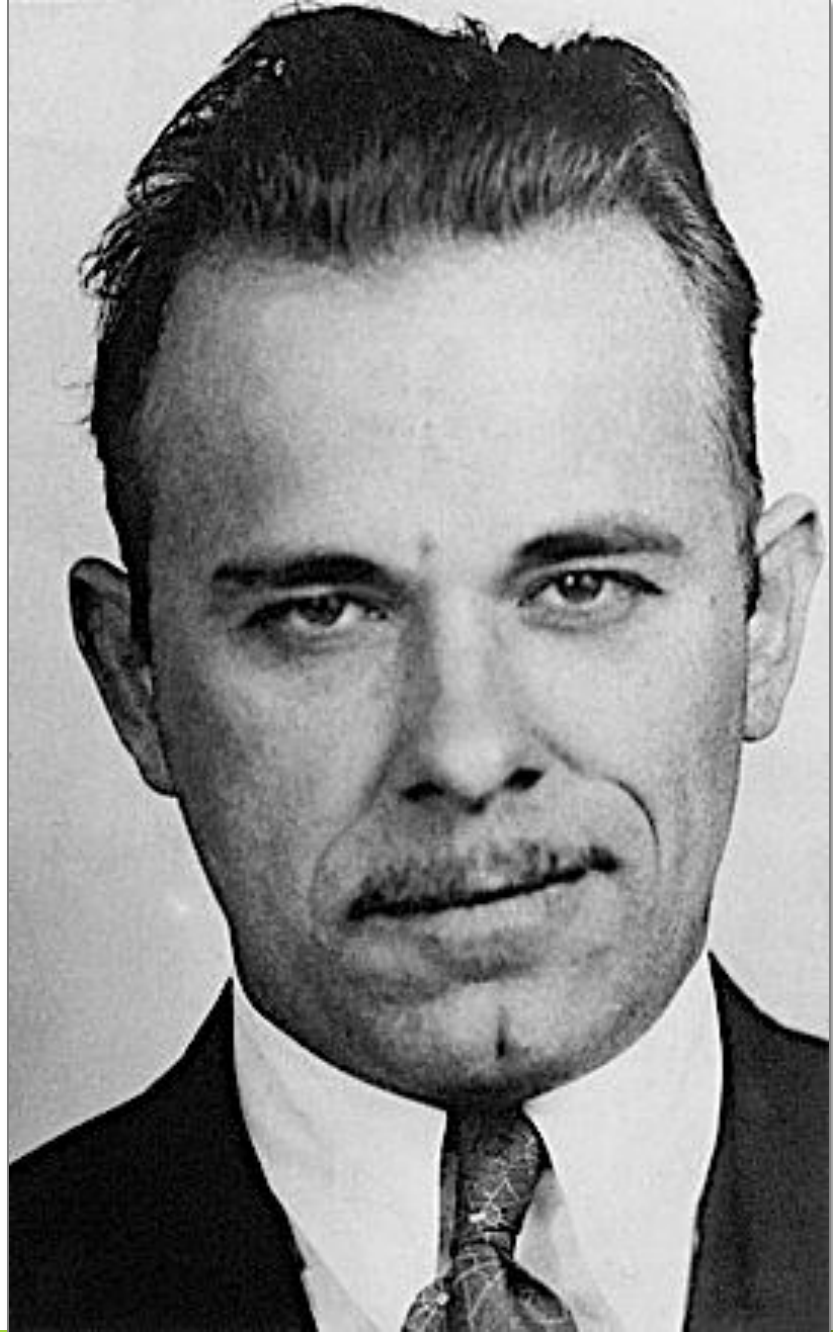


A man with grey hair and glasses, wearing a white lab coat over a light blue shirt and a dark tie, stands in a futuristic, teal-lit environment. He has a serious expression. In the background, there is a large, glowing circular device with intricate mechanical details. The overall atmosphere is high-tech and clinical.

AI and Medicolegal

Navigating the Future



Who has had a chance to use AI over last year?

(Economist-5/7/24, 5-10% uptake)





ChatGPT

The logo for Google Bard, featuring the word "Bard" in white text on a dark background with colorful, abstract shapes in shades of blue, red, and yellow.

