

USING SMART TECHNOLOGY TO AGE IN PLACE

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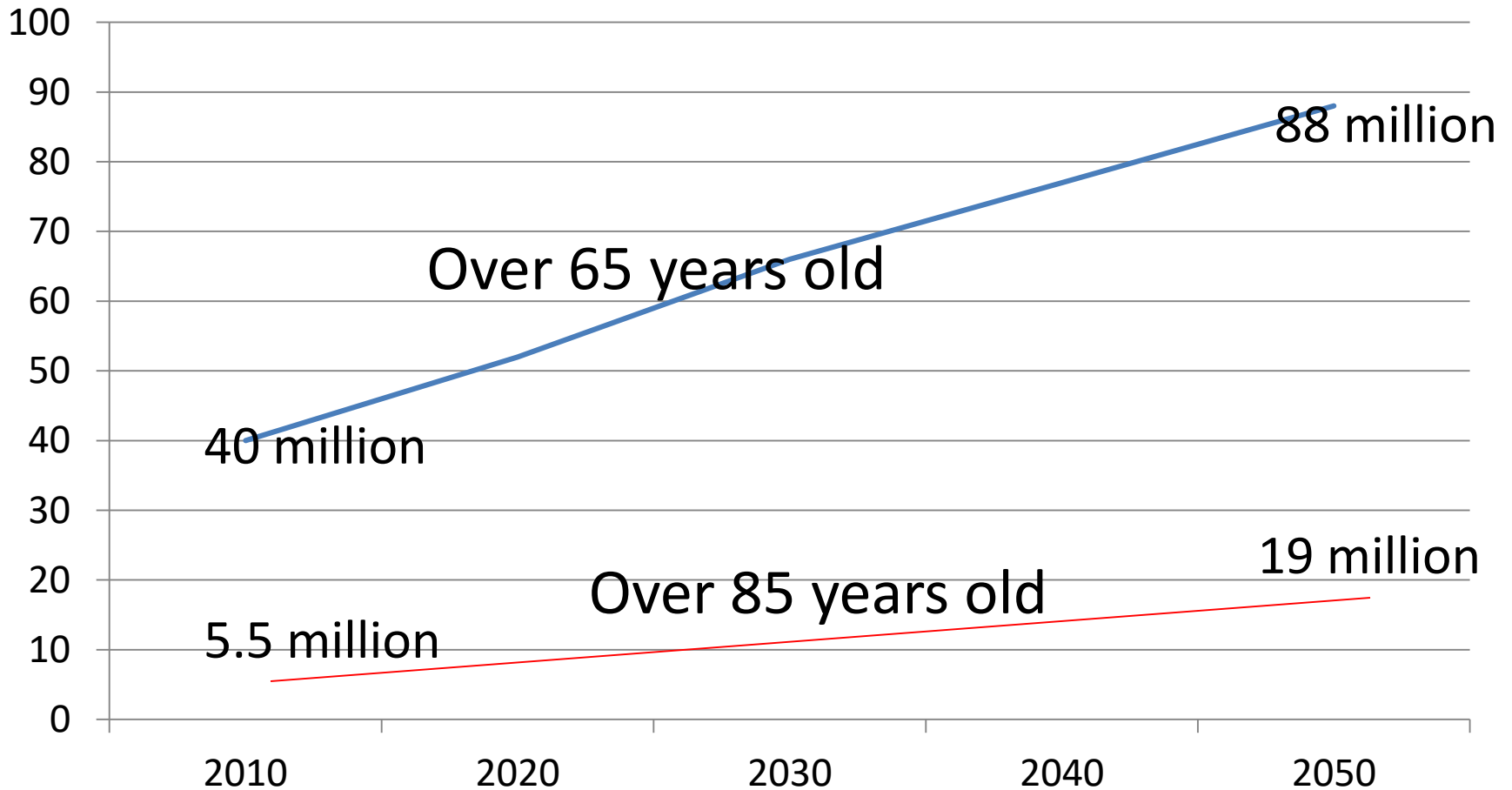
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Demographics

