

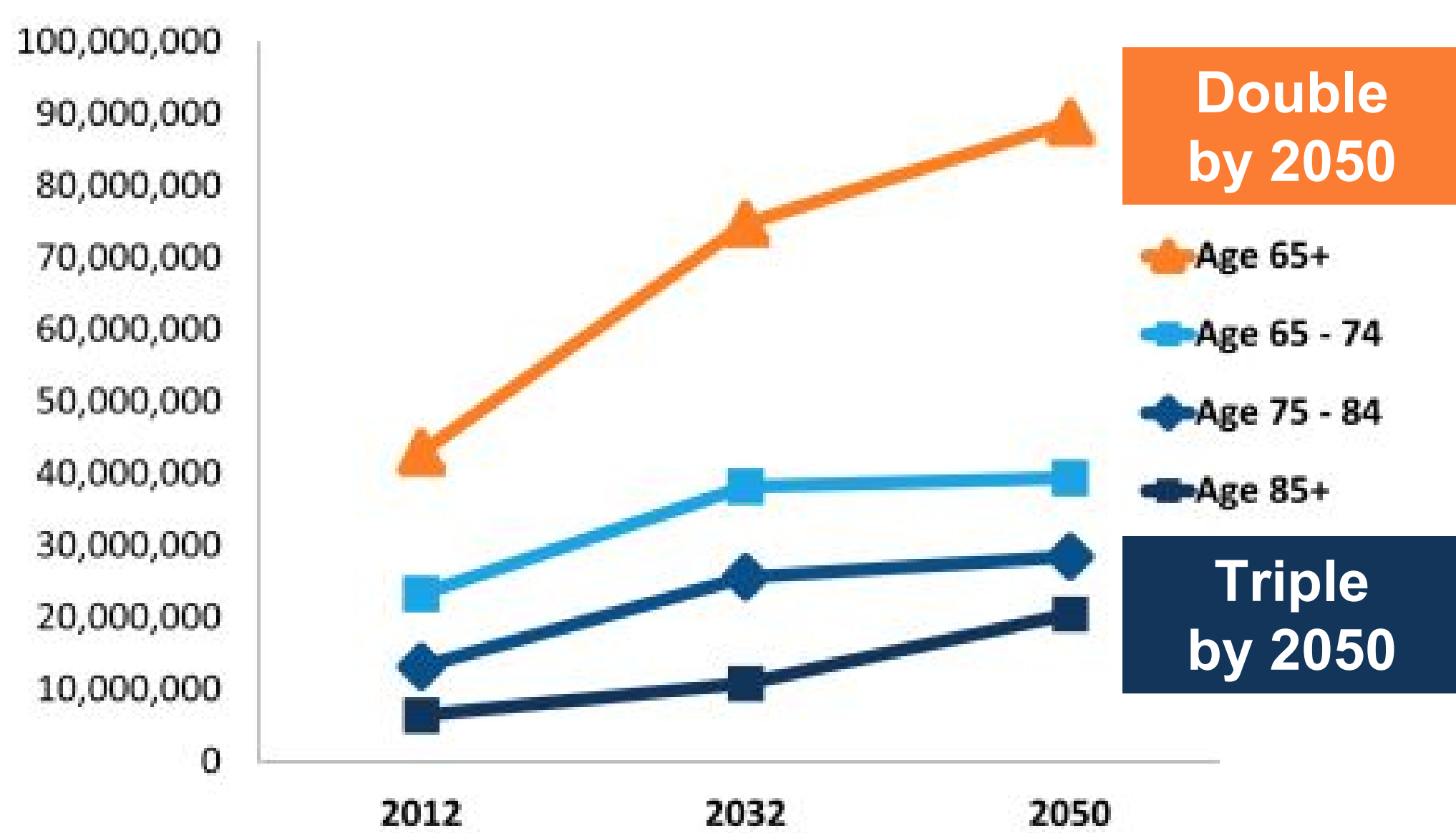
Computer Vision-based Approach to Maintain Independent Living for Seniors