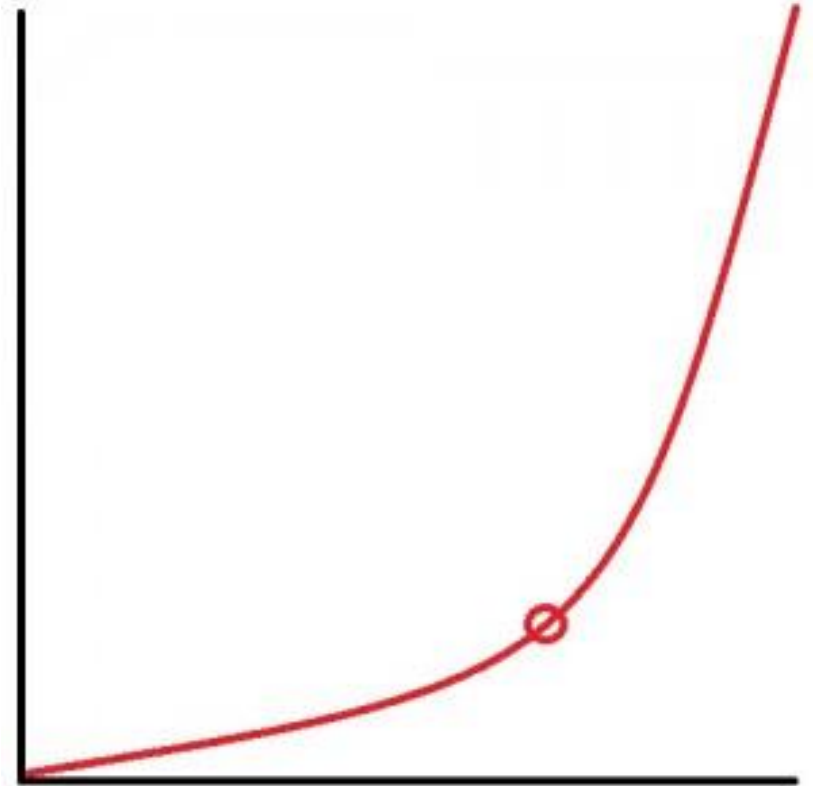
Bard

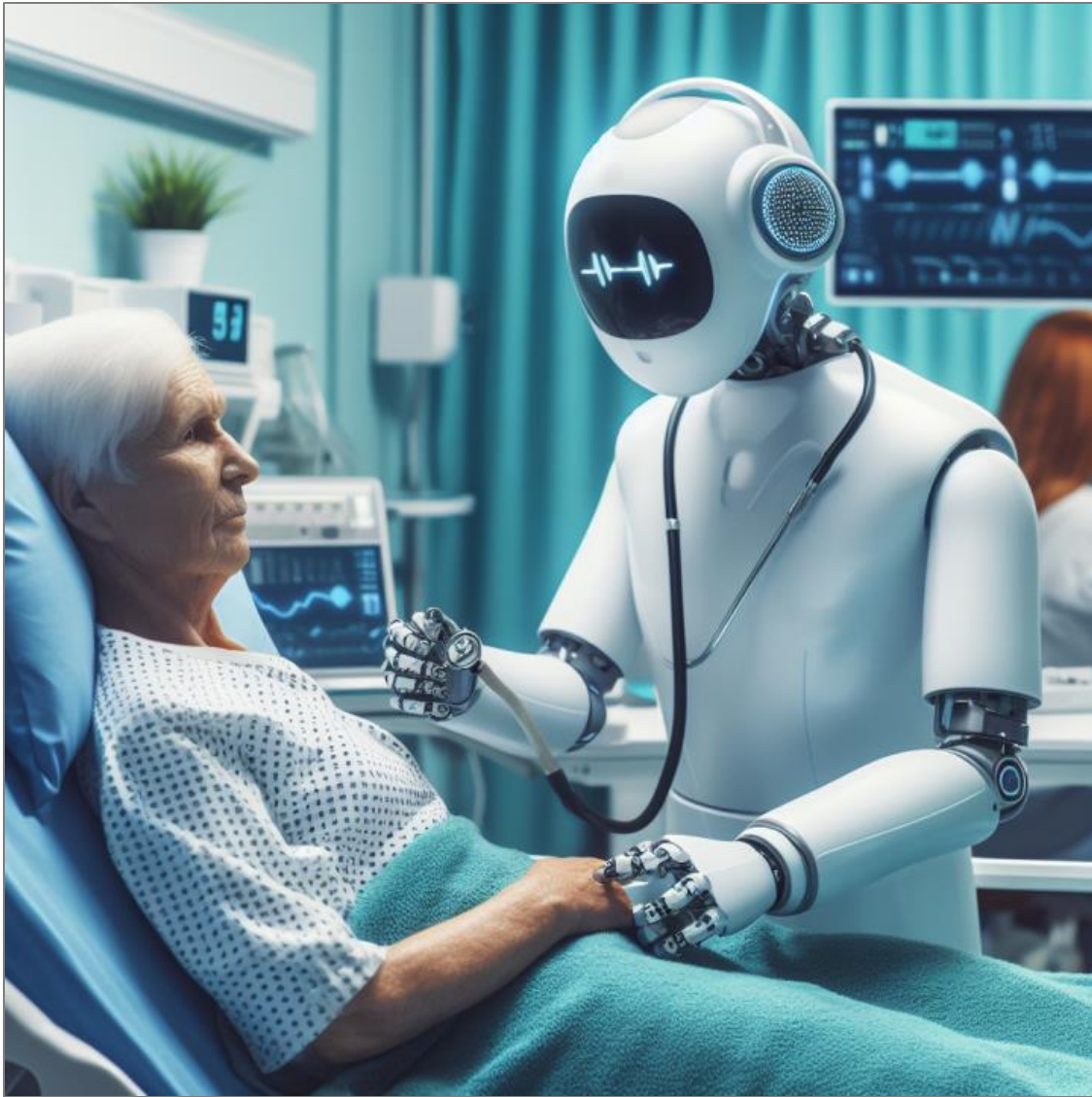
The logo for Anthropic Claude, featuring an orange starburst icon followed by the word "Claude" in black text on a light beige background.