- Currently 46 million $65 \geq$ yrs old in US
 - Fastest growing demographic is $85 \geq$ followed by the $100 \geq$ group
- People are living longer
- Other demographic changes of note
 - Shift from rural to urban living of older adults
 - Change in family structure
 - Family scattered across the country (not available)
 - Typical family structure that took care of the elders and supported elders not in existence

Aging of American Population



Cost of Care for Older Adults

- Cost of nursing home care exceeds \$100,000/year (Genworth, 2018)
- Increase for assisted living is 67%
- Home care is \$1,500 less cost
- States seek to keep seniors out of nursing homes and seek alternative ways of providing cost effective care
- What is most cost effective solution?
 - One solution is sensors and smart machines which could potentially keep individuals in their homes for longer periods of time

Shortages

- By 2022, 1,000,000 nursing jobs unfilled
 - Although numbers increasing, not able to keep up with demand
- Not enough nursing homes to care for older adults
- Need to find new models of cost effective care for people
- In addition, older people do not want to be in nursing homes; want to stay in their own residence and communities

Aging in Place

- Ability of older people to live in their own home and community safely, independently, and comfortably, regardless of age, income, level of intrinsic capacity (CDC, 2015)
- May be better use of healthcare expenditures (Marek, 2012)
- Aging is multidirectional and personal
- No one size fits all

The Meaning of “Aging in Place” to Older People

Janine L. Wiles, PhD,^{*,1} Annette Leibing, PhD,² Nancy Guberman, MSW,³
Jeanne Reeve, PhD,⁴ and Ruth E. S. Allen, PhD¹

- Environmental gerontology important
- Sense of attachment and social connection
- Sense of familiarity
- Sense of identity, independence and autonomy
- Sense of safety

Creating Safe Places for Elderly with Information and Communication Tech

- Need information and communication technologies distributed throughout the home that relays information to care providers and provides knowledgeable feedback to the users.
- Goals is to improve quality of life and to prevent and detect health incidents.
- Challenges is making the technology transparent and fully understanding the users and their needs.

What Happens as We Age (1/3)

- Motor functions
 - Decline in muscle mass and strength
 - Decrease in gait speed
 - Bone mass and density decline
 - Osteoporosis/Hip Fractures
 - Significant predictor of outcomes in older age
- Sensory changes
 - Hearing loss (presbycusis)
 - Results from cochlear aging, environmental, genetics
 - Higher frequencies impacted
 - Impacts communication resulting in social isolation, anxiety, depression, labelled as slow
 - Blurring of near vision (presbyopia), cataracts, macular degeneration
 - Impacts mobility and falls, triggers depression, barrier to access information

Cognitive Function Changes (2/3)

- Findings
 - Deterioration in memory and capacity to solve complex tasks – dividing or switching attention
 - Reductions in ability to learn/master reorganization tasks
 - No issues with comprehension, reading, vocabulary
 - Influenced by SES, lifestyle, use of meds
- Helpful activities
 - Keep the mind active (learn new tasks, read, play games)
 - Physical activity
 - Staying connected with others

Falls (3/3)

- Incidences of Falls
 - Avg. 1/yr. - 30% at 65; 50% at 85
 - Major risk factor for fractures (40% of injury-related deaths)
- Contributing Health Factors
 - Low levels of physical activity
 - Insufficient sleep
 - Increased BMI
- Contributing Environmental Factors
 - Slippery floors Dim lighting
 - Obstacles/tripping hazards Poor stairways
 - Improper assistance devices Footwear
- Wearable Tech Monitors – Apple watches; others

Internet of Things (IoT)

- Disruptive innovation
- IoT collects and transmits data over the internet
- School of Nursing plan
 - Current flow of data and information
 - Plan for future flow of data to the researcher
- Cloud storage and security

