

**Introducing an AI enabled digital solution that solves
a real-world clinical problem:
*learnings from addressing pain identification challenges***

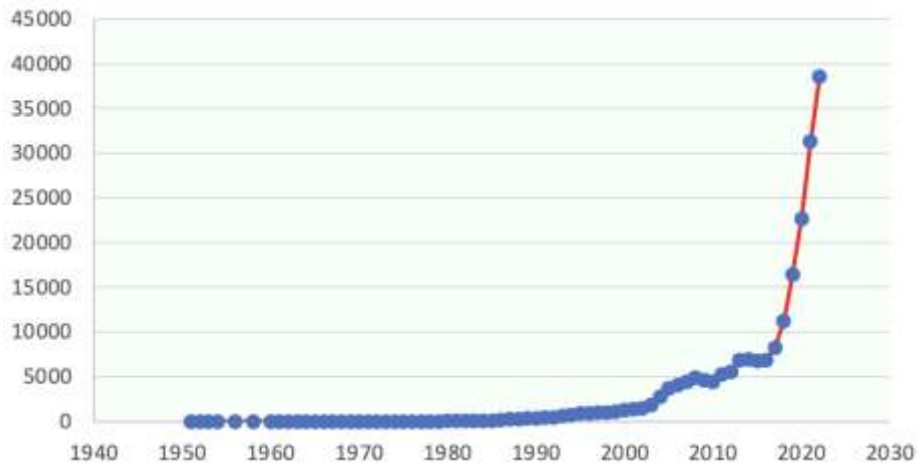
Prof Kreshnik Hoti



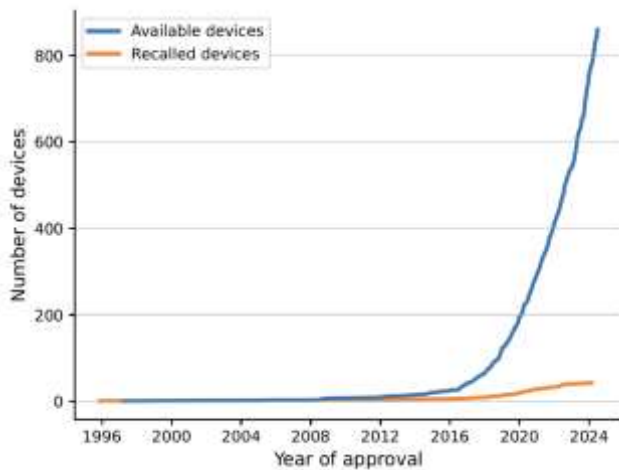
Disclaimer

- *Kreshnik Hoti is a Professor at the Division of Pharmacy, Faculty of Medicine, University of Prishtina. He is one of the co-founders and shareholders of PainChek (formerly known as EPAT Technologies) for whom he also consults in the role of Senior Research Scientist. He is named a co-inventor together with Prof Jeffrey Hughes and Dr Mustafa Atee on a pain assessment method and system ([US20170156661A1](#)).*





PubMed search for term: Artificial Intelligence

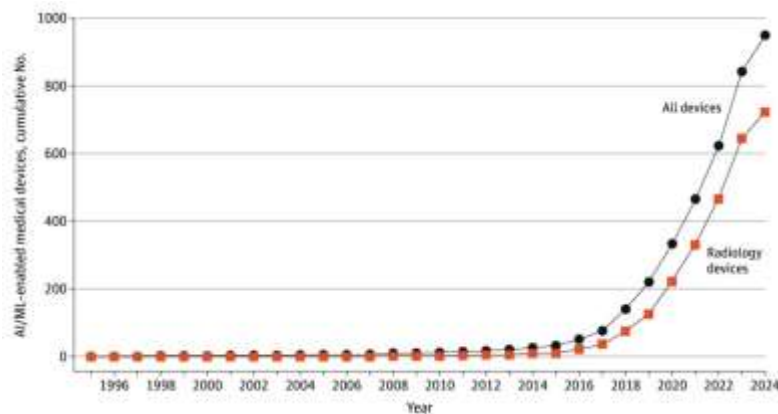


- 1250 AI enabled devices to date
- 148 new ones during 2025 (until May)

Available and recalled AI-enabled medical devices that received FDA approval over the period 1995-2024.

