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DATA FOR OPTIMIZING HEAT SUPPLY SYSTEMS IN EXISTING DISTRICTS

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Outline

- **Motivation: Data demand for indentifying modernization options and efficiency potentials**
- **State of the art: Typology-based demand estimation supported by machine learning**
- **New data from local surveys: Drive-through thermography**
- **Summary**

Heat demand data is crucial for energy planning – but hard to get

High heat demand density
→ heat network!?

Low heat demand density
→ heat pumps!?

- < 18.1 MWh/a
- 18.1 – 28.6 MWh/a
- 28.6 – 38.2 MWh/a
- 38.2 – 52.2 MWh/a
- > 52.2 MWh/a



Heat demand data is crucial for energy planning – but hard to get

High heat demand density
→ heat network!?

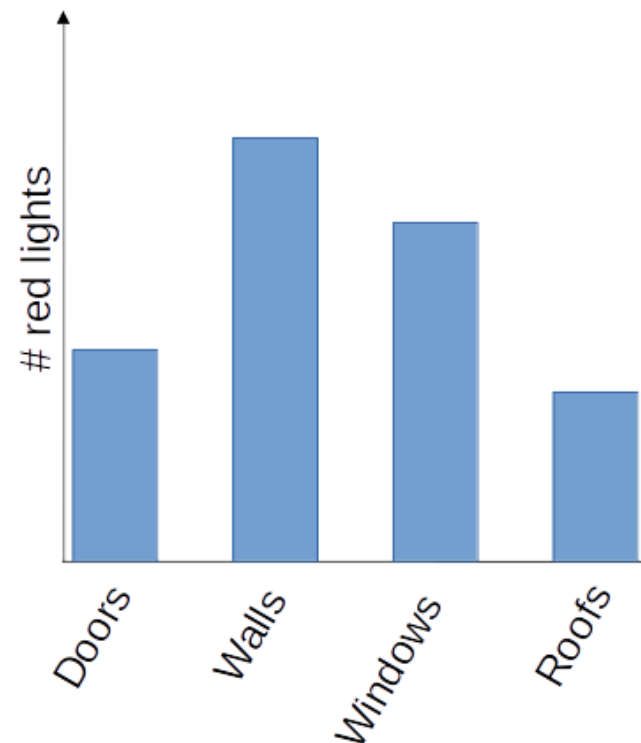
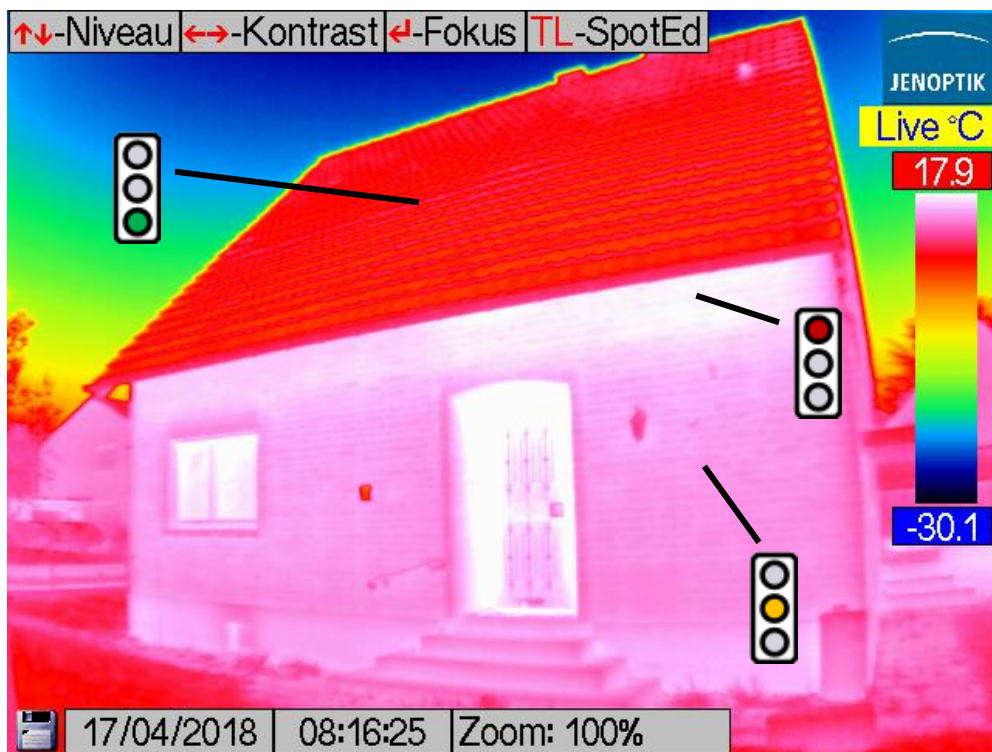
Low heat demand density
→ heat pumps!?