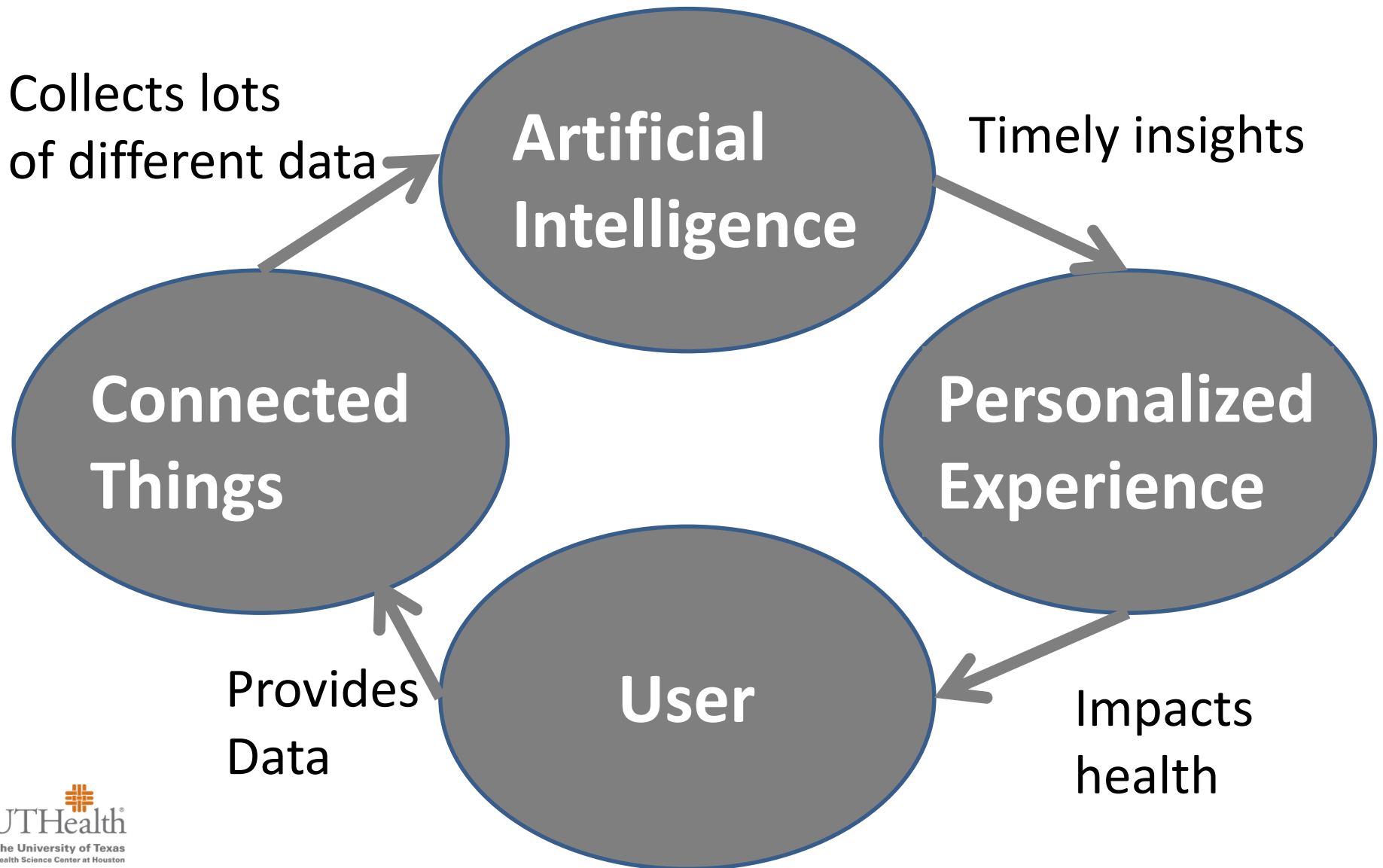
Sensors

- Many different types of sensors
 - Bio-sensors
 - Contact sensors
 - Motion sensors
 - Pressure sensors
 - Light, temperature, and humidity sensors
- Wearables one type of sensor