Source: Windecker D, Baj G, Shiri I, et al. Generalizability of FDA-Approved AI-Enabled Medical Devices for Clinical Use. *JAMA Netw Open*. 2025;8(4):e258052. doi:10.1001/jamanetworkopen.2025.8052





**Number of US Food and Drug Administration-Approved
AI/ML-Enabled Medical Devices by Year.**

Source: Sivakumar R, Lue B, Kundu S. FDA Approval of Artificial Intelligence and Machine Learning Devices in Radiology: A Systematic Review. JAMA Netw Open. 2025 Nov 3;8(11):e2542338. doi: 10.1001/jamanetworkopen.2025.42338. PMID: 41201805; PMCID: PMC12595527.



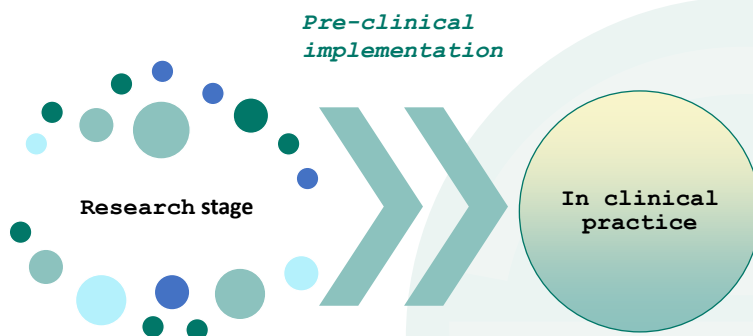
What's the real aim...?

- *Research publication?*
- *High-impact?*
- *Application in the real world?*



Key scenarios for AI driven solutions

Conceptual stage



The problem...

Pain assessment is difficult especially for those who cannot communicate such as dementia sufferers

Pain is often under-detected and under-treated



Those with dementia & cognitive impairment often:

- Lose their ability to self-report pain
- Lose their ability to regulate learned responses to pain as their condition progresses


PainChek
 by Cerecor


Behavioural and Psychological Symptoms of Dementia (BPSD)

>90% of people with dementia affected

- Greater the pain = Greater BPSD & severity
- Pain group 3.8 times more likely to experience BPSD

25.3% more
neuropsychiatric
behaviours

33.6% higher
severity of
behaviours

31.4% more
distress to
caregivers



Source: Atee M, Morris T, Macfarlane S, Cunningham C. Pain in dementia: prevalence and association with neuropsychiatric behaviors. Journal of Pain and Symptom Management. 2021 Jun 16(6):1215-26. Kunik ME, et al. S Causes of aggressive behavior in patients with dementia. The Journal of clinical psychiatry. 2010 Mar 9;71(9):1145-52; Atee et al. Pain in Dementia: Prevalence and Association With Neuropsychiatric Behaviors. Journal of Pain and Symptom Management. 2020 ; Pain Australia

Antipsychotic prescribing in Dementia

- Department of Health study

*180,000 prescriptions of
antipsychotics annually*

*140,000 prescribed
inappropriately*

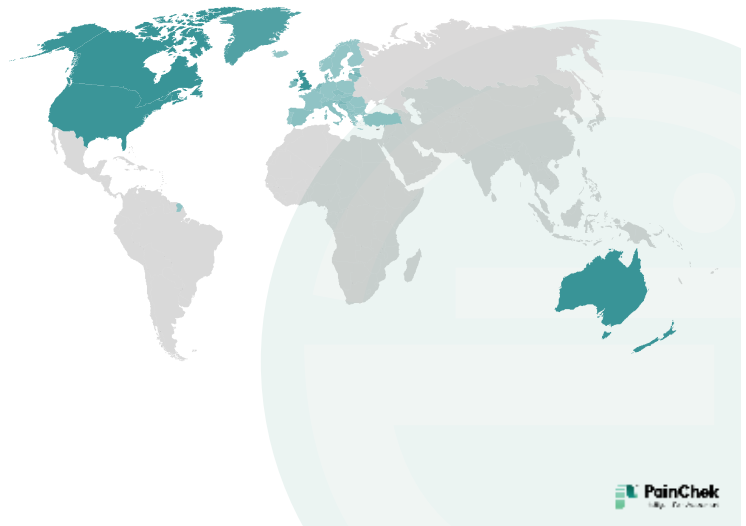
- Antipsychotic use associated with side effects and increased mortality



A solution created by pharmacists



- Over 15 million global pain assessments
- Approx. 200,000 residents with dementia in 1900 facilities
- Over 16,000 carers and healthcare professionals trained
- Over 200,000 pain assessments being conducted monthly in the UK
- Regulatory cleared: Australia, EU, Canada, Singapore, New Zealand...
- PainChek Adult FDA de Novo cleared on October 2025



Facial Expressions...

