approach Zero by
2050

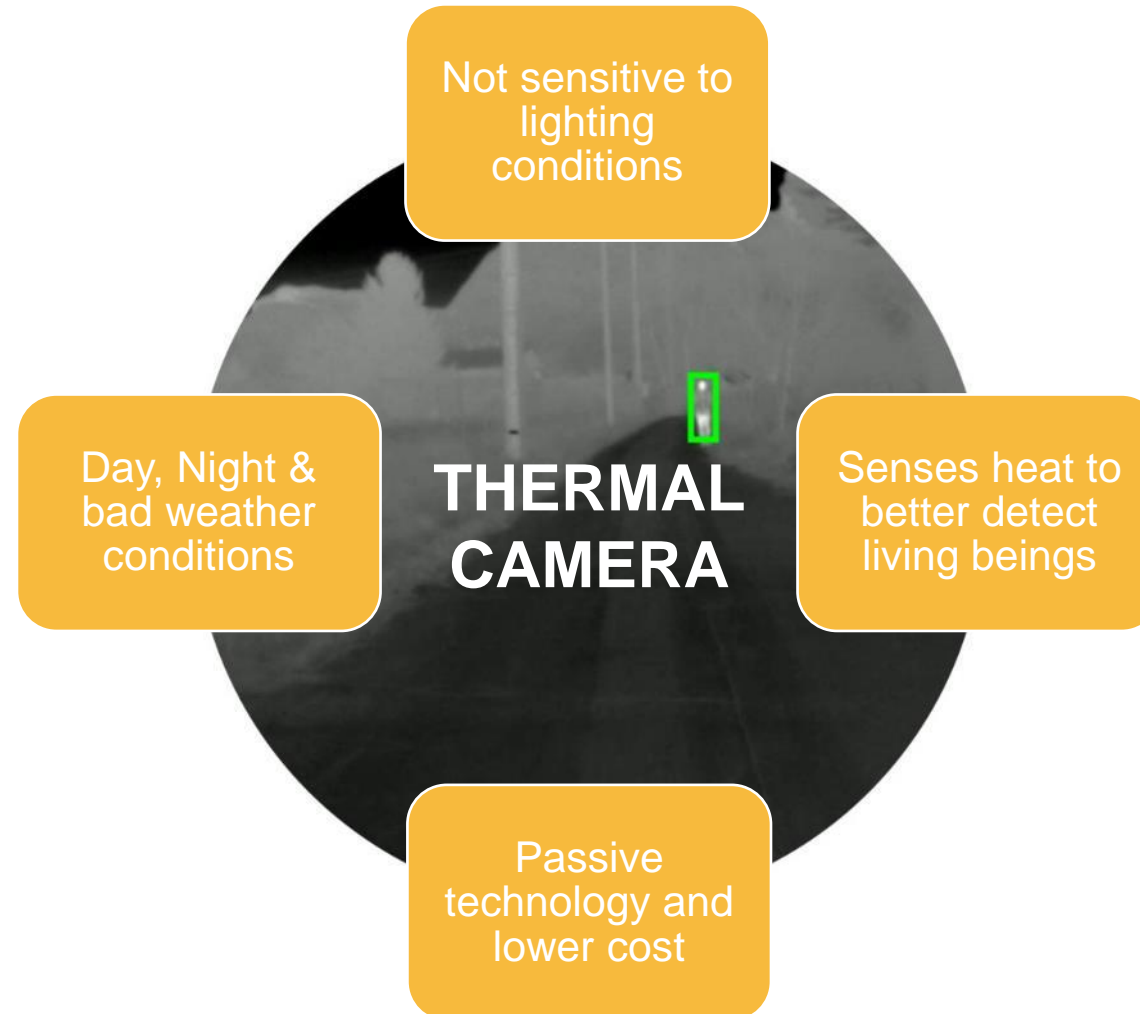


Thermal technology to detect Vulnerable Road Users in all visibility conditions

How does thermal imaging work?