Examples of Wearables

- Watches/bracelets/rings
 - Vital signs
 - EKGs
 - Glucose monitoring
 - Reminders
- In clothing
- Shoes

AI and The Internet of Things



The Smart Home

Environment/Security

Door Alarms

Nursebots

Motion Sensors

Gait Detectors

Fall Detectors

Medication Reminder

Cognition Tools

Smart Sink

Smart Stove

Smart Refrig



Wearables

Bed Monitor

Vital Signs

Skin Detector

Gut Microbiome

Stool Analysis

Urinalysis

Blood Glucose

Facial Monitor

Weight

Blood Flow

Cizik School of Nursing



School of Nursing Smart Apartment

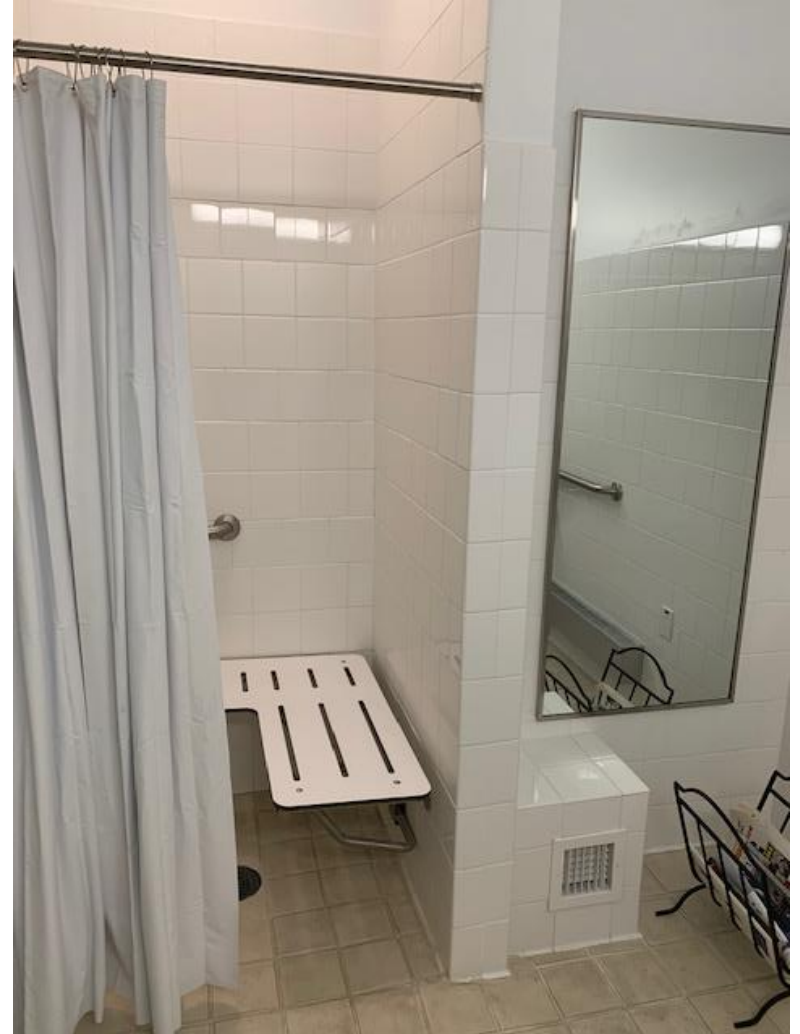


- Purpose of the smart apartment is to serve as a laboratory for testing of sensors into home environment
- Then pilot testing in real world homes

Building the Apartment



Apartment Bedroom and Bathroom



Interprofessional Groups

- Interprofessional (nurses, engineers, informaticians, psychologist, etc.)
- Mission to improve healthcare through telehealth and other technologies for older adults
- Four Subgroups
 - Research
 - Education
 - Practice
 - Advisory Council