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Background

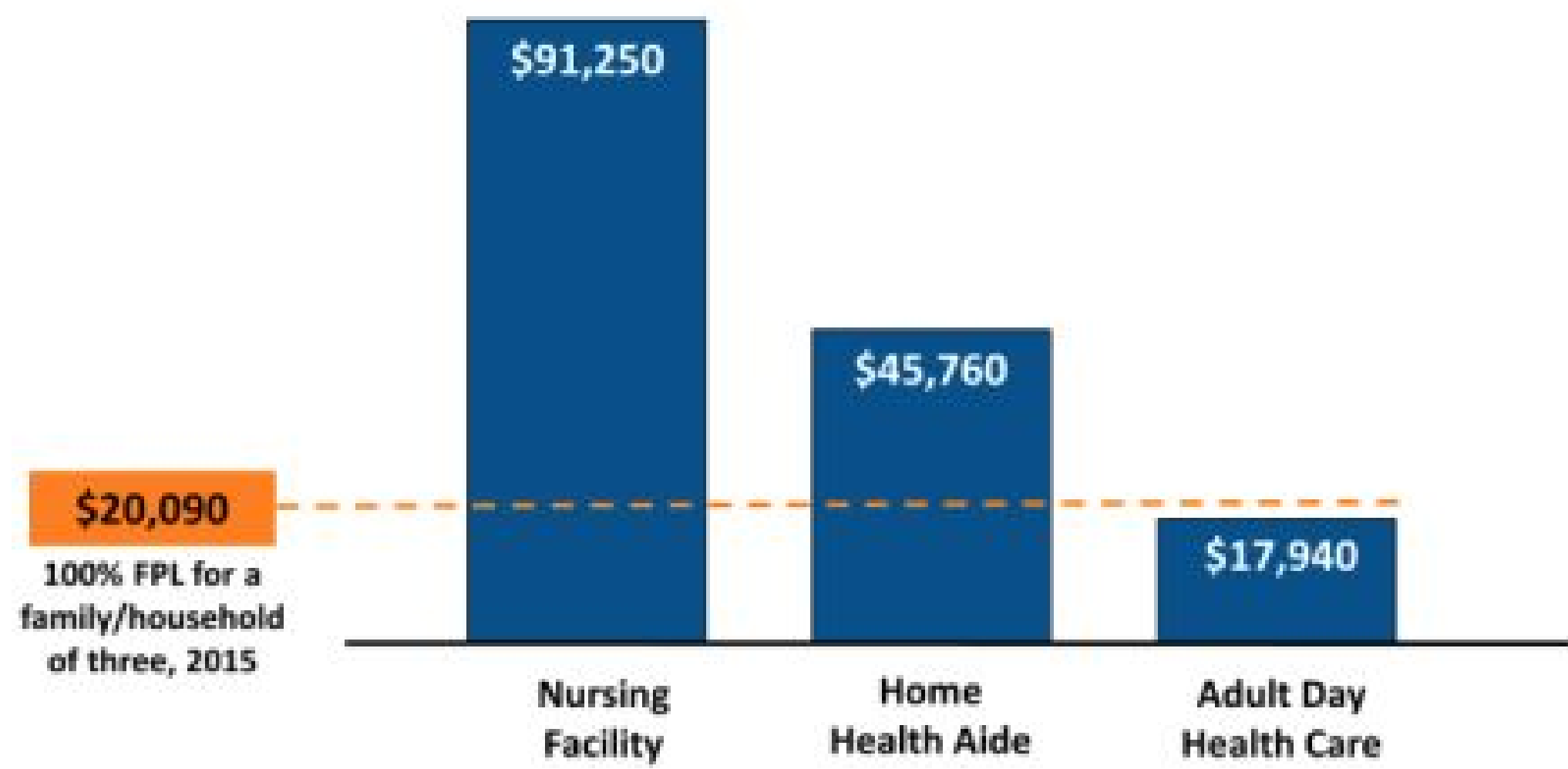
Senior Population



1.3 million
people live in seniors homes in the US

83 million
will be age 65+ in US by 2050

Median Annual Care Costs by Type of Service, 2015



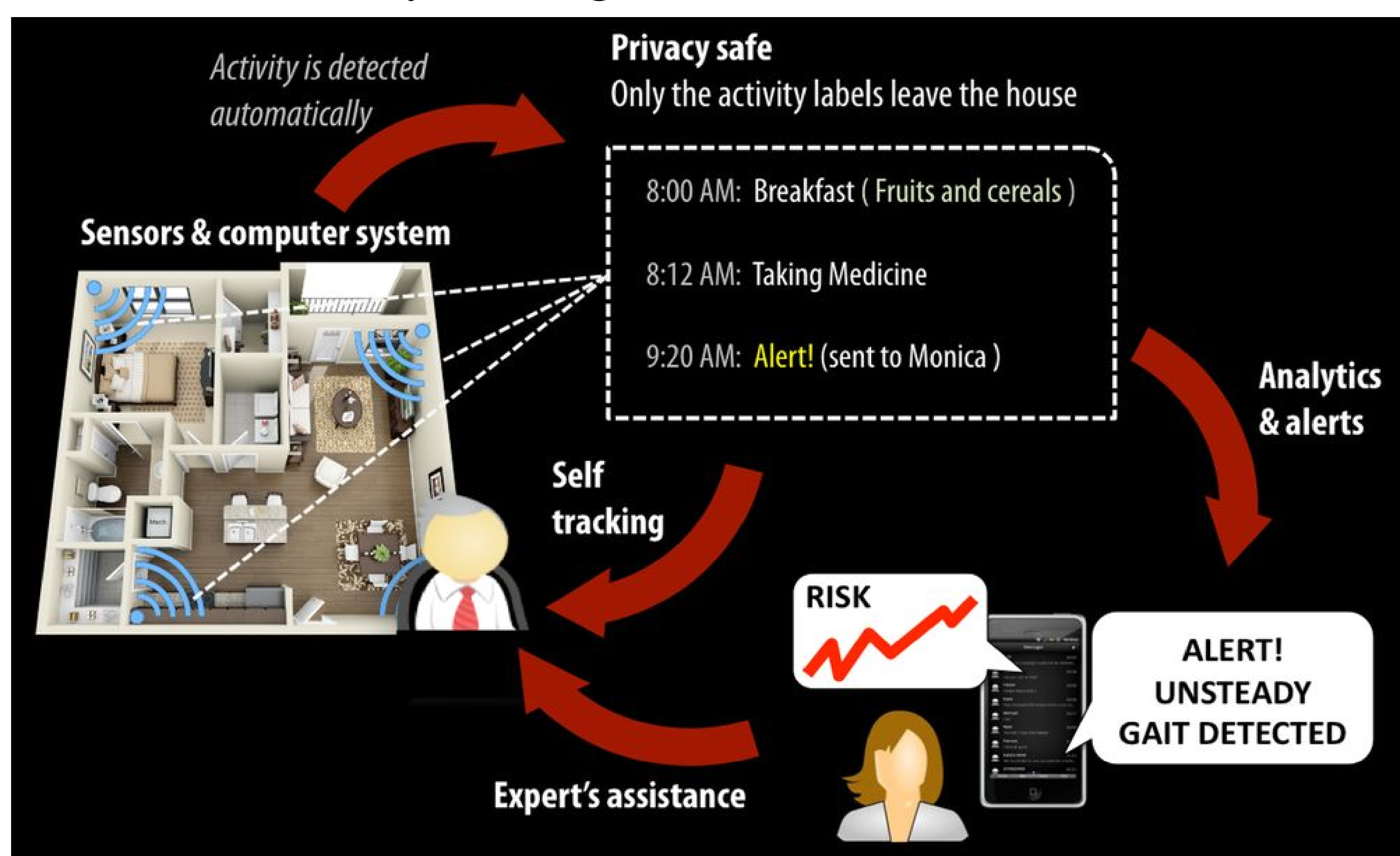
34%
of US health spending is on seniors

3%
of US GDP is spent on Medicare costs




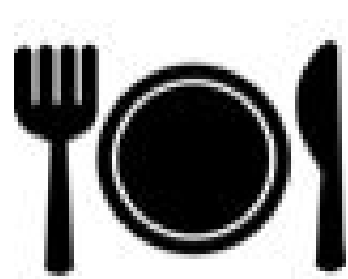
Objective

A cost-effective solution for monitoring, assessment, and support of

- Seniors at risk for losing independence
- Those already in long-term care



Expert Geriatrician-selected Activities

Mobility	Infection	Sleep	Diet
			
Falls Slowed movements Unstable transfers Front door loitering Immobility	Fever Urinary frequency Respiratory rate	Sleeping Day/night reversal	Eating Fluid intake Alcohol consumption High salt intake Pill consumption