Those with dementia & cognitive impairment demonstrate more intense facial expressions of pain

Facial Action Coding System (FACS)

- A catalogue of facial muscle movements (contractions/ relaxations) to describe facial expressions
- Different muscle movements/ combinations of muscle movements have been found to indicate pain



Comparison of Current Tools

Abbey Pain Scale

Q2. Facial expression
eg: looking tense, frowning grimacing, looking frightened
Absent 0 Mild 1 Moderate 2 Severe 3

Q2

PAINAD

Behavior	0	1	2	Score
Facial expression	<ul style="list-style-type: none"> Smiling or inexpressive 	<ul style="list-style-type: none"> Sad Frightened Frown 	<ul style="list-style-type: none"> Facial grimacing 	



AI face assessment

1) PainChek App POC pain assessment



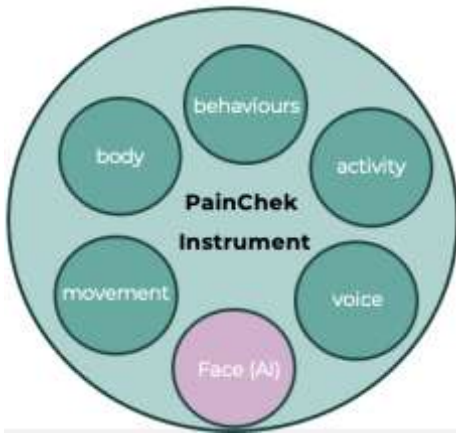
2) PainChek Portal Digital analytics



3) Education



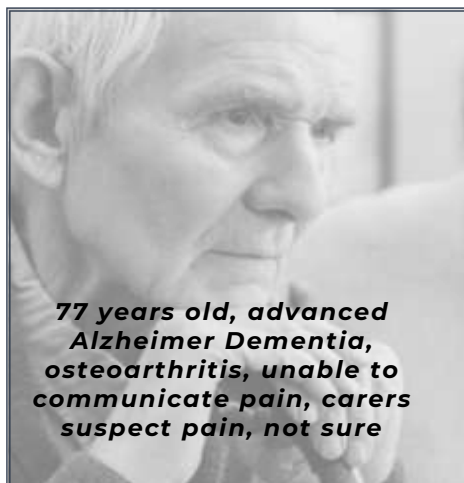
PainChek used in adults unable to verbally communicate (e.g. dementia)



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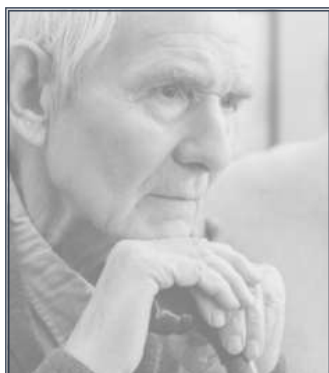


Relevance for pharmacists delivering pharmaceutical care
 e.g. medication review...

John**David**

HOW WOULD YOU MANAGE THEIR PAIN?

21

John

PainChek®

Pain Score	Pain intensity
0 to 6	No Pain
7 to 11	Mild Pain
12 to 15	Moderate Pain
16 and over	Severe Pain

PainChek Score 14, Moderate 📊

A PainChek score between 12 and 15 is classified as Moderate Pain

David

PainChek Score 14, Moderate 📊

A PainChek score between 12 and 15 is classified as Moderate Pain

HOW WOULD YOU MANAGE THEIR PAIN?

