Transforming Aged Care with Artificial Intelligence

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Acknowledgement of Country

I am delivering this talk from the land of Yugambeh/Kombumerri peoples who are the traditional custodians of this land.

I would like to pay my respect to the elders past, present and emerging and extend my respect to other Aboriginal and Torres Strait Islander peoples.

Introduction

Aged care is undergoing a revolutionary transformation with the integration of Artificial Intelligence (AI). This presentation explores the potential impact of AI in improving outcomes for elderly individuals and addresses the need for innovation within the sector.

With the growing aged population and rapid technological advancements, it is crucial to harness the power of AI to revolutionize the aged care industry and enhance the quality of life for older Australians.

Challenges in Aged Care

- **Funding issues** pose significant challenges to the aged care sector. The current funding model often leads to long wait times for care packages, impeding timely access to some services.

- **Workforce shortages** further compound the challenges faced by the aged care industry. Low wages and demanding conditions make it difficult to recruit and retain skilled workers, impacting the quality of care provided.

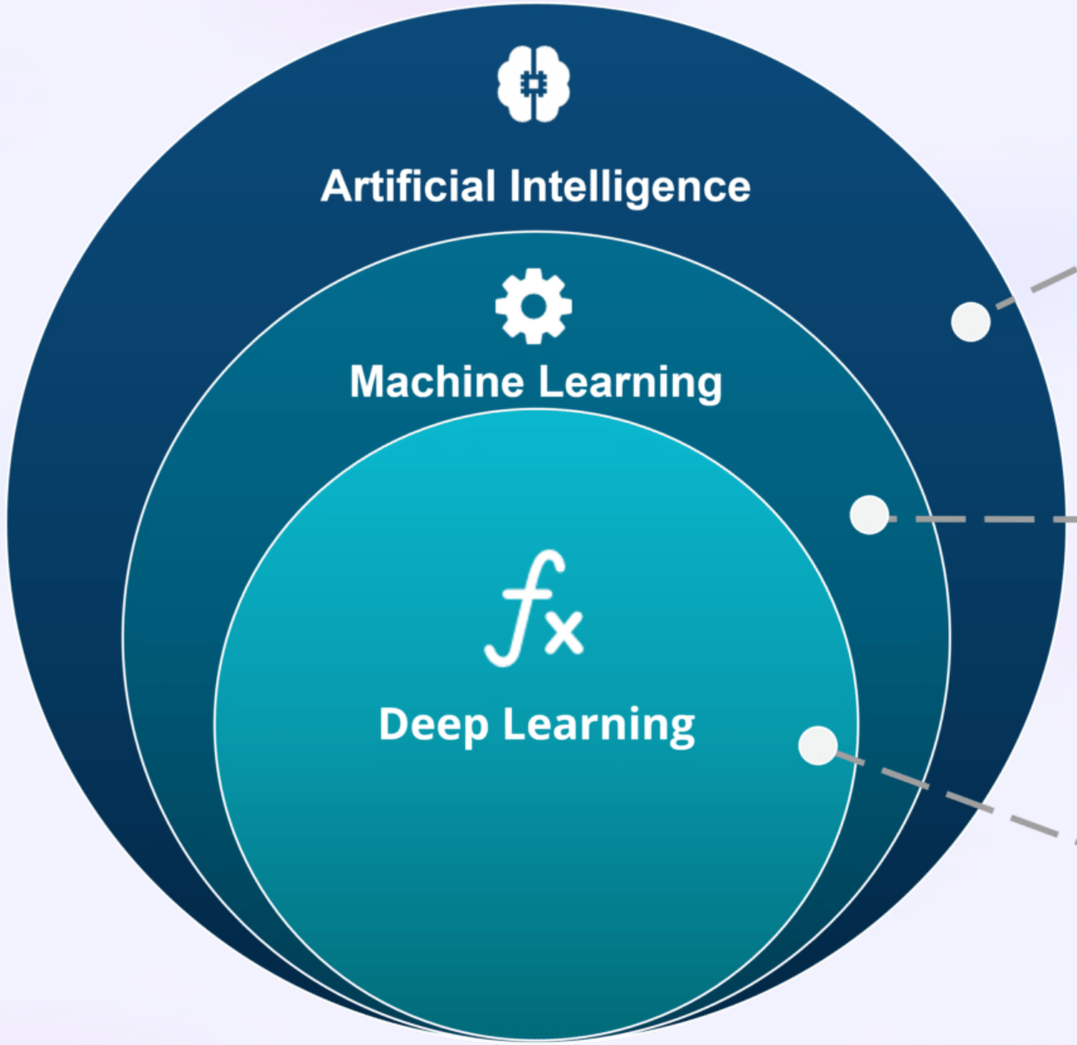
- Ensuring the **highest standard of care** for elderly individuals is paramount. **Adequate staffing ratios**, **comprehensive training programs**, and **robust regulatory oversight** are essential to address concerns related to the quality of care.

What is AI?