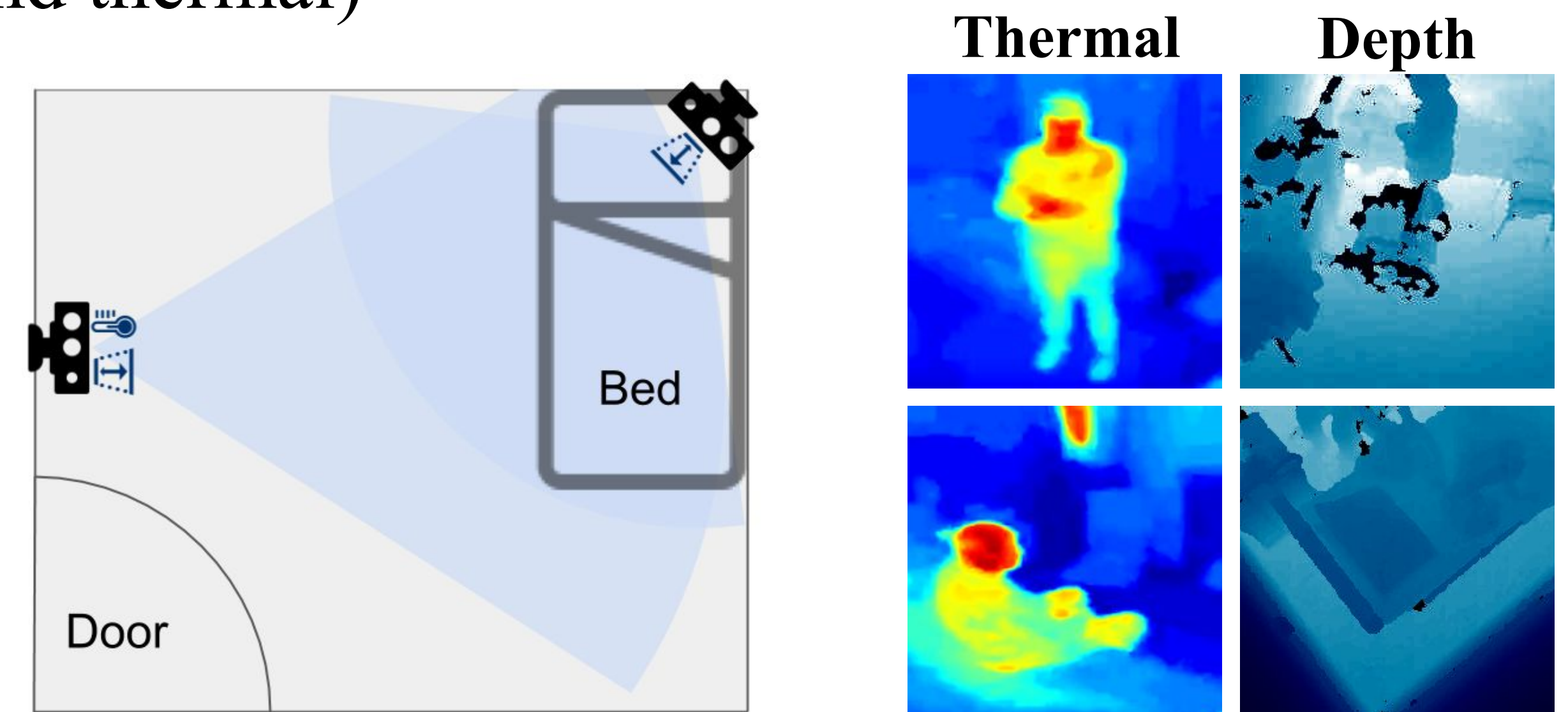
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