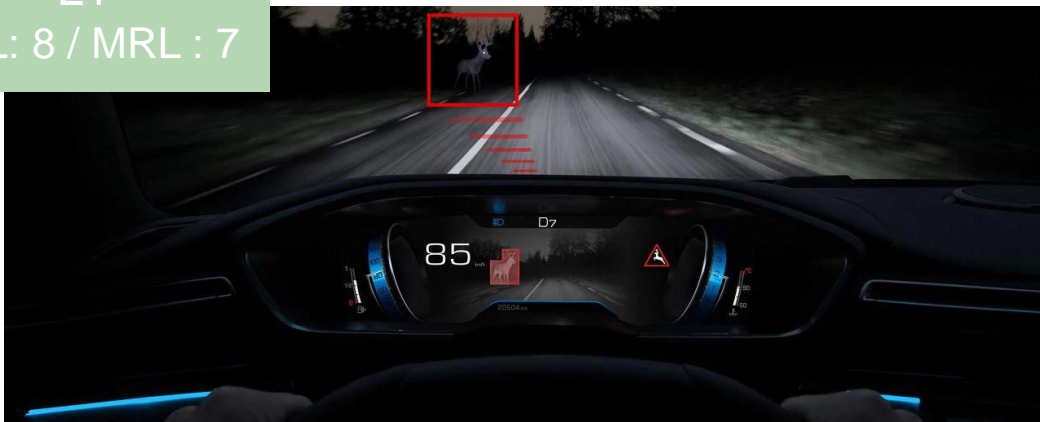
Benefits of thermal imaging compared to other technologies



Night Vision

L1

TRL: 8 / MRL : 7



Detect a danger at night and warn the driver

Active Emergency Braking

L2+

TRL: 5 / MRL : 3



Detect an obstacle at 50 to 100m and automatically brake and/or steer

Driver Monitoring System

L1+

TRL: 4 / MRL : 2



Evaluate psychophysiological state of the driver

Thermal Imaging applications

Bus, Trucks, Autonomous Vehicle

L2-L4+

TRL: 7 / MRL : 4



Detect an obstacle at up to 400m and automatically brake and/or steer

Comparison between visible and thermal cameras in urban road scenario #1

(Video removed due to file size)

(Video removed due to file size)

Thermal Camera

Passive imagery, not
sensitive to lighting conditions

Visible Camera

Active imagery with light from
sun and headlamps

Comparison between visible and thermal cameras in urban road scenario #2

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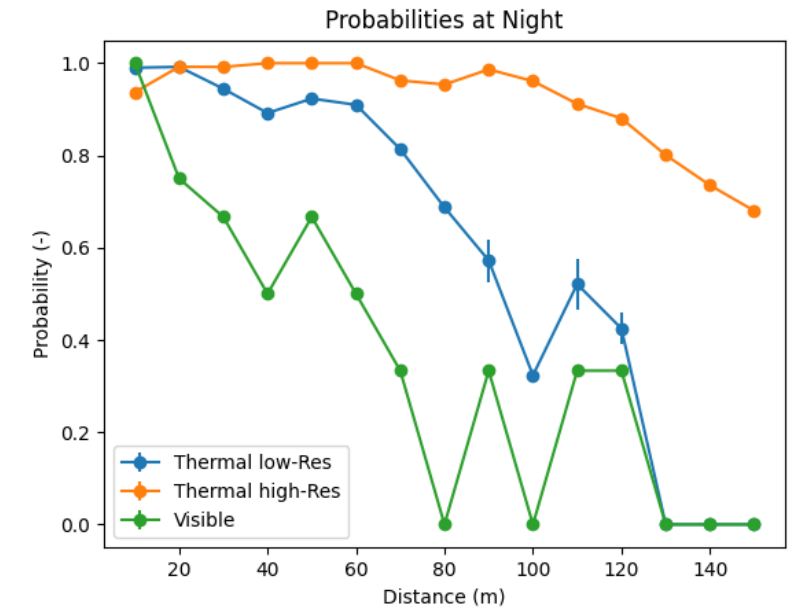
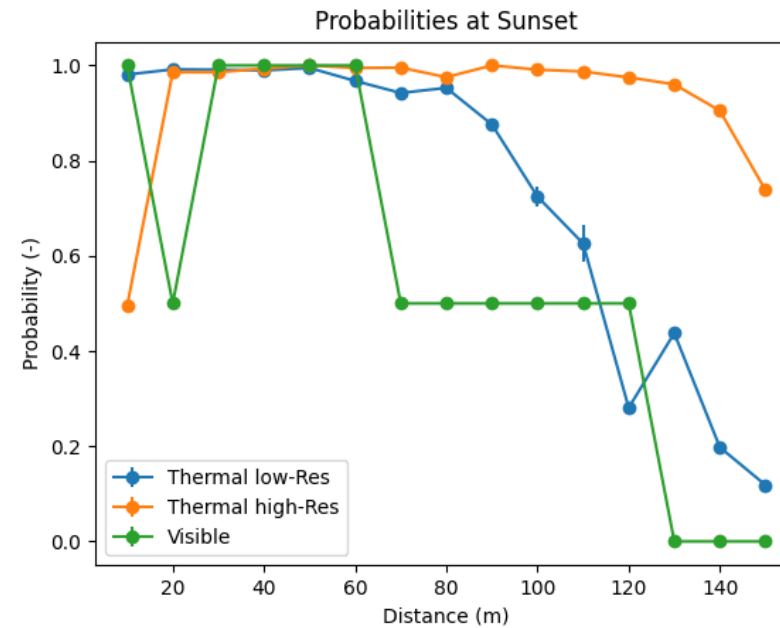
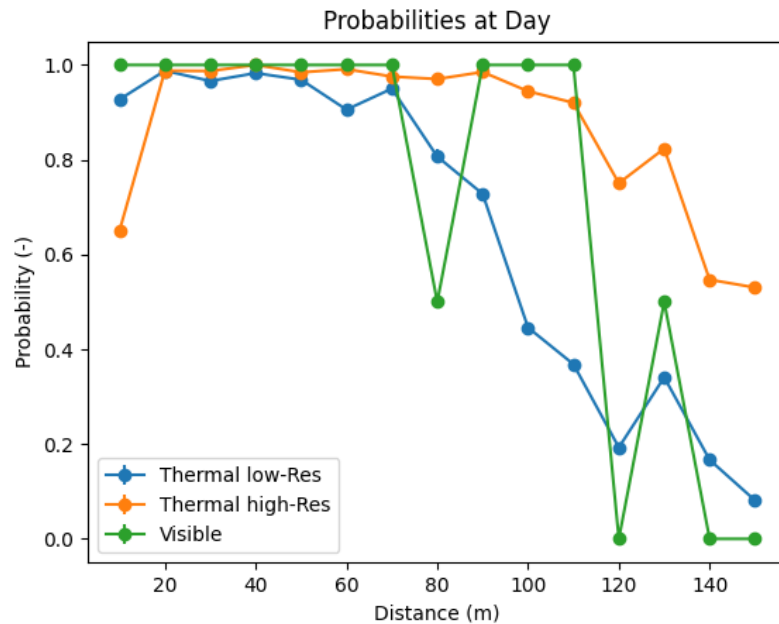
Thermal Camera

