Computer Vision-based Approach to Maintain Independent Living for Seniors

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### Background

**Senior Population**

![Graph showing population increase over time](image)

- **Double by 2050**
- **1.3 million** people live in seniors homes in the US
- **Triple by 2050**
- **83 million** will be age 65+ in US by 2050

**Median Annual Care Costs by Type of Service, 2015**

- **Nursing Facility**: $11,250
- **Home Health Aide**: $45,760
- **Adult Day Health Care**: $17,540

- **$25,000**: Cost of a facility/annum of care, 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

### Research Design

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

2. Combination of automated and manual data annotation

3. 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).

### Expert Geriatrician-selected Activities

<table>
<thead>
<tr>
<th>Mobility</th>
<th>Infection</th>
<th>Sleep</th>
<th>Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls</td>
<td>Fever</td>
<td>Sleeping</td>
<td>Eating</td>
</tr>
<tr>
<td>Slowed movements</td>
<td>Urinary frequency</td>
<td>Day/night reversal</td>
<td>Fluid intake</td>
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<tr>
<td>Unstable transfers</td>
<td>Respiratory rate</td>
<td></td>
<td>Alcohol consumption</td>
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<tr>
<td>Front door loitering</td>
<td>Immobility</td>
<td></td>
<td>High salt intake</td>
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<tr>
<td>Immobility</td>
<td></td>
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<td>Pill consumption</td>
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</tbody>
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### 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


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