Artificial Intelligence (AI) is a field of technology where computers are designed to perform tasks that typically require human intelligence. This includes things like understanding **human language**, **recognising patterns and images**, **making decisions**, and **learning from data**. AI systems can improve over time as they are exposed to more information. In simple terms, AI is like teaching computers to think and learn like humans.

At its core, AI combines computer science with robust datasets to enable problem-solving. It includes sub-fields such as **machine learning** and **deep learning**, which are essential components of modern AI systems. Furthermore, AI involves machines performing cognitive functions that we usually associate with human minds, like perceiving, reasoning, learning, interacting with an environment, problem-solving, and even demonstrating creativity.

What is AI?



ARTIFICIAL INTELLIGENCE
A technique which enables machines to mimic human behaviour

MACHINE LEARNING
Subset of AI technique which use statistical methods to enable machines to improve with experience

DEEP LEARNING
Subset of ML which make the computation of multi-layer neural network feasible

Source: https://www.edureka.co/blog/ai-vs-machine-learning-vs-deep-learning/

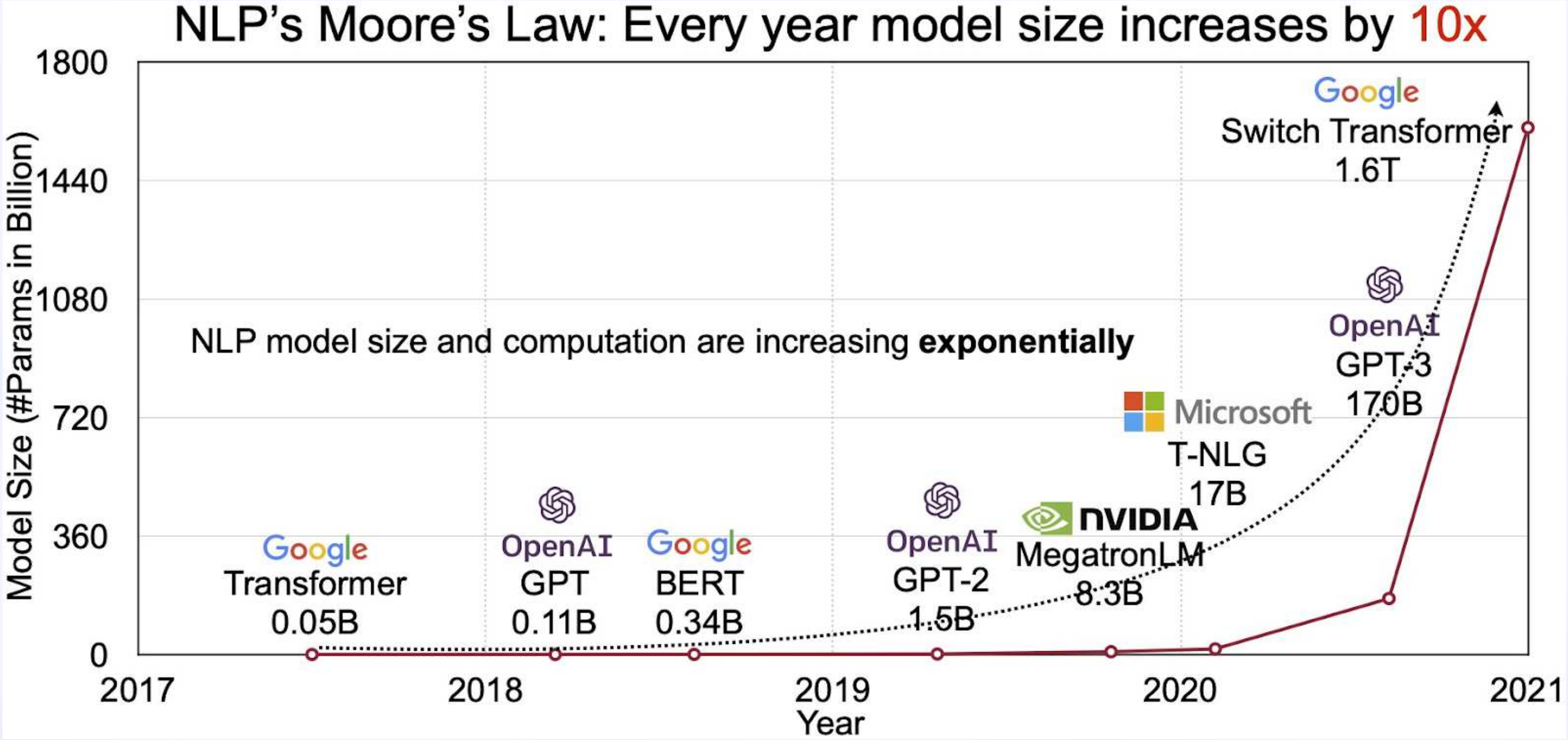
Natural Language Processing (NLP)

Natural Language Processing (NLP) is a branch of artificial intelligence that focuses on the interaction between computers and humans through natural language. The ultimate objective of NLP is to enable computers to understand, interpret, and generate human language in a valuable and meaningful way.

