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Making public transportation safer for Vulnerable Road Users (VRUs)

using Thermal Imaging Technology

Contents

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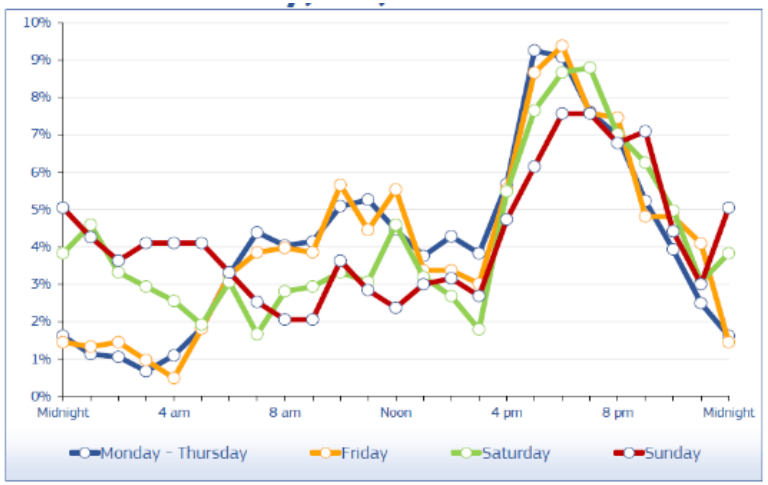
VRU Fatalities
Night-time is a major problem

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 occured between **4pm and midnight** in the EU*

THE WALL STREET JOURNAL.

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New Cars' Pedestrian-Safety Features Fail in Deadliest Situations, Study Finds