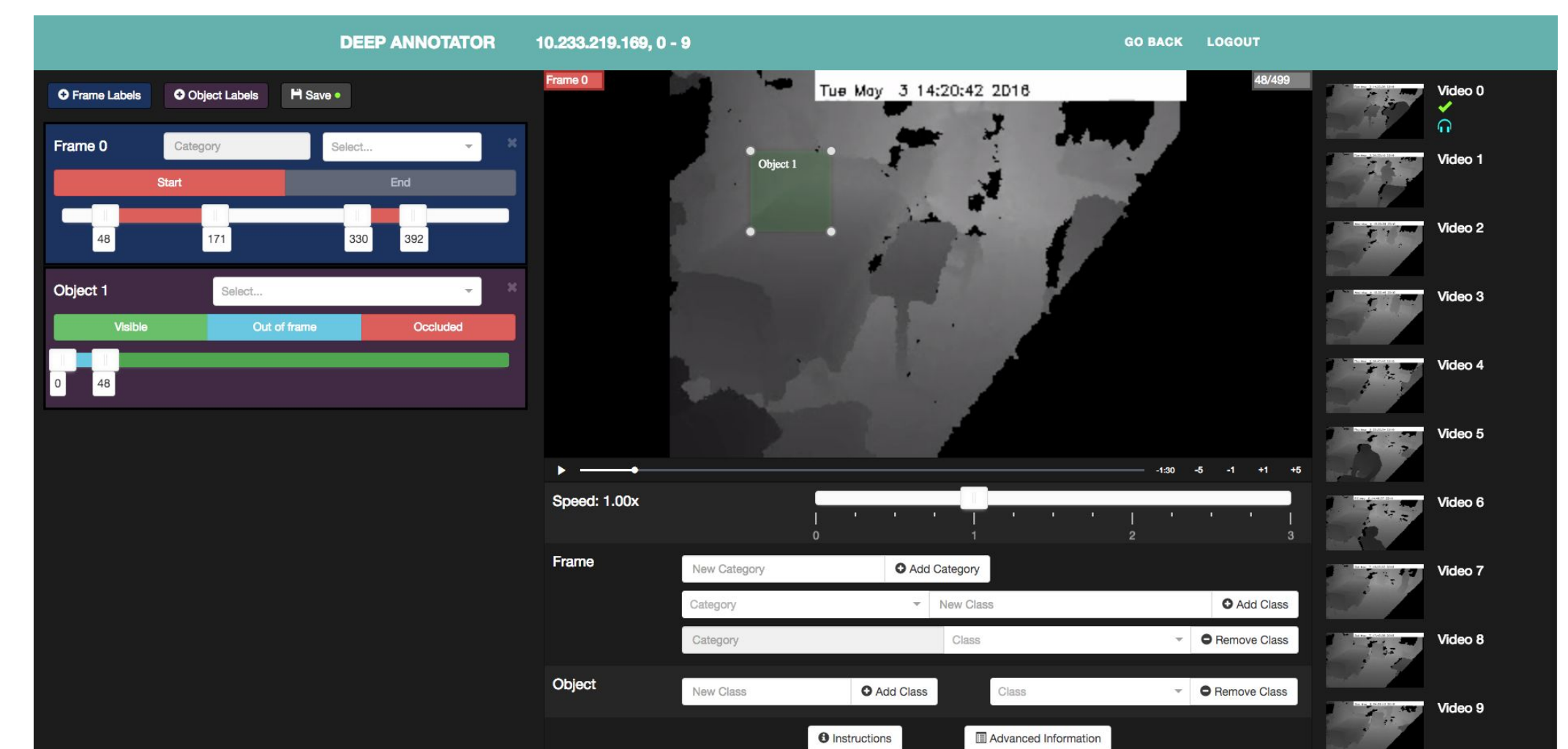
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Research Design