NLP is used in various applications like **speech recognition systems** (like virtual assistants), **machine translation** (like translating text from one language to another), **sentiment analysis** (determining the mood or subjective opinions within large amounts of text), and **text summarization**.

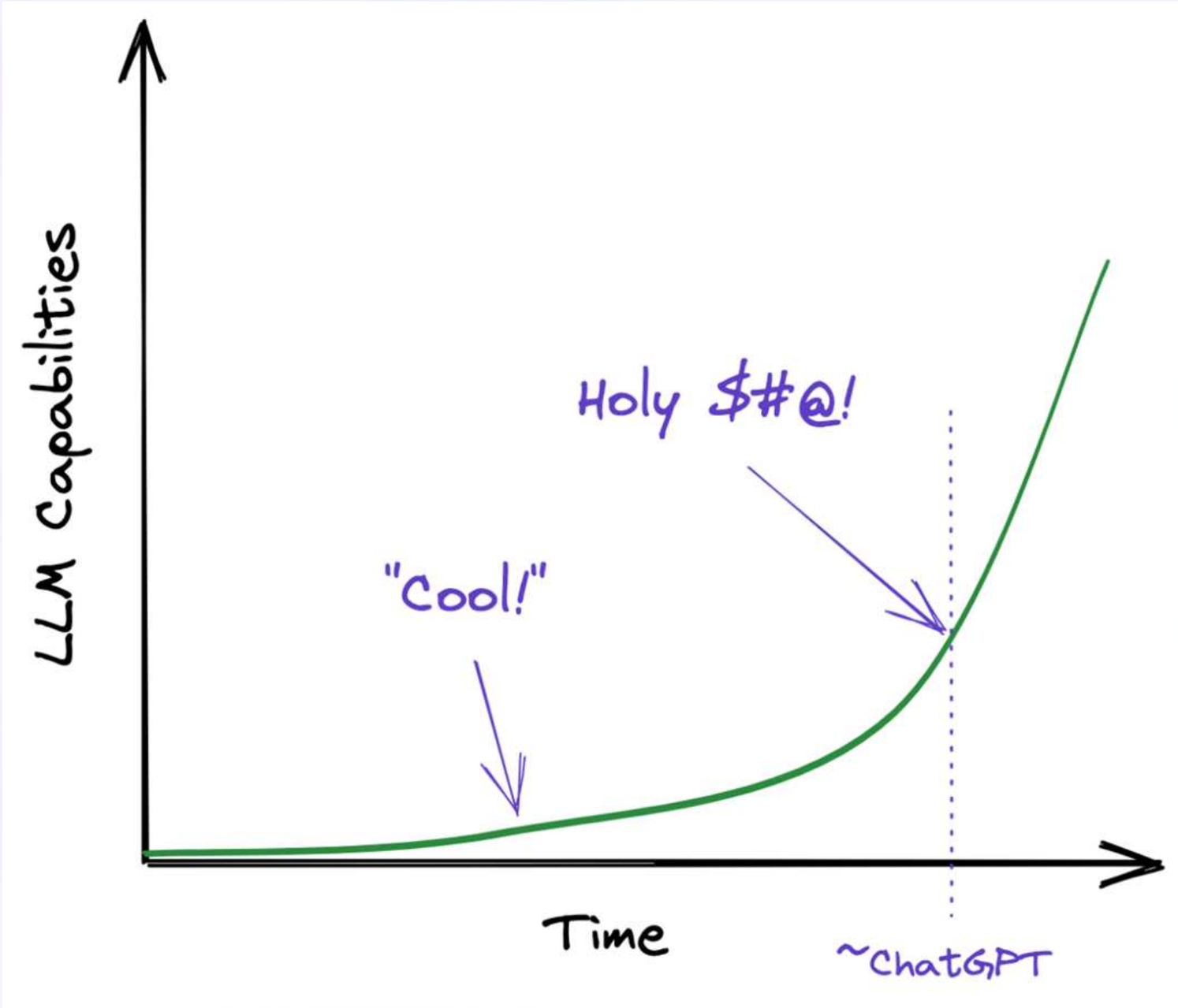
GPT (Generative Pre-trained Transformer) is a form of Natural Language Processing (NLP). GPT models, developed by OpenAI, are advanced NLP systems that use **deep learning techniques**, particularly a type of neural network known as a transformer, to generate human-like text.

The training of large models like GPT-3 or GPT-4 requires significant computational resources. Advances in hardware, particularly GPUs (Graphics Processing Units, e.g., NVIDIA), have made it feasible to train these complex models.



https://indiaai.gov.in/article/the-future-of-large-language-models-llms-strategy-opportunities-and-challenges

In simple terms….



Source: https://www.linkedin.com/pulse/devtools-language-models-predicting-future-diego-oppenheimer/

The Role of AI in Addressing Challenges

- Artificial Intelligence (AI) offers immense potential to address the challenges faced by the aged care industry. Through **predictive analysis**, **remote monitoring**, and **personalized care**, AI is revolutionizing the delivery of services and enhancing the overall experience for older adults.