AAA finds pedestrian detection ineffective at night, when most deaths occur

Source: NHTSA 2015-2019, ERSO 2017

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

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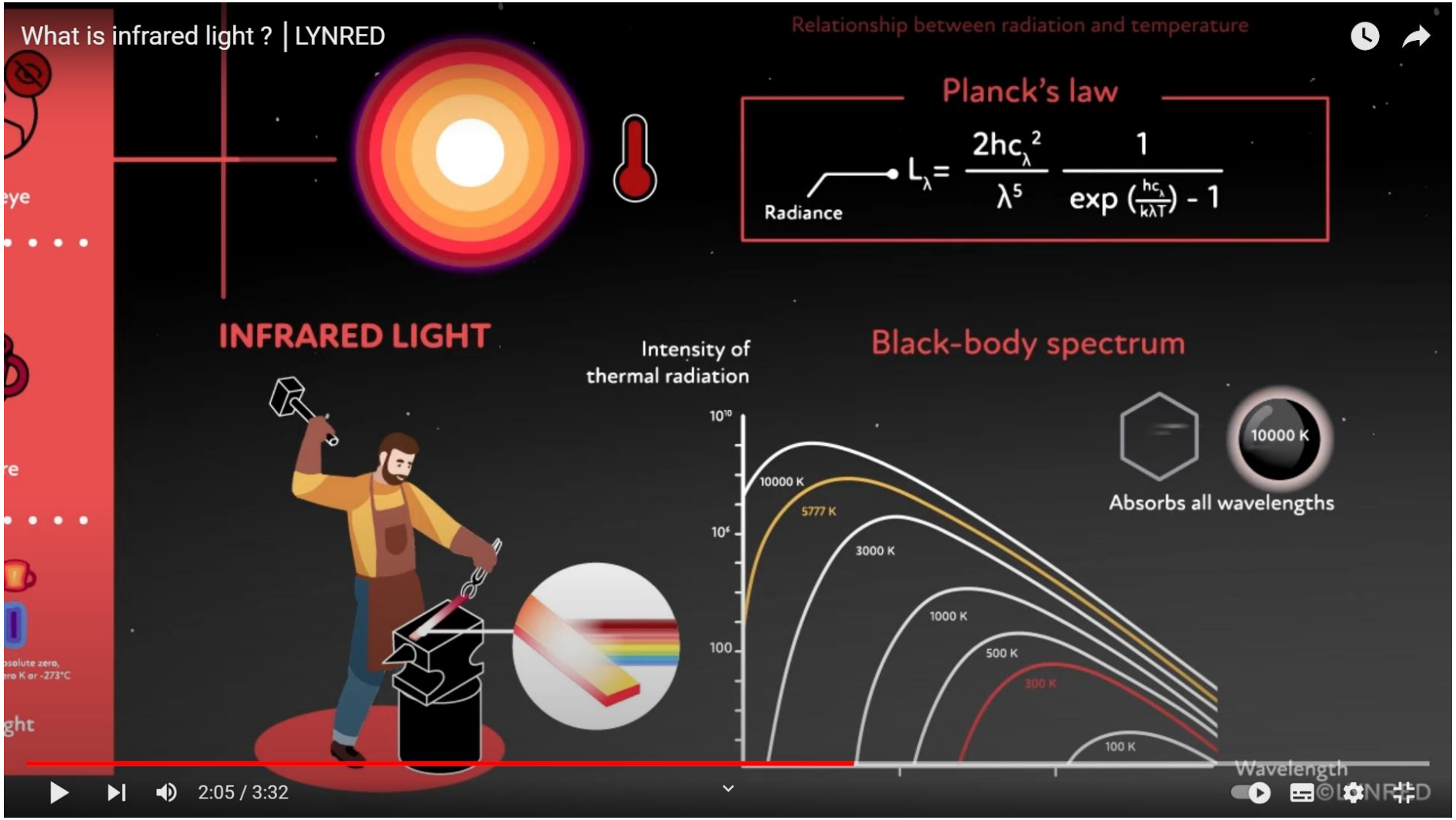
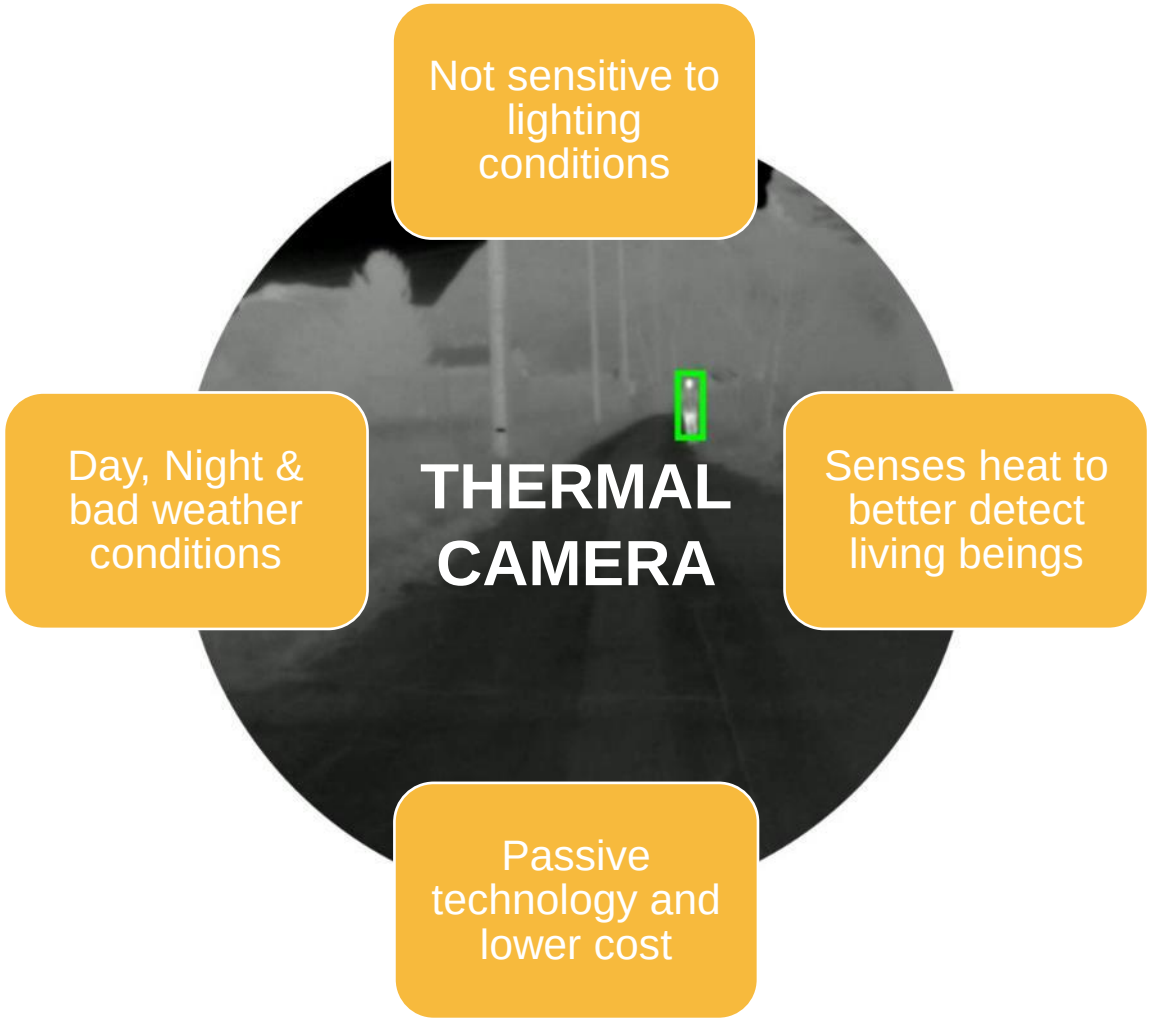
Thermal technology to detect Vulnerable Road Users in all visibility conditions