22

John

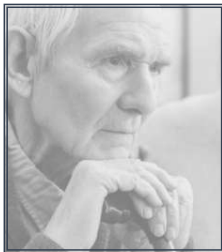
PainChek Score 14, **Moderate** 📶
 A PainChek score between 12 and 15 is classified as Moderate Pain

**David**

PainChek Score 14, **Moderate** 📶
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23

John

PainChek Score 14, **Moderate** 📶
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Introvert	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Verbally abusive	<input type="checkbox"/>	<input type="checkbox"/>
Aggressive	<input type="checkbox"/>	<input type="checkbox"/>
Fear or extreme dislike of touch, people	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Inappropriate behavior	<input type="checkbox"/>	<input type="checkbox"/>
Confused	<input type="checkbox"/>	<input type="checkbox"/>
Distressed	<input type="checkbox"/>	<input type="checkbox"/>

Requiring care	<input type="checkbox"/>	<input type="checkbox"/>
Prolonged resting	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Altered sleep cycle	<input type="checkbox"/>	<input type="checkbox"/>
Altered routines	<input type="checkbox"/>	<input type="checkbox"/>

24

David



PainChek Score 14, **Moderate**

A PainChek score between 12 and 15 is classified as Moderate Pain

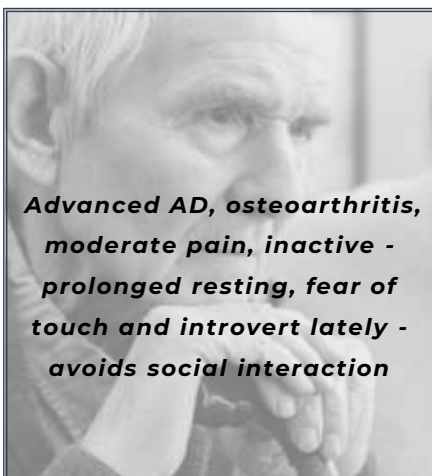


Intimidated	<input type="checkbox"/>	<input type="checkbox"/>
Verbally abusive	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Aggressive	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Fear or extreme dislike of touch, people	<input type="checkbox"/>	<input type="checkbox"/>
Inappropriate behavior	<input type="checkbox"/>	<input type="checkbox"/>
Confused	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Distressed	<input type="checkbox"/>	<input checked="" type="checkbox"/>

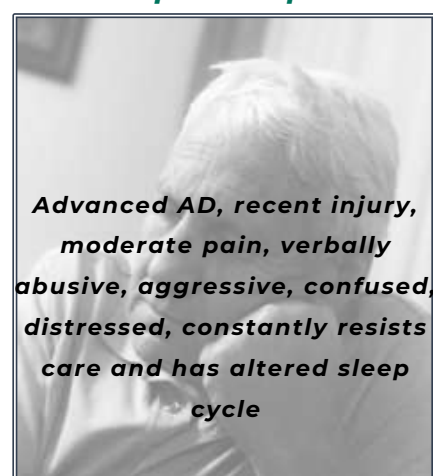
Resisting care	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Prolonged resting	<input type="checkbox"/>	<input type="checkbox"/>
Altered sleep cycle	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Altered routine	<input type="checkbox"/>	<input type="checkbox"/>

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John's pain experience

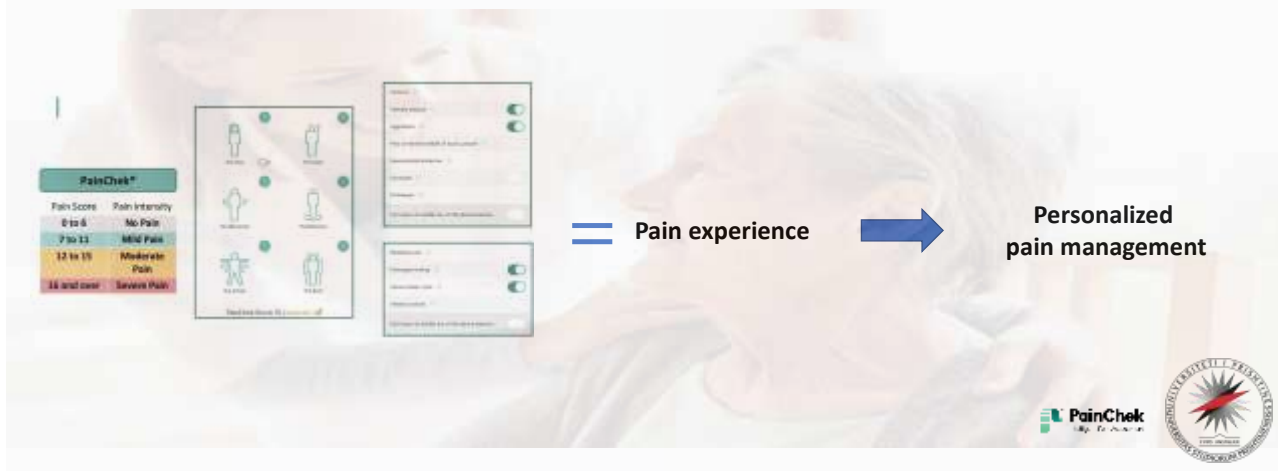


David's pain experience



HOW WOULD YOU MANAGE THEIR PAIN?