- By leveraging AI-powered solutions, organizations can **streamline operations**, **optimize resource allocation**, and improve **decision-making** processes. This enables them to tackle specific business challenges effectively while ensuring the highest standard of care.

Predictive Analysis in Aged Care

Predictive analytics are used to **understand customer decisions** and **behaviours** across a range of industries. They're also increasingly being used as a powerful method of **producing insights** and driving improved outcomes for customers across all aspects of a business.

For aged care, the use of predictive analytics is still in its infancy.

Some providers **don't know where to start** while others are concerned, they **don't have the right data and systems** to support it. In reality, most providers have access to a wealth of data but haven't yet navigated how best to use it.

Further, the issue is exacerbated by the **number of software stacks available** and **which one to choose**. More than 400 software are available, none of them talk to each other and a new software is launched every week. **Many use Microsoft Stack for various purposes PowerBi.**

Another issue is the **affordability of the available software**. Need to constantly look out for government grants and funds.

Predictive Analysis in Aged Care

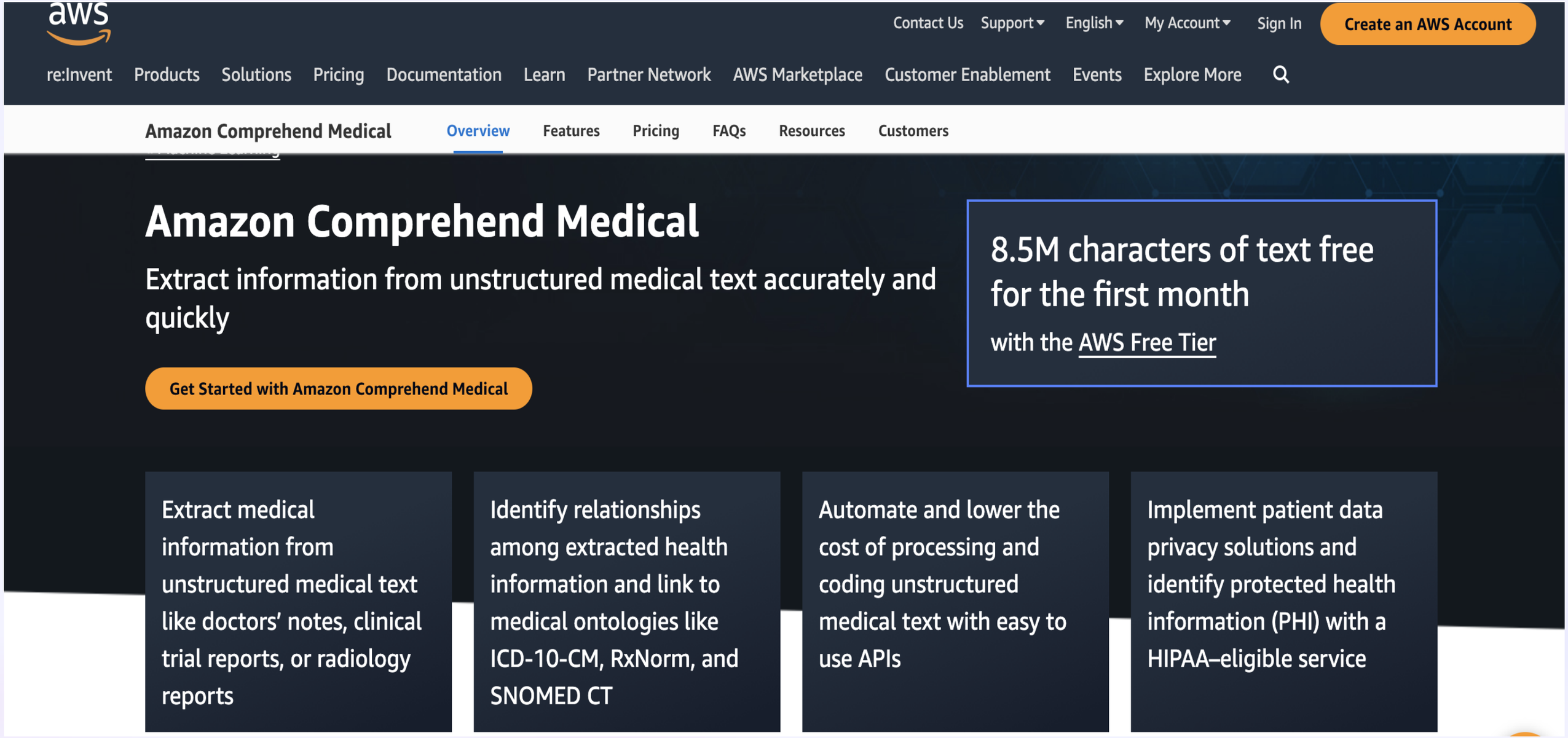
Predictive analytics allows us to look at a set of data, and after determining the key drivers for the behaviour or area of interest, supports us to predict what might happen in various scenarios. A predictive model in healthcare is defined as the use of available data to predict the occurrence of a health state or outcome that has not yet been observed.