- Energy performance certificates vary in quality, are not collected centrally (in Germany)
- Energy consumption is protected by privacy rules

○ < 18.1 MWh/a
● 18.1 – 28.6 MWh/a
● 28.6 – 38.2 MWh/a
● 38.2 – 52.2 MWh/a
● > 52.2 MWh/a



Knowing weaknesses in building envelopes may further increase efficiency efforts

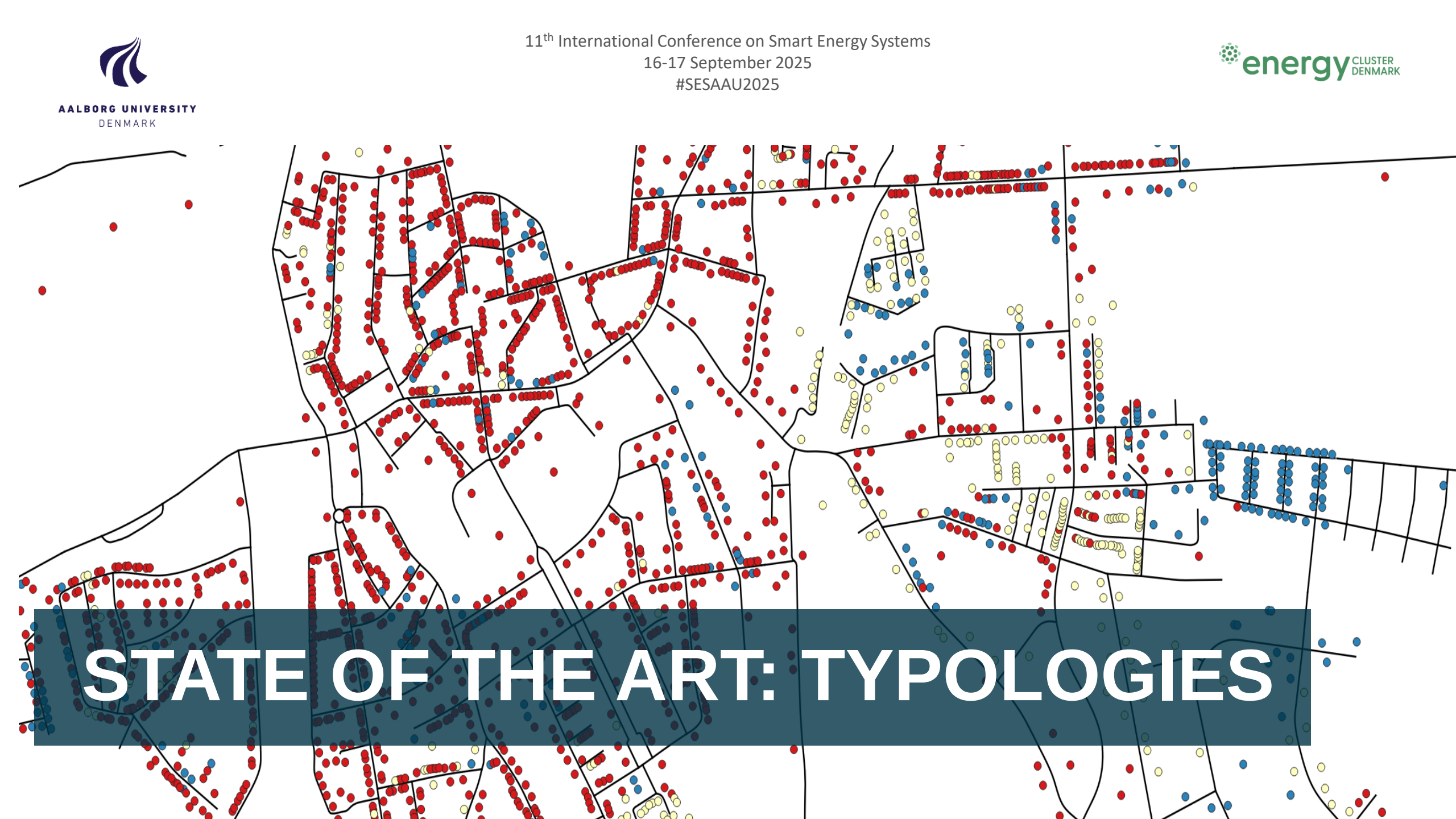


→ e.g. targeted funding programs



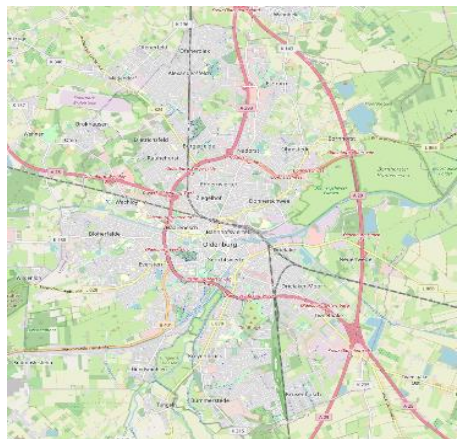
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The background of the slide is an abstract map with black lines representing roads or boundaries. Scattered across this map are numerous small dots in red, blue, and yellow. A dark blue horizontal bar is positioned across the lower third of the slide, containing the title text in white.