How does thermal imaging work?



Benefits of thermal imaging compared to other technologies



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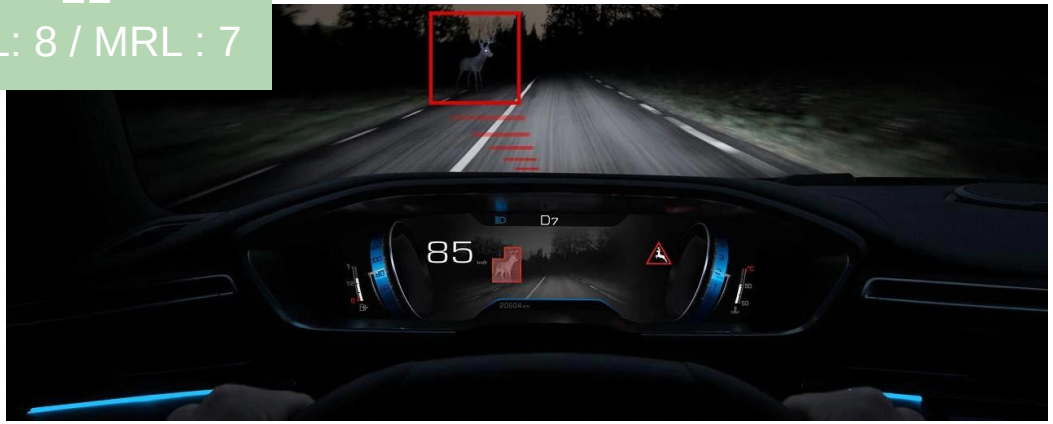
Use cases

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

Thermal Imaging applications

Driver Monitoring System
L1+
TRL: 4 / MRL : 2

Evaluate psychophysiological state of the driver

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

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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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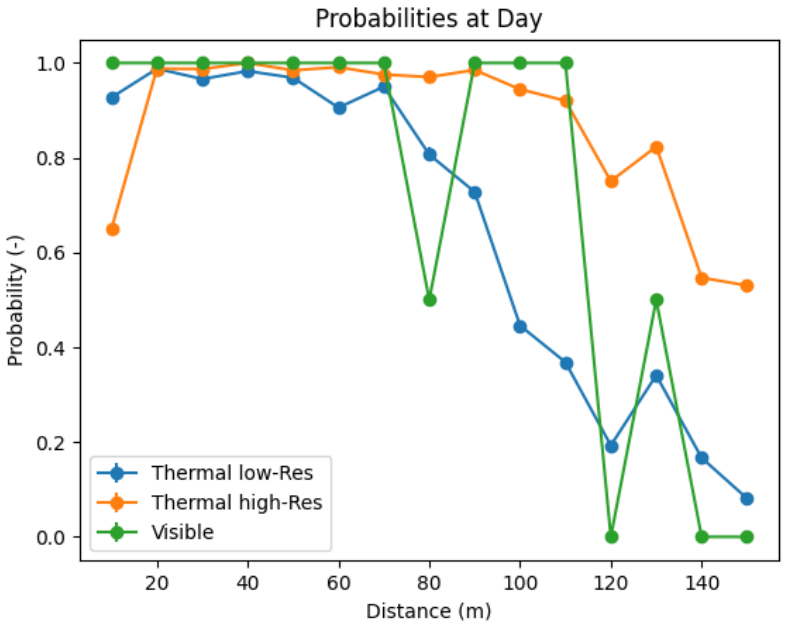
Thermal Camera