Falls in older adults remain a pressing health concern. For adults aged 65 years and over in Australia, falls are the largest contributor to **injury-related hospitalisations** (42%) and have an estimated recurrent health service expenditure of **AUD$3.9 billion dollars nationally.**

With advancements in data analytics and increasing uptake of **electronic health records** (EHR), developing comprehensive predictive models for fall risk is now possible.

For example, EHR data has been used in wide and deep machine learning to **predict the onset of type 2 diabetes**. Clinical data across 70 hospitals were used to develop and validate a predictive model which **identified patients in hospital at high risk of readmission** early during their stay.

Predictive Analysis in Aged Care



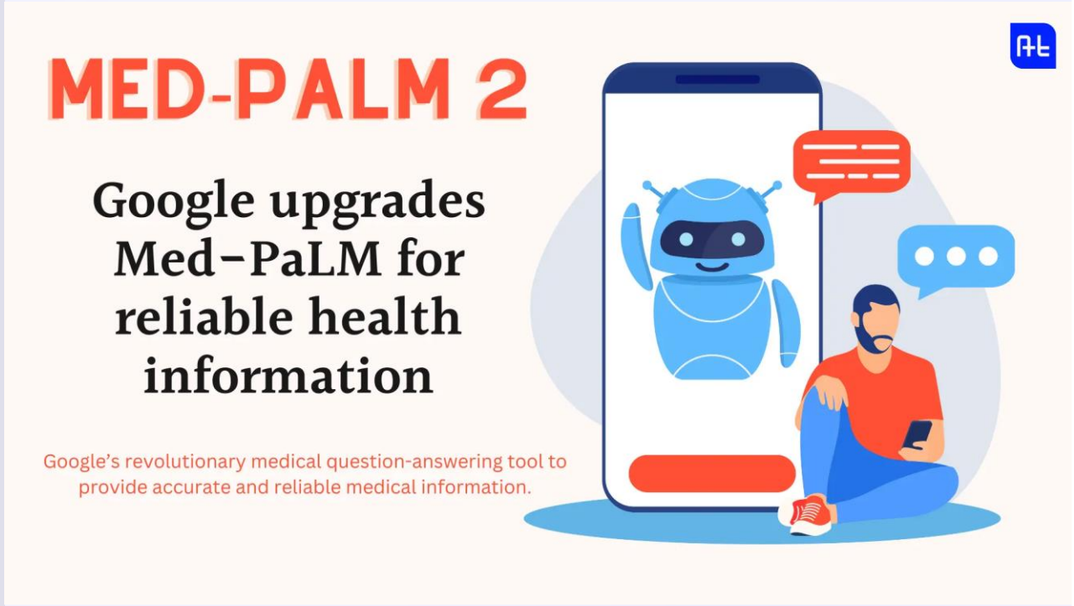
Source: https://healthitanalytics.com/news/amazon-takes-on-unstructured-ehr-data-with-machine-learning-nlp