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Scotland evidence...

21 facilities in Scotland across phases 1 and 2.

Key results:

- Approximately 10,000 pain assessments
- 224 assessing users

Source: Nyangu I, Campbell K, Dunham M, Samuriwo R, Thompson K. Evaluation of a Digital Solution for the Assessment and Management of Pain in Scottish Care Services. Edinburgh Napier University, Digital Health and Care Innovation Centre. April 2025

Scotland evidence...



Medication reductions

Antipsychotics - 33%

Anxiolytics - 19%

Antidepressants - 21%

Other outcomes

Reductions in falls - 40%

Dependency and care needs - 27%

BMI increase - 47%

Source: Nyangu I, Campbell K, Dunham M, Samuriwo R, Thompson K. Evaluation of a Digital Solution for the Assessment and Management of Pain in Scottish Care Services. Edinburgh Napier University. Digital Health and Care Innovation Centre. April 2025

Read the full report via this link: <https://www.dhi-scotland.com/resources/evaluation-of-a-digital-solution-for-the-assessment-and-management-of-pain>

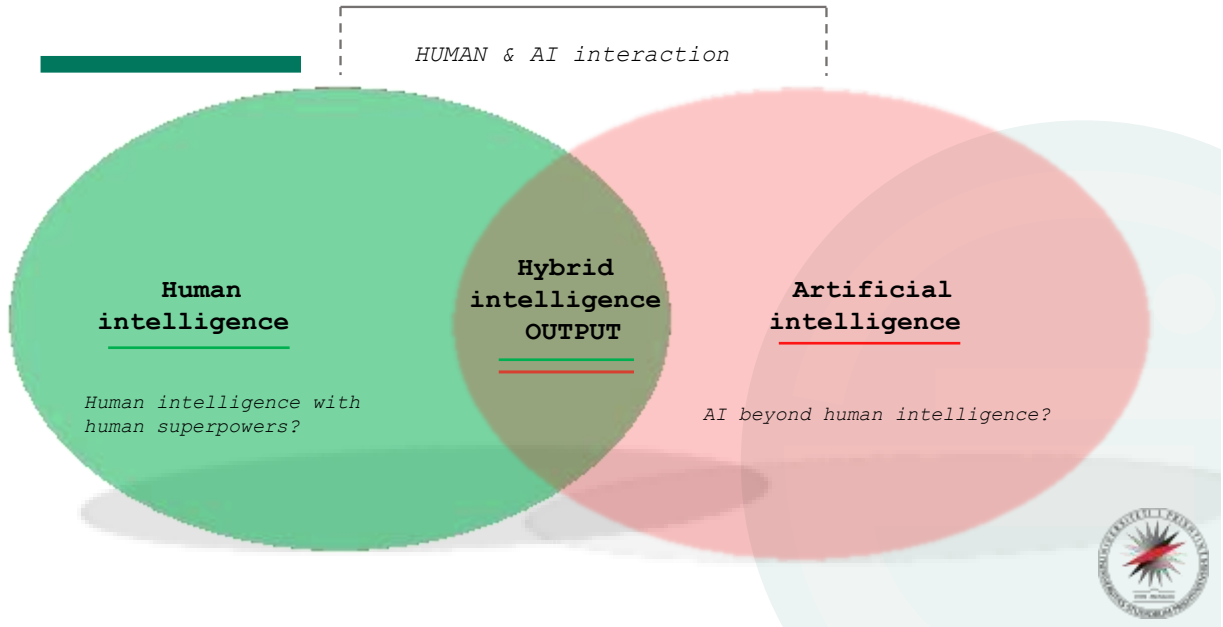
Considerations...