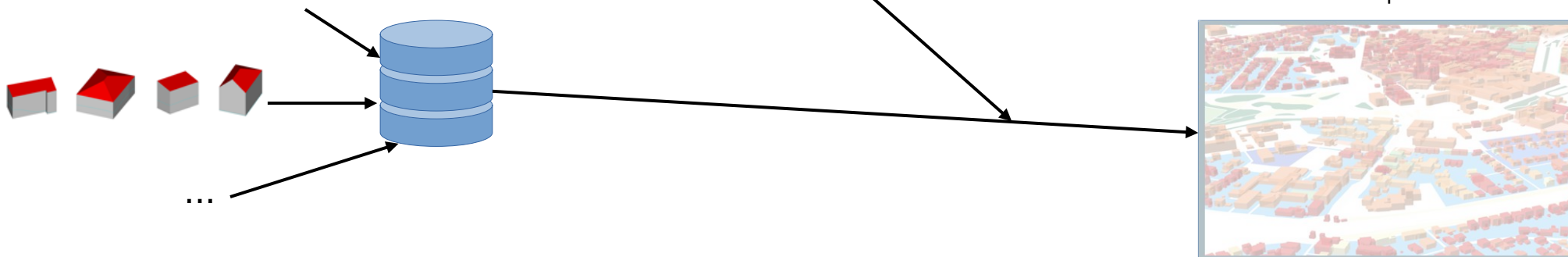
STATE OF THE ART: TYPOLOGIES

Typology based workflows become challenging on the district and city scale

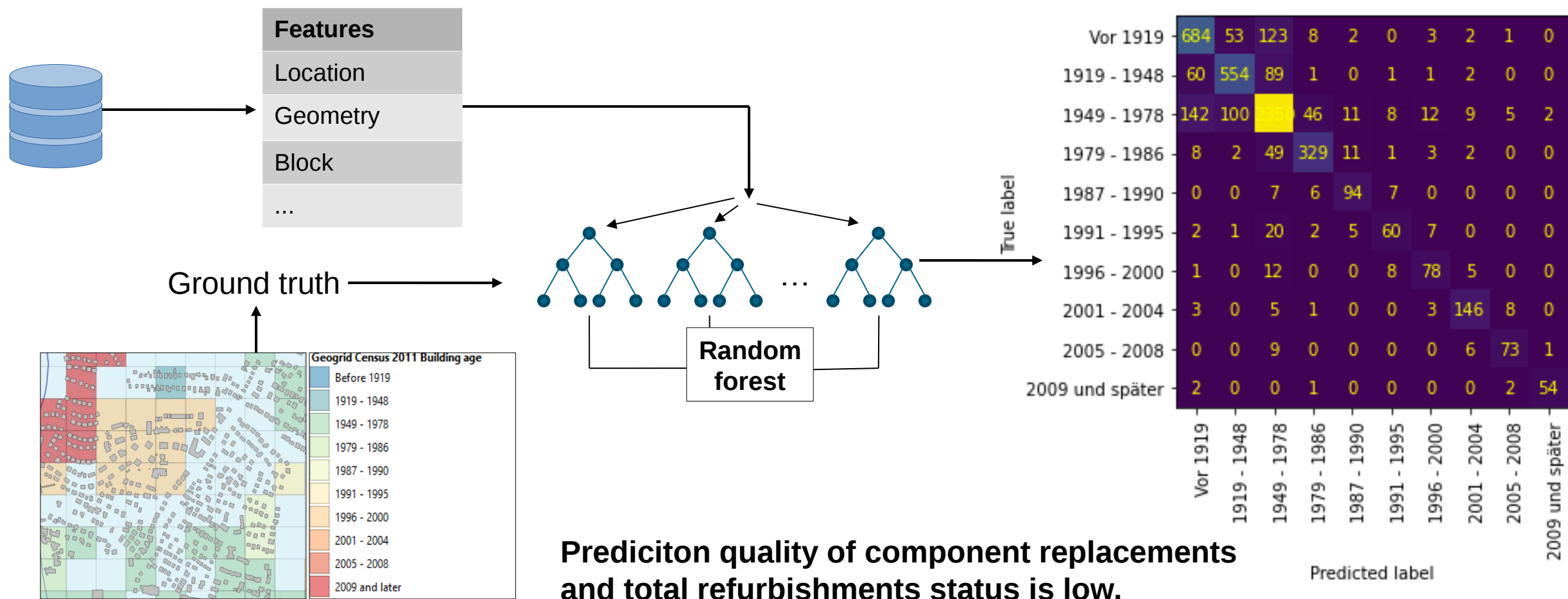


	SFH			MFH			...
	Existing	Usual refurb.	Adv. refurb.	Existing	Usual refurb.	Adv. refurb.	...
1958-1968	163 kWh/m ²	117 kWh/m ²	75 kWh/m ²	117 kWh/m ²	67 kWh/m ²	40 kWh/m ²	...
1969-1978	139 kWh/m ²	90 kWh/m ²	60 kWh/m ²	119 kWh/m ²	74 kWh/m ²	50 kWh/m ²	...
1979-1983	109 kWh/m ²	75 kWh/m ²	51 kWh/m ²	104 kWh/m ²	69 kWh/m ²	46 kWh/m ²	...
...	...	...	...	...	...	...	...