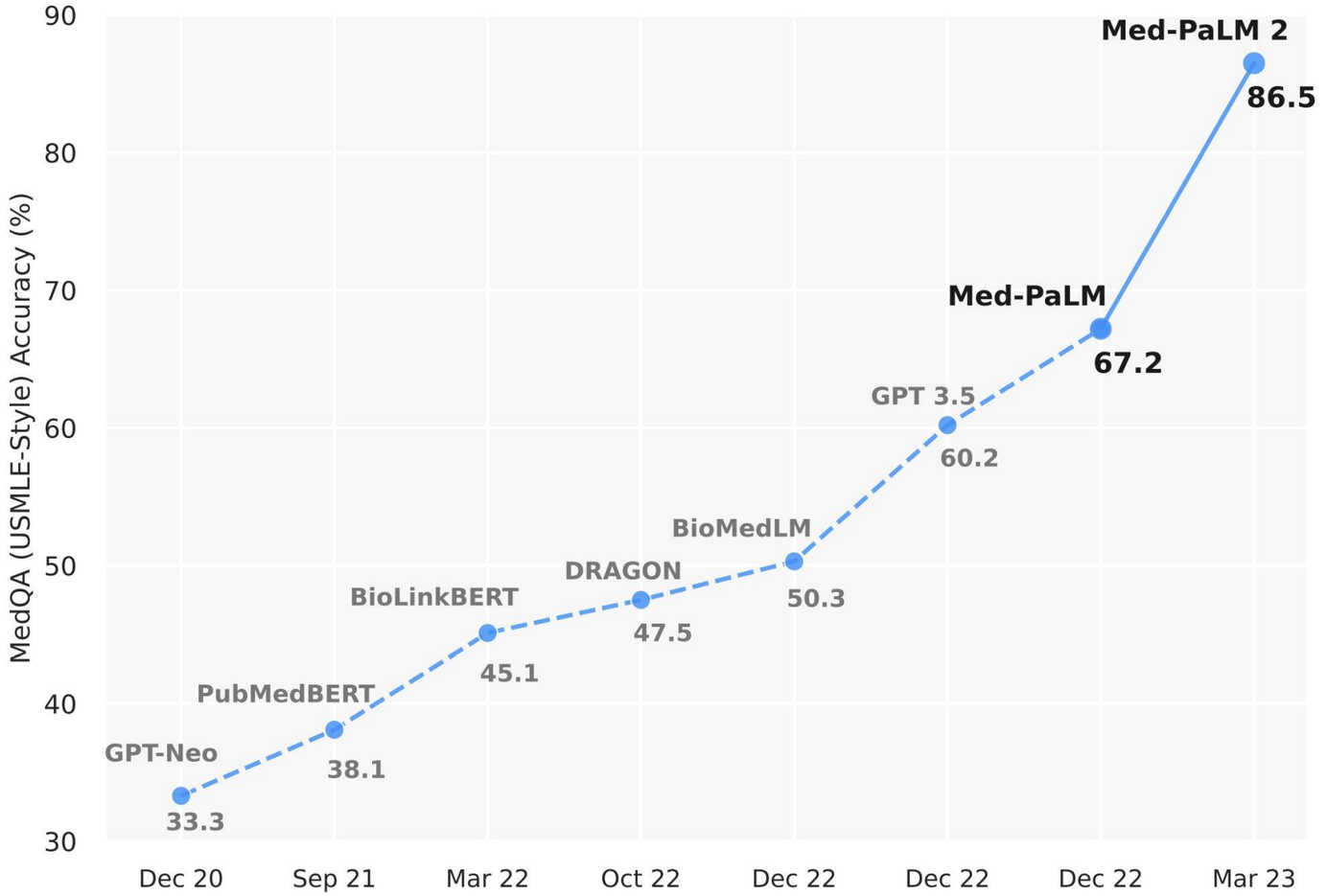
Predictive Analysis in Aged Care

Comprehend Medical helps healthcare providers, insurers, researchers, and clinical trial investigators as well as healthcare IT, biotech, and pharmaceutical companies to improve clinical decision support, streamline revenue cycle and clinical trials management, and better address data privacy and protected health information (PHI) requirements.

No data is stored on Amazon servers or used for training the machine learning and natural language processing models. Instead, customers connect through an application programming interface (API) and retain control of all their data assets.

Health Information in Aged Care





Workload in Aged Care

- High workload, particularly **administrative tasks**, significantly contributes to occupational stress and impacts care quality and patient outcomes. Studies show that **physicians in ambulatory settings spend more time on electronic health records** and **desk work** than on direct patient care (Sinski et la., 2016).

- AI can lessen administrative workload by **auto-filling data fields**, **pulling past clinical data**, and **transcribing patient encounters**. It's estimated that **voice-to-text transcription** could save doctors 17% and nurses 51% of their work time (Accenture, 2019).

- **Amazon Comprehend Medical** makes it easier to analyse unstructured EHR data to extract key clinical terms related to a patient’s diagnoses, medications, symptoms, treatments and other interactions with the healthcare system.

Workforce Management

Effective workforce management is crucial in aged care to address staff retention and meet the increasing demands of an aging population. Challenges have intensified due to COVID-19, leading to workforce shortages and the need to adapt to changing consumer needs during the pandemic.

Some of the key issues in scheduling staff include; **staff availability** due to factors such as **capability, illness, leave and care requirements of individuals**.

