Title :

Enhancing Elderly Healthcare:
A Higher Education Initiative for Community-Driven ICT Solutions in Physical Monitoring and Emotional Well-being

Full name of Speaker :

Asst.Prof.Dr. Peter ChunYu Yau

Institution :

University of Glasgow (Singapore)

Members: Peter Yau, Ejoe Tso, SyeLoong Keoh

Story

Mrs. WONG | 85 years old
Currently resident of The HK Society for the Aged

In the late one night (around 01:00am),

Mrs. WONG presses nurse bell due to **urination**

→

Long response time (>10min), Stepped out of the room **alone**

→

Fell because of losing balance

→

Confirmed **Hip Fracture** after hospitalization

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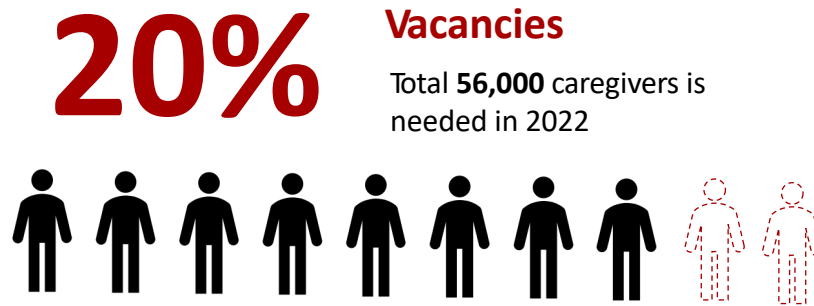
Project Title:

Background :

Several ASEAN countries, along with Japan, are experiencing significant challenges related to their aging populations, necessitating urgent and effective policy and healthcare interventions. For instance, Japan saw 28.4% of its population aged 65 or older in 2020, with projections indicating this will rise to 38.1% by 2050.
Similarly, Singapore's elderly population is anticipated to grow from 15.2% in 2020 to 23.8% by 2030 . Other nations like Thailand, Malaysia, Indonesia, Vietnam, and the Philippines are also witnessing rapid increases in their elderly demographics.

Targets:

The primary target is elderly care centers looking to enhance services through technology solutions. This includes assisted living facilities, nursing homes, and community care organizations.
The project also aims to engage higher education institutions and community organizations for collaborative development and deployment of ICT solutions.

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Factsheet (Research Analysis) – Manpower Shortage

20% **Vacancies**

Total **56,000** caregivers is needed in 2022

Average age of caregivers

55y

"**Elderly Caring For The Elderly**" **exacerbating the manpower shortage issue**

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Proposed Method:

Implementation:

The project will begin with pilot implementations in selected nursing homes that have agreed to participate in the test, ensuring these facilities are representative of typical nursing homes in terms of size, staff-to-client ratio, and care requirements. Each pilot site will be equipped with the AI Nursing Call system, and caregiving staff will receive training on its functionalities.

During the implementation, objective performance metrics such as response time to client calls, frequency of caregiver interventions, and instances of communication failures will be monitored. Additionally, subjective measures including caregiver and client satisfaction will be gathered through surveys and interviews to provide comprehensive feedback on the system's efficacy and user experience.

Factsheet (Research Analysis) – Impact of Manpower Shortage

Low Manpower Ratio ➡ Increasing **workload**

1:5

Caregiver ➡
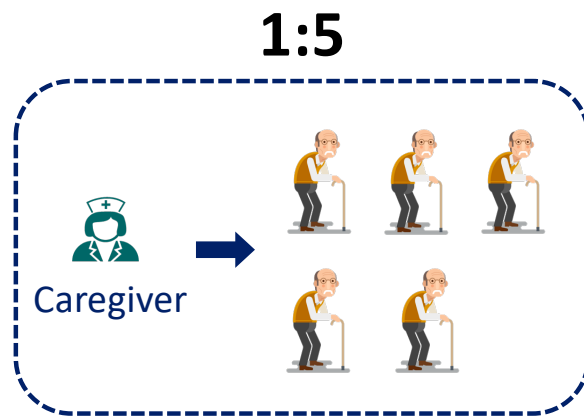
The **general** manpower ratio