Source: TABULA WebTool <https://webtool.building-typology.eu/#bm>



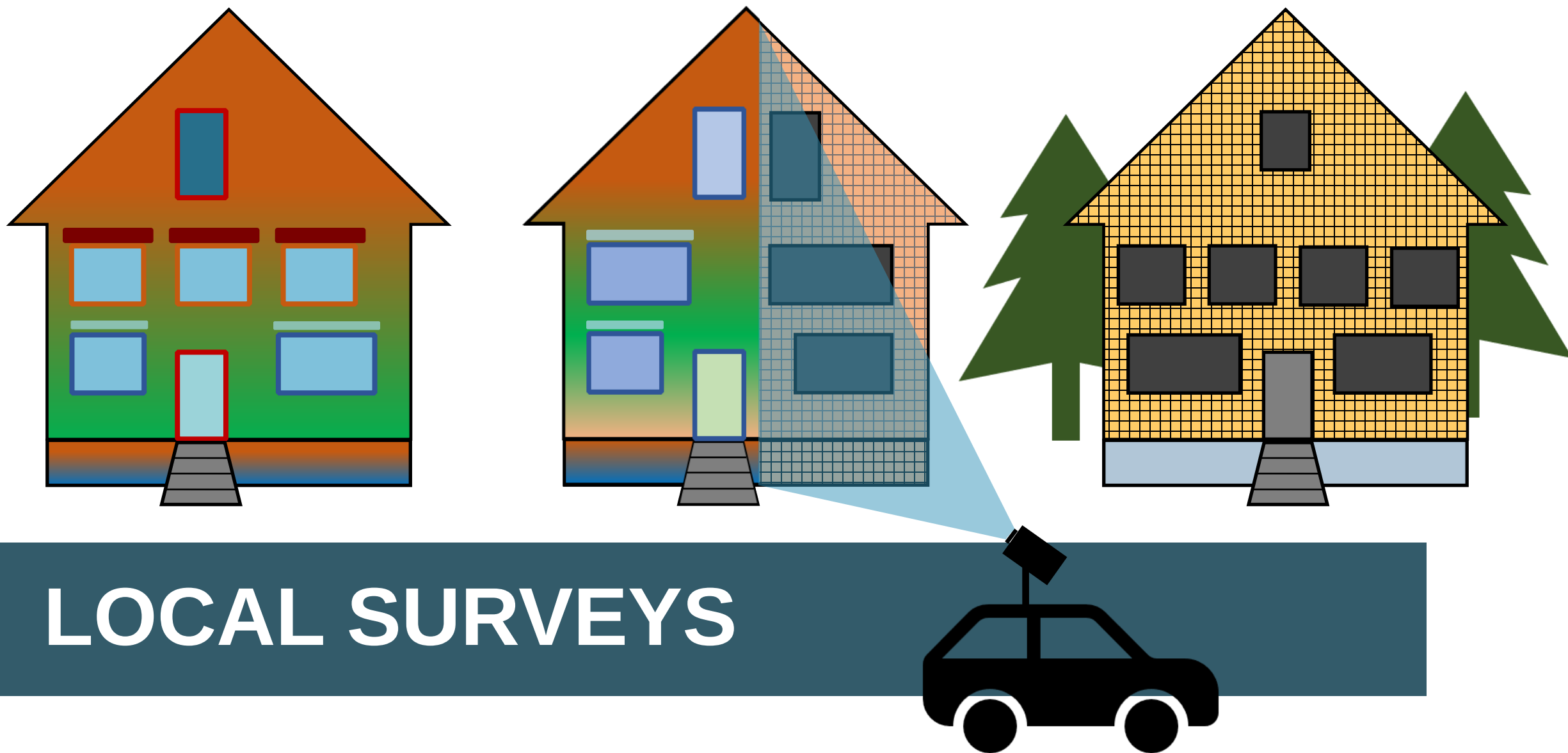
Machine learning can fill some information gaps but the refurbishment level and weaknesses remain unknown