- *Technical performance of algorithms...*
- *Patient safety and data errors*
- *Equitable AI*
- *Patient trust*
- *Data privacy, data security and patient consent*
- *Data biases*
- *Expenses to integrate solutions in pharmacy*
- *Education and training...*



Hybrid intelligence considerations

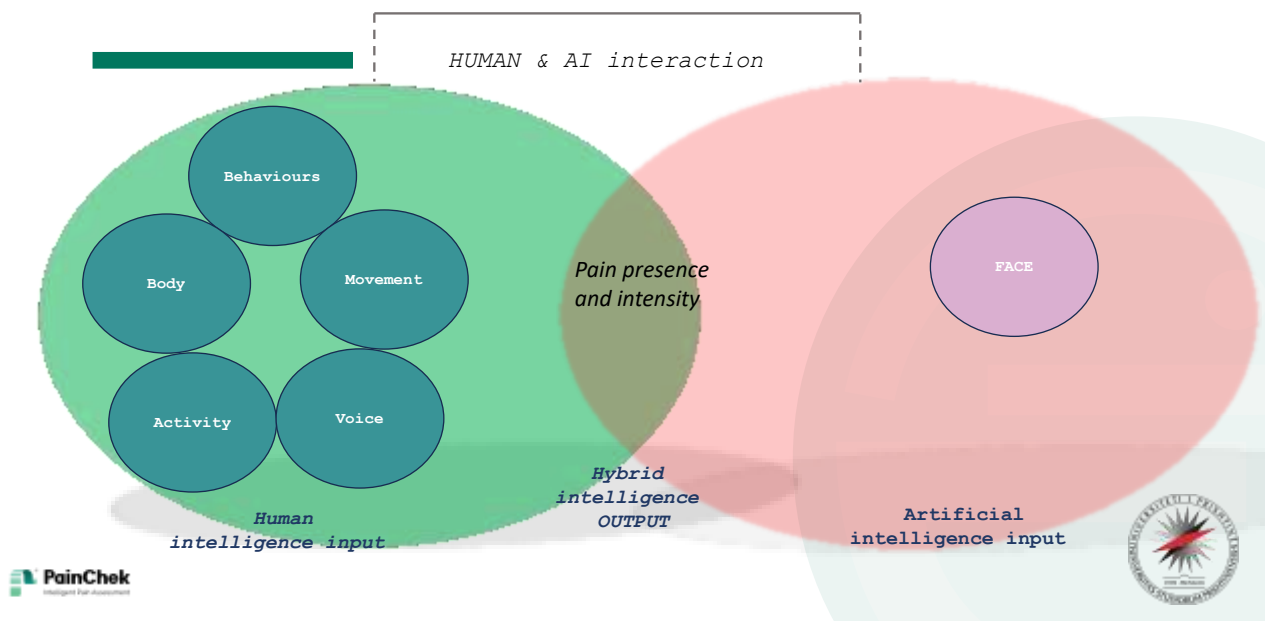


Hybrid intelligence considerations

- Symbiotic relationship
- People, data & AI augment each other's strengths
- Human on the 'driving seat'
- AI extends human capabilities
- AI does not replace human judgement



Hybrid intelligence in PainChek solution



Understanding realistic expectations

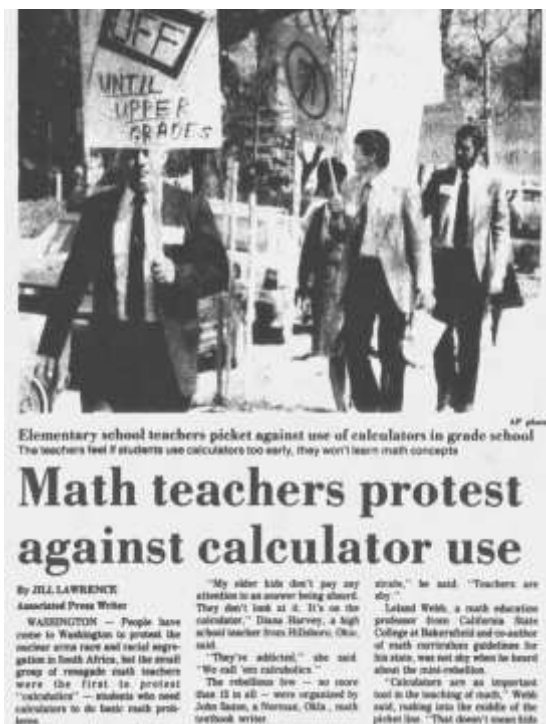
AI not magic

Digital solution & AI part of the team – not a HP replacement

AI does not solve all healthcare problems

Digital solution & AI to facilitate focus on 'human superpowers'





Thank you

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