1:20

Caregiver ➡
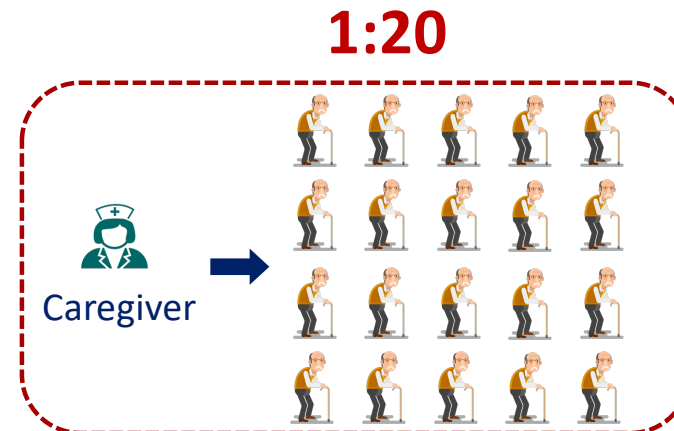
The median manpower ratio in 2024

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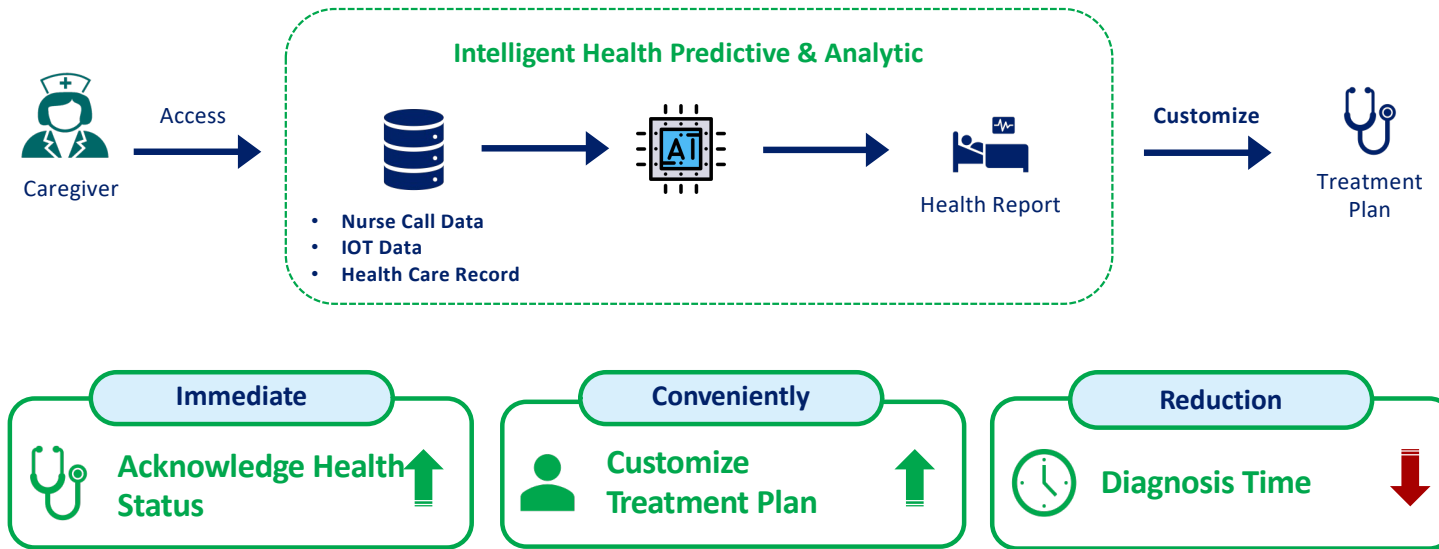
Proposed Method:

Computing Science and ICT:

The methodology for enhancing elderly healthcare monitoring through ICT leverages a combination of advanced computing science techniques and innovative devices. For fall detection, deep learning models such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), including Long Short-Term Memory Networks (LSTMs), are employed to learn and generalize complex patterns in image and sequential data.