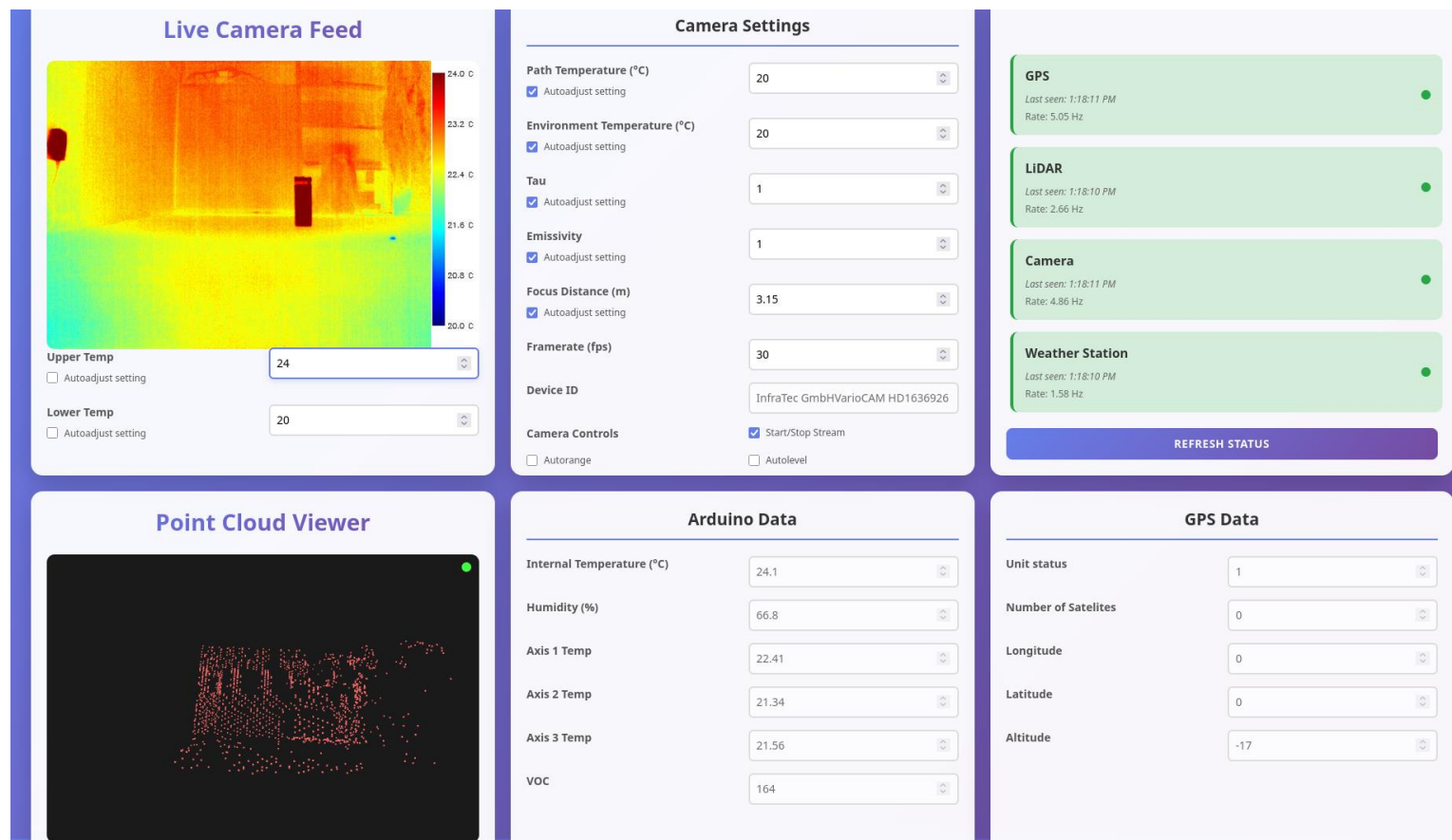


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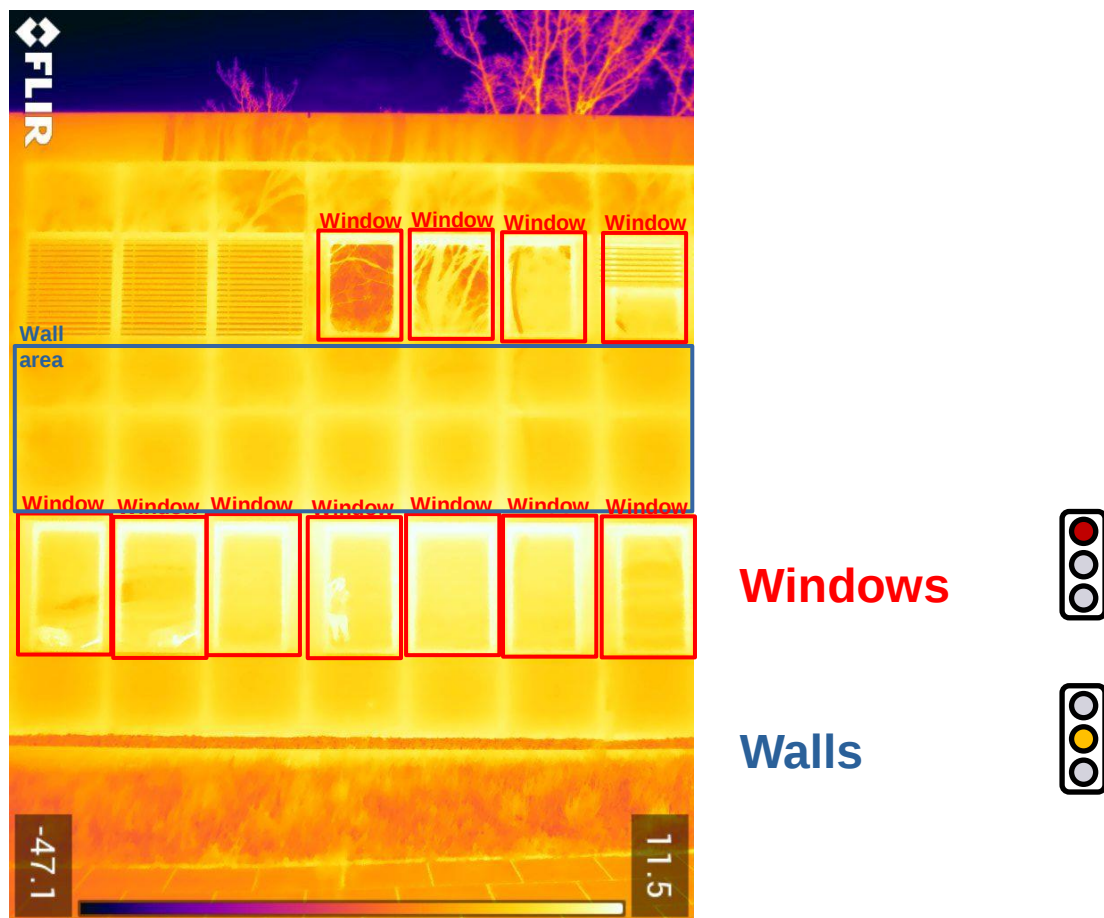
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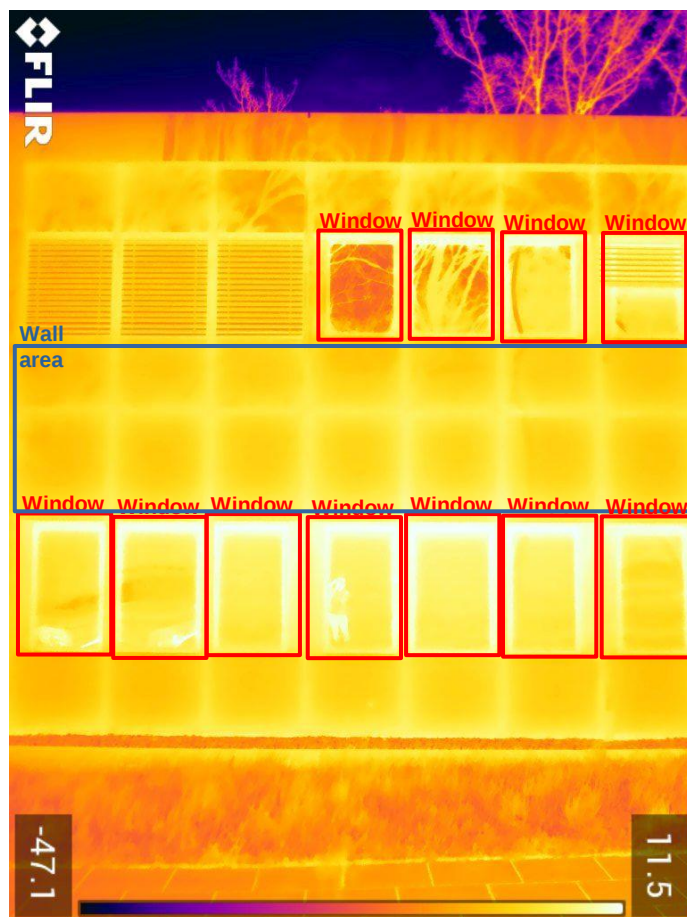
Car-mounted multi sensor system can quickly capture large areas



Full facade characterization requires intra- and inter-building analyses



Full facade characterization requires intra- and inter-building analyses



Automated performance classification

Intra image
Inter building

Windows



Walls



- Repeating reference measurements
- Ray tracing
- Material estimation

Summary

- **Heat demand, refurbishment status and energetic weaknesses are essential to accelerate the transformation to a climate neutral building stock.**
- **Typology-based estimations can get us a long way – but open questions remain.**
- **Local surveys with a car-mounted multi sensor systems can fill important gaps**
 - **Individual weaknesses of building envelopes**
 - **Insulation level of the walls**
- **Careful analysis and correction of measurements is required to avoid misinterpretation**