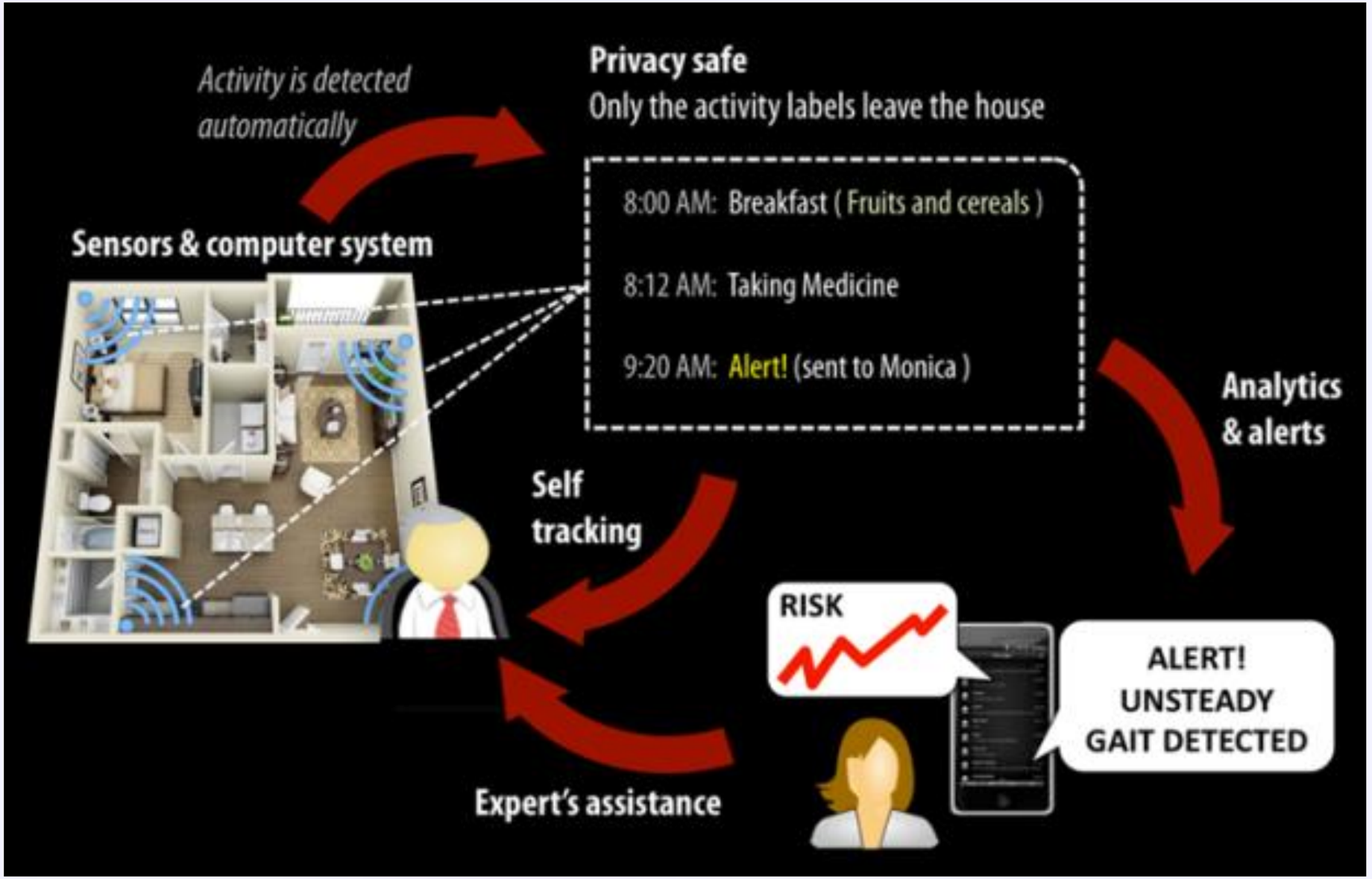
Utilising the existing data that exists within your systems, it is possible to understand **if the employee works at any other locations**, and what is the likelihood of a particular type of staff member being unavailable for reasons such as personal leave or annual leave. When aged care providers understand these patterns, it will inform them whether they need to access supplemental staff with requisite skills.

Global AI Innovations in Aged Care

- Digital health monitoring systems using AI algorithms
- Robotics and AI-powered assistive devices for daily living
- Smart sensors and Internet of Things (IoT) applications for safety and wellbeing

Global case studies highlight the groundbreaking applications of AI in aged care. Countries leading in AI adoption have successfully implemented innovative solutions, showcasing the immense potential of AI in transforming the delivery of care and support for older adults.

Global AI Innovations in Aged Care



Source: https://med.stanford.edu/pacresearch/research/senior-care.html

Global AI Innovations in Aged Care

Robots taking the strain off aged care workers in South Australia's Barossa

Broadcast Fri 3 Dec 2021 at 3:30pm

Robots Axil, Robbie and Speckle will move laundry and clean touch points at the facility.

Global AI Innovations in Aged Care

Global AI Innovations in Aged Care

Virtual reality is helping residents with COVID isolation in aged care centres across Queensland

By Melanie Vujkovic

Posted Thu 2 Jun 2022 at 10:11am, updated Mon 13 Jun 2022 at 10:48am

Virtual reality is being integrated in aged care facilities across Queensland and soon Victoria. *(Supplied)*