Passive imagery, not
sensitive to lighting conditions

Visible Camera

Active imagery with light from
sun and headlamps

Thermal imaging performance vs visible cameras



Detection confidence is identical whatever the lighting condition for thermal cameras
Detection confidence drops dramatically when lighting conditions are degraded for visible camera

- ✓ Test performed by JRC lab (European Commission Laboratory) presented at TRB conference in Washington in January 2024
- ✓ Comparison between a Tesla visible camera kit and Lynred thermal camera

Solution to detect Vulnerable Road Users And prevent fatalities

About LYNRED

KEY FIGURES AND SHAREHOLDERS

SAFRAN
50%



THALES
50%



RESEARCH PARTNER
CEA LETI- ONERA- III-V LAB



85%
EXPORT



> 133 PATENT FAMILIES
> 680 PATENTS FILED



15% REVENUE
INVESTED in R&D



> 2 MILLION DETECTORS
SHIPPED SINCE 1986



FULL INFRARED
SPECTRUM



> 1000
EMPLOYEES
2022 REVENUE:
€233 MILLION

**GLOBAL IR INDUSTRY
LEADER**
offering the largest
Infrared product portfolio



Lynred Tier 1 collaborators in automotive

❑ Veoneer/Magna (Goleta, CA / Detroit MI)

- World leader in automotive thermal cameras with over 1MU deployed on dozens of car models around the world
- PoC : Richard Saeone
- Evaluation kit available

❑ Adasky (Israël / Detroit, MI)

- Start-up support by Gentex, Zeeland, MI
- Local contact in Michigan : Bill Grabowsky
- Car equipped with thermal camera, available in the US for demo
- Evaluation kit available

❑ Hanwha (Korea)

Possible next steps

Possible next steps

- ☐ Schedule a live demo of thermal imaging on an MDOT vehicle to show how a driver could interact with it
- ☐ Collaborate with Lynred and one of our tier 1s to evaluate a thermal imaging kit on your vehicle
- ☐ MDOT consider including new technology like thermal imaging in the upcoming RFP
- ☐ RFP responders consider using thermal imaging solutions to differentiate your offering



Thanks
for your attention

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