Signal processing techniques like Fourier Transform and Wavelet Transform convert time-series data into the frequency domain and provide a time-frequency representation, respectively, aiding in identifying characteristic fall frequencies and abrupt changes.

Principal Component Analysis (PCA) reduces the dimensionality of sensor data, simplifying fall classification . Computer vision techniques, including background subtraction and optical flow, help distinguish individuals from the background and analyze motion changes, while Histogram of Oriented Gradients (HOG) assists in object detection

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Proposed Method:

Smart Care — Ez-Healthcare System

Intelligent Health Predictive & Analytic

Caregiver → Access → [Nurse Call Data / IOT Data / Health Care Record] → AI → Health Report → Customize → Treatment Plan

- Nurse Call Data
- IOT Data
- Health Care Record

Immediate — Acknowledge Health Status ↑

Conveniently — Customize Treatment Plan ↑

Reduction — Diagnosis Time ↓

Members: Peter Yau, Ejoe Tso, SyeLoong Keoh

Impact:

Testimonial:

In January 2024, our research supporter, Mr. Ejoe Tso, conducted our project feasibility test with the Hong Kong Society for the Aged, a 40-year-old elderly service provider that runs 29 centers in Hong Kong: "A notable aspect of the project is the introduction of an advanced AI Nursing Call system.

We believe this innovative technology could positively impact the social service sector in the near future, particularly by streamlining communication between clients and caregivers in nursing homes, ensuring timely and efficient care.

We are confident that integrating such technology into elderly care has the potential to transform daily operations by increasing responsiveness and reducing the strain on caregiving staff. Ultimately, this will foster a safer and more responsive environment for the clients we serve."

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Impact:

Triple Win based on Pilot Trial Results

Elderly Person Reduce Waiting Time	**Caregiver** Enhance Productivity	**Elderly Care Home** Improve Satisfaction of Care Services
↓ **60%**	↑ **75%**	↑ **99%**

Members: Peter Yau, Ejoe Tso, SyeLoong Keoh

Impact:

Community-drive contributions:

The project's collaborative impact will be significant, fostering partnerships between higher education institutions, community organizations, and elderly care centers. This collaboration will facilitate the development and deployment of advanced ICT solutions, improving care quality through shared expertise and resources.

Socially, the integration of monitoring systems will enhance the safety and well-being of elderly individuals, reducing falls and medical complications. These advancements will alleviate caregiver stress and improve overall quality of life, contributing to safer, more responsive environments for the elderly, thereby promoting their independence and dignity.

Members: Peter Yau, Ejoe Tso, SyeLoong Keoh

Our Recognitions (Award Winning)

The Gold Award in HK Techathon+ 2024

The Gold Award in ITCC Innovation Award 2024

The HKSTPC Silver Technopreneur Award in YDC Dare to Change Competition 2024

Finalist and the Innovation Award in City I&T Grand Challenge HK 2

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Output/Outcome:

Results:

Scientifically, the project will generate crucial data and insights on the effectiveness of IoT and AI in elderly care. Findings will be shared through peer-reviewed publications, advancing the field and providing a basis for future innovations. Furthermore, the creation of an open-source ICT architecture will allow for ongoing enhancements, ensuring long-term impact and wide adoption.

This ICT framework will be a valuable resource for developers, caregivers, and community organizations, aiding continuous improvements in elderly healthcare monitoring.

Members: Peter Yau, Ejoe Tso, SyeLoong Keoh

Conclusion:

Responsive Inclusivity:

As the "Responsive Inclusivity" initiative advances, our future plans involve expanding our reach and forging strategic partnerships to enhance web accessibility globally. We aim to scale the project by including more diverse institutional websites across different regions and languages, thus broadening our impact.

Collaborations with volunteer tech communities, global accessibility advocacy groups, educational institutions, and tech nonprofits will be critical in resource sharing and collaborative problem-solving. Additionally, we will engage with governmental bodies to push for policies that incorporate web accessibility standards in public digital resources.

Members: Peter Yau, Ejoe Tso, SyeLoong Keoh