Claude



Microsoft
Copilot





I tried starting an AI doctor practice, but the patients always complained about feeling like they were being treated by a machine.

AIM

- 40 yrs ago
- Roomba 2002



Existential threats to humanity

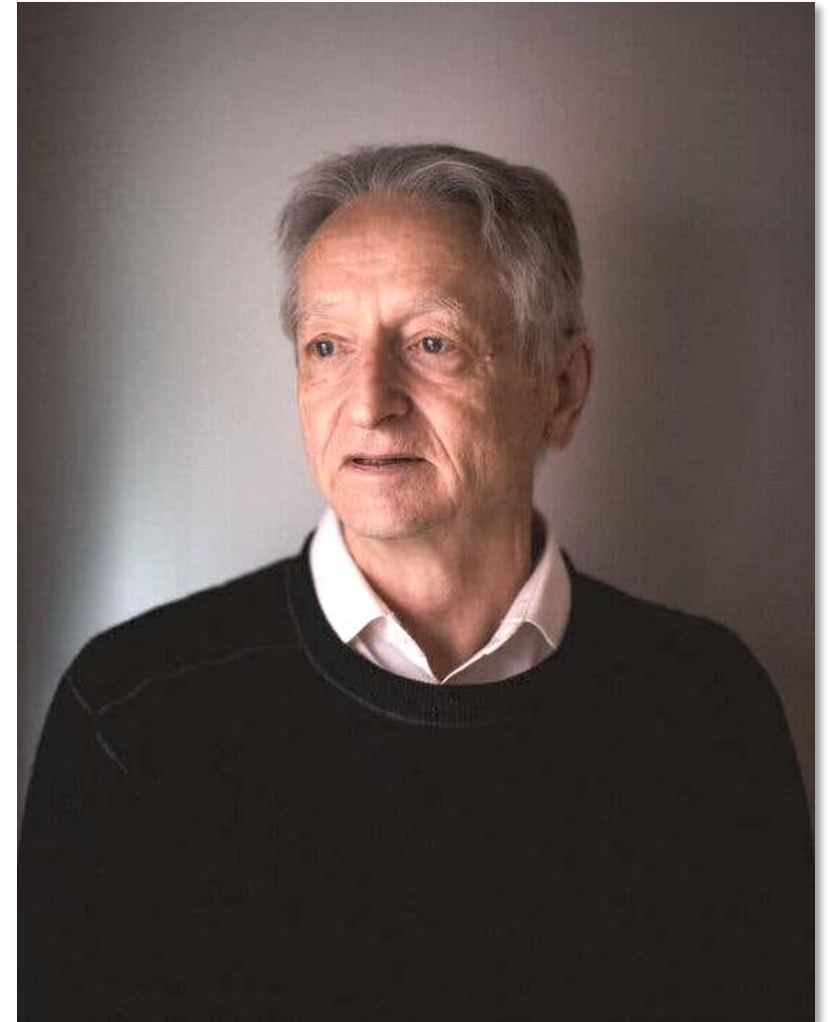
- Nuclear war
- Climate change
- AI

AI

- Autonomous, vastly smarter than us (think computer chess)
- Potential to become malevolent
- Are there any examples in history of such entities serving us well?
- Basis for revolutions, wars, bill of rights, constitutions...
- *Novacene* by James Lovelock, 2020.
- *Live forever* (Economist 2/2/24)

‘The Godfather of A.I.’ Leaves Google and Warns of Danger Ahead.