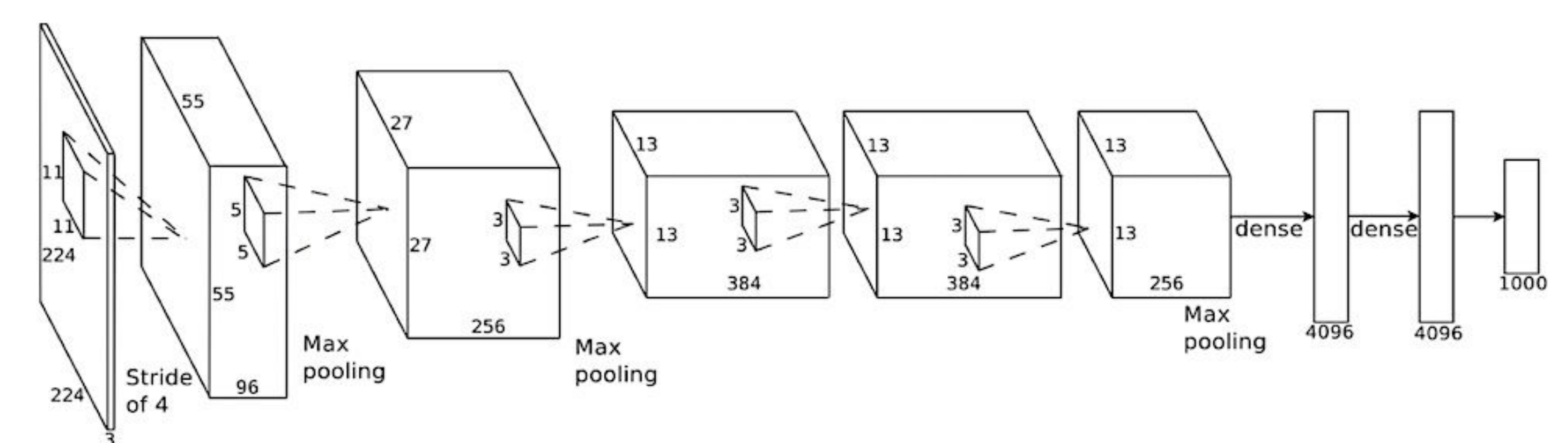
- Video data collected via **privacy-safe** sensors (depth and thermal)



- Combination of automated and manual data annotation



- Train **Convolutional Neural Networks (CNNs)** on the annotated data to classify these activities



Preliminary Results

71-86% accuracy on detecting fundamental activities on **Thermset** (214 hours of thermal video).

	sleeping	sitting	standing	people	background
background	0.10	0.01	0.09	0.00	0.81
people	0.01	0.13	0.29	0.57	0.00
standing	0.02	0.09	0.85	0.04	0.00
sitting	0.09	0.86	0.05	0.00	0.00
sleeping	0.71	0.03	0.20	0.03	0.02
	sleeping	sitting	standing	people	background

Conclusion

- It is viable to use privacy-safe sensors for monitoring elderly citizen, and can potentially allow for them to receive the care that they require from the comfort of home.
- We aim to identify elder patients who are at risk for requiring long-term care, and to provide feedback to caregivers that would support their safe and independent living.

Reference

- [1] A. Houser, W. Fox-Grage, and K. Ujvari. Across the States 2013: Profiles of Long-Term Services and Supports
- [2] Genworth, Genworth 2015 Cost of Care Survey; U.S. Department of Health and Human Services, 2015 Poverty Guidelines
- [3] A. Krizhevsky, I. Sutskever, and G. Hinton. ImageNet classification with deep convolutional neural networks. In NIPS, 2012.
- [4] G. Pusiol, F. Polacov, and P. Pusiol. 2017. Thermset: A thermal database of seniors living independently and in nursing homes. <https://github.com/activityrecognition/ARTraining>