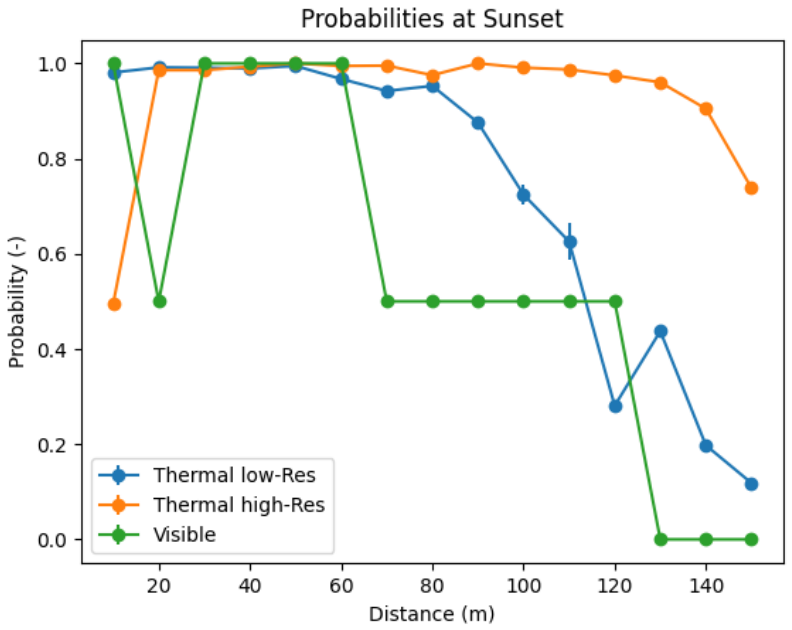
Passive imagery, not sensitive to lighting conditions

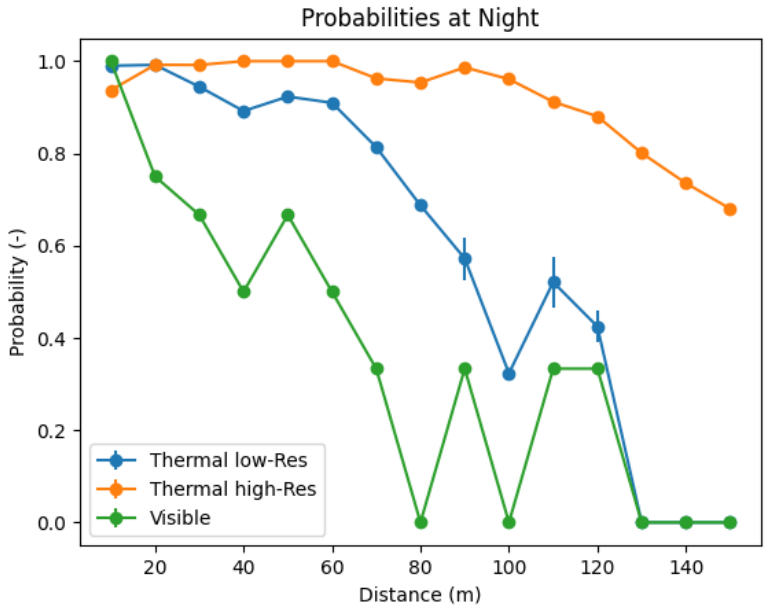
Visible Camera

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 Comission Laboratory) presented at TRB conference in Washington in January 2024
- ✓ Comparison between a Tesla visible camera kit and Lynred thermal camera

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Solution to detect Vulnerable Road Users And prevent fatalities

About LYNRED

KEY FIGURES AND SHAREHOLDERS

SAFRAN
50%

THALES
50%

LYNRED

LYNRED USA

LYNRED
Asia Pacific

RESEARCH PARTNER
CEA LETI- ONERA- III-V LAB

> 133 PATENT **FAMILIES**
> 680 PATENTS **FILED**

> 2 MILLION DETECTORS
SHIPPED SINCE 1986

85%
EXPORT

15% REVENUE
INVESTED in R&D

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)

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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

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Thanks
for your attention

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