For half a century, Geoffrey Hinton nurtured the technology at the heart of chatbots like ChatGPT. Now he worries it will cause serious harm.



Prof Stephen Hawking, one of Britain's pre-eminent scientists, has said that efforts to create thinking machines pose a threat to our very existence.

He told the BBC: *"The development of full artificial intelligence could spell the end of the human race."*

His warning came in response to a question about a revamp of the technology he uses to communicate, which involves a basic form of AI.

But others are less gloomy about AI's prospects.

2014

The Luddites

- 19th-century movement of English textile workers opposed the use of certain cost-saving machinery; destroyed machines in clandestine raids.
- Protested against manufacturers using machines in "a fraudulent and deceitful manner" to replace the skilled labour of workers & drive down wages by producing inferior goods.
- Self-described followers of "Ned Ludd", a legendary weaver. His name used as a pseudonym in threatening letters to mill owners & govt officials.
- Movement started in Nottingham, England and spread to the North West and Yorkshire between 1811 and 1816.
- Mill & factory owners shot protesters. **Eventually the movement was suppressed with legal & military force, which included execution & penal transportation of accused & convicted Luddites.**
- The term used to refer to those opposed to industrialization, automation, computerization, or new technologies in general.



Development of AI

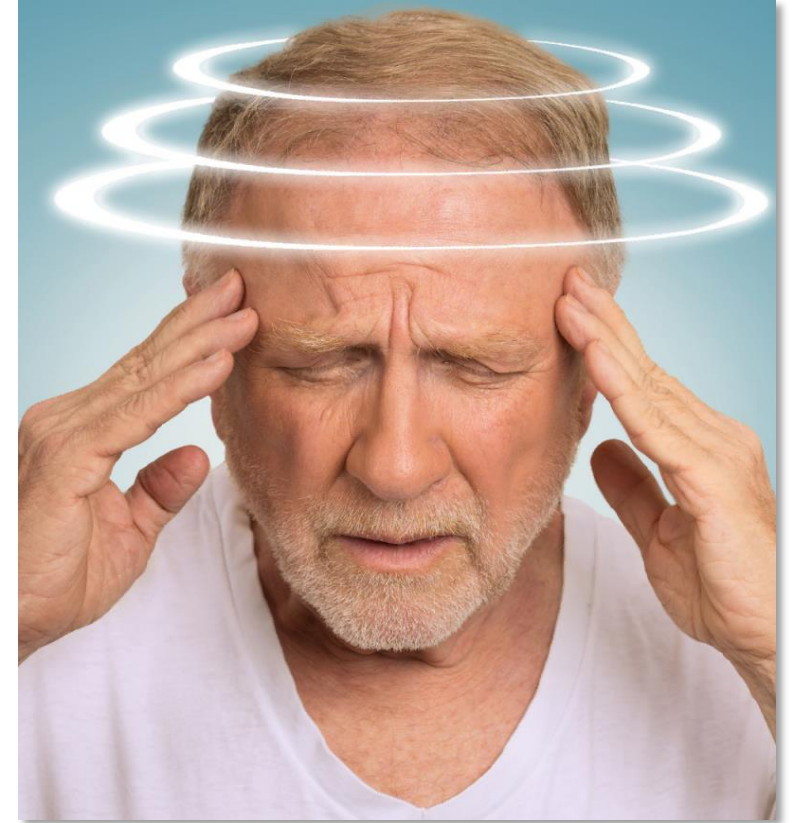
Learns on small then larger data sets. Like us at school BUT faster.

Based on mammalian brain model.
?Maybe will reproduce a lot of our stupidities

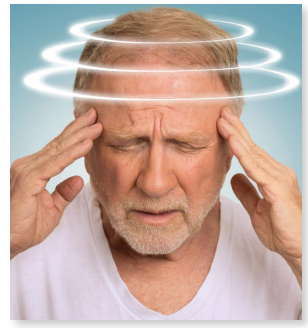


What could have caused this?