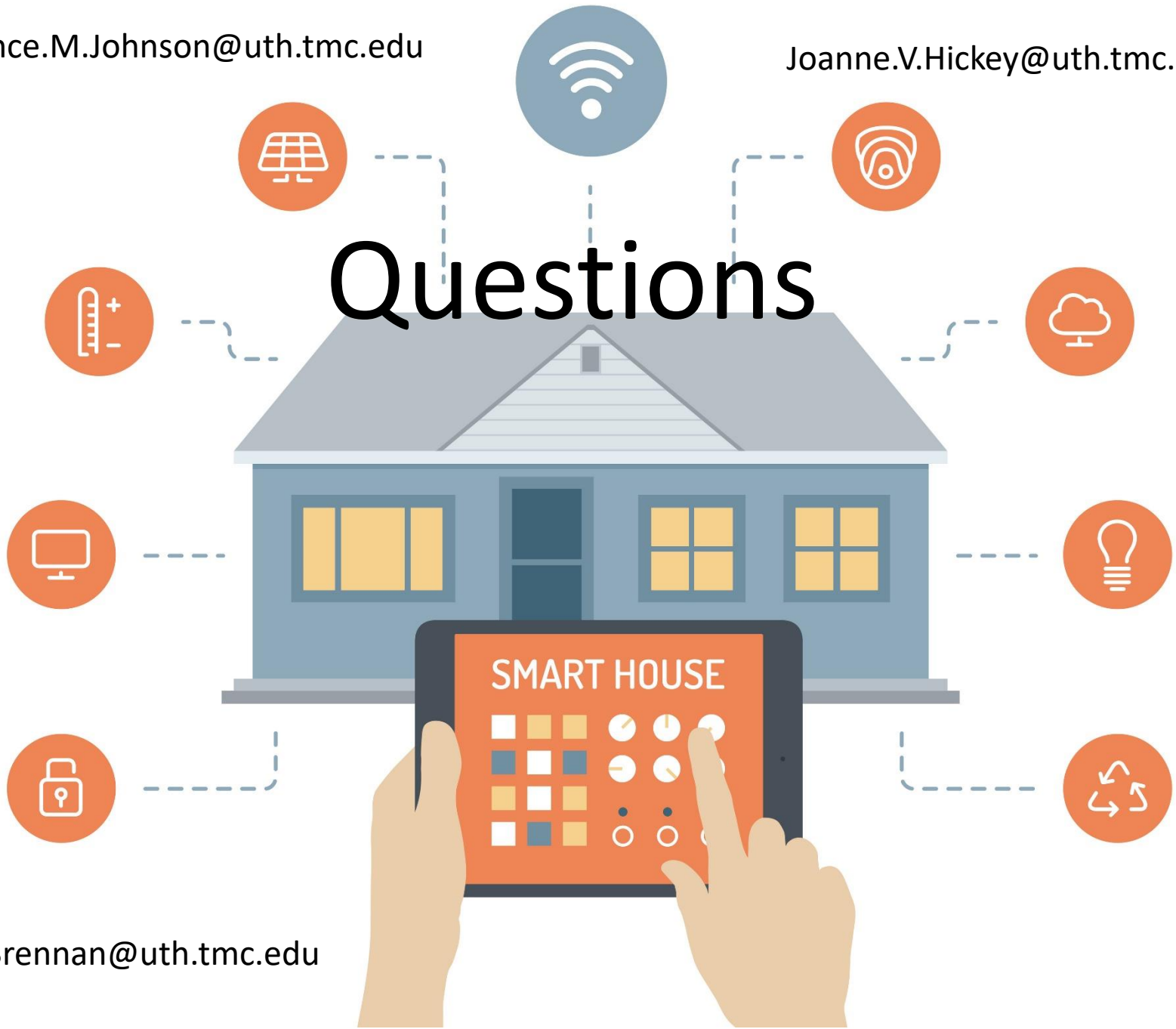
Future Direction and Funding

- Research pilot projects
- Education pilot projects

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Questions



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