Ethical Considerations

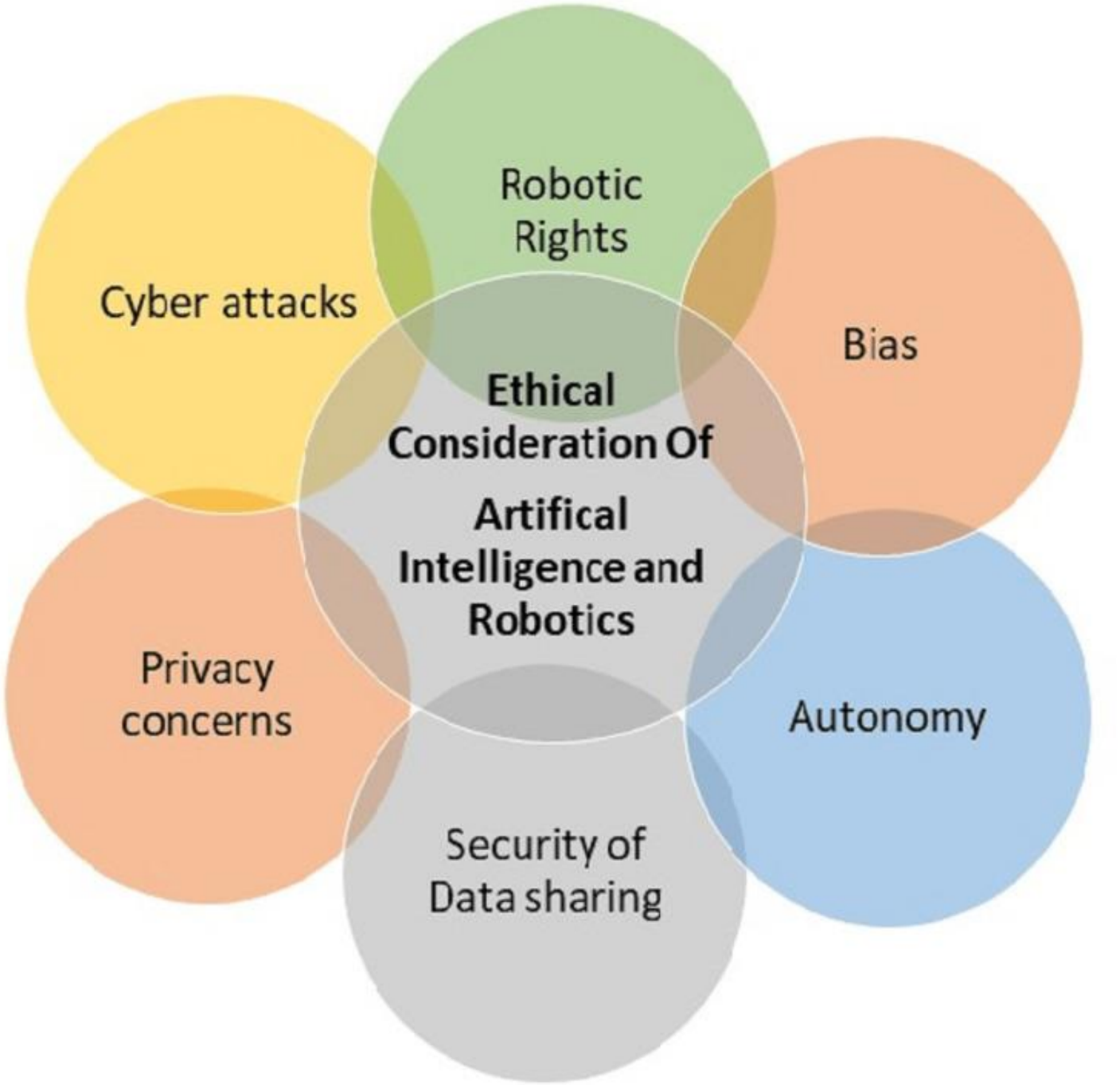
- While AI brings tremendous benefits, it raises important ethical considerations. The constant surveillance enabled by AI technologies fosters discussions around the autonomy and privacy of elderly individuals.

- It is imperative to strike a balance between harnessing the benefits of AI and addressing ethical issues related to privacy, safety, and autonomy. Policies and safeguards must be in place to ensure the responsible and inclusive use of AI in aged care.

Privacy and Data Security

- Data security and privacy are paramount in AI applications within aged care settings. Safeguarding sensitive information and mitigating risks of privacy breaches are critical to building trust and ensuring the well-being of elderly individuals.

- Addressing concerns surrounding safety, privacy breaches, and ensuring inclusive technology adoption is essential for the successful implementation of AI-powered solutions in aged care.


Robotic Rights
Cyber attacks
Bias
Ethical Consideration Of Artifical Intelligence and Robotics
Privacy concerns
Autonomy
Security of Data sharing

Impact on Staff

- AI has transformative implications for the role of aged care staff. By automating routine tasks, AI technologies can reduce the workload and enable caregivers to allocate more time to direct patient care and critical decision-making processes.

- However, adapting to new technologies and embracing new job roles is a challenge for many staff members. Organizations must provide comprehensive training and support to facilitate a smooth transition and empower their workforce in the AI era.

Emerging Trends and Future Technologies

Smart Homes and Ambient Assisted Living

Integration of AI technologies in smart homes enables remote monitoring, falls detection, and personalized assistance for older adults, enhancing their safety and well-being.

Robotics and AI-enabled Social Companions

Advanced robotics and AI algorithms are poised to provide social companionship, emotional support, and cognitive stimulation for elderly individuals, combating social isolation.

Virtual Reality for Cognitive Stimulation

Virtual reality (VR) applications offer immersive experiences to stimulate cognitive abilities, promote mental well-being, and slow cognitive decline in older adults.

Strategic Implementation

Effective implementation of AI technologies in aged care requires a systematic approach. Organizations should undertake a thorough assessment of their needs, formulate robust strategies, and execute a well-planned implementation process.

- Evaluate infrastructure and resource requirements
- Identify suitable AI solutions and vendors
- Consider ethical, legal, and regulatory aspects
- Plan for staff training and change management

Please feel free to connect

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