A 70-year-old male, at work, feels dizzy, vision foggy, voice sluggish, feels very tired. History of type 2 diabetes and well controlled high blood pressure. May have taken one two many blood pressure medication same morning.



Response



The most likely culprit here is a combination of factors related to the man's age, medical history, and possible medication issue. Here's a breakdown of the possibilities:

Overmedication: Taking too much blood pressure medication can cause dizziness, fatigue, and even slurred speech. This is the most concerning factor given his recent medication intake.

Dehydration: Feeling tired, dizzy, and foggy-headed can be signs of dehydration, especially for someone older.

Underlying condition: While less likely, these symptoms could also indicate a new medical condition, especially given his age.

Here's what to do:

Seek medical attention immediately: Let a medical professional assess the situation. They can determine if it's a medication issue or something else.

Mention the possible overmedication: Clearly inform the doctor about the possibility of taking too much blood pressure medication.

Stay hydrated: Encourage the man to drink plenty of water while waiting for medical attention.

Disclaimer: I am not a medical professional and this is not medical advice. Please seek help from a qualified healthcare provider as soon as possible.

My current uses

Work

- Summarize and do causal analysis
- Literature search

Other

- Letters
- Writing
- Finances
- Retirement Planning
- Etc

Further uses

Interact/prompt/conversation re:

- Retirement advice
- Family matters
- Professional matters
- Financial matters
- Etc

The AI was great at writing medicolegal reports, but it never made friends in the courtroom—it was just too calculating.



**Upload,
de-identify,
summarise
and
cross-reference
with client
in front of you.**



Prompt:
*“Upload,
de-identify and
summarise
these 242
pages of text.”*

The document summarises the medical history of a bus driver who injured her left knee in a bus accident on October 22nd, 2021.

The injury involved a medial meniscus tear.

Timeline of Events:

- October 22nd, 2021: Bus accident resulting in left knee injury (medial meniscus tear).
- September 2022: MRI reveals a full-thickness radial tear of the posterior attachment of the medial meniscus. Begins physiotherapy.
- January 18th, 2023: Undergoes left knee arthroscopy and medial meniscectomy by Dr. xx.
- February 15th, 2023: Reports improvement but cannot walk normally due to overdoing exercise. Cleared for light duties.
- March 1st, 2023: Complains of constant dull ache in knee. Begins taking Naprosyn.
- March 17th, 2023: Cleared to resume driving for 20 hours per week.
- May 18th, 2023: Reports ongoing left medial knee pain and increased analgesic use. MRI shows displaced medial meniscus material.
- May 29th, 2023: Seen by Dr. xx who recommends assessment and treatment for knee pain.
- July 17th, 2023: Dr. Arash Nabavi advises against further physiotherapy and cortisone injections. Recommends cycling and walking for exercise. May benefit from PRP injections in the future.
- September 25th, 2023: Dr. xx notes patient continues to have intermittent discomfort and some stiffness in the knee. Advises against continuing physiotherapy as it makes her knee more painful.

Current Status:

- Reports intermittent discomfort and stiffness in left knee.
- Unable to continue physiotherapy as it worsens pain.
- Advised to manage pain with cycling, walking, and potentially PRP injections in the future.

Additional Notes:

- Patient is a bus driver and experiences difficulty returning to her pre-injury duties due to ongoing knee pain.
- Has undergone physiotherapy and may require further intervention in the future.



How to manage this OT case...

36-year-old man, having a lumbar laminectomy, posterior approach, suddenly his blood pressure drops.

What has happened?



Response



A sudden drop in blood pressure during a lumbar laminectomy could indicate a serious complication. Here are the potential causes and immediate management steps:

Potential Causes:

1. Vascular Injury:

1. Aortic or Major Vessel Injury: During the posterior approach, there's a risk of injuring major blood vessels, leading to significant hemorrhage.
2. Epidural Venous Plexus Injury: Damage to the venous plexus can result in considerable blood loss.

2. Massive Bleeding:

1. Retroperitoneal Hemorrhage: If a major vessel is injured, blood can accumulate in the retroperitoneal space, which might not be immediately apparent but can cause hypotension.

3. Cardiac Complications:

1. Myocardial Infarction: Anesthesia or surgical stress can precipitate a cardiac event, leading to hypotension.
2. Pulmonary Embolism: A dislodged clot can cause a pulmonary embolism, leading to a sudden drop in blood pressure.

4. Anesthetic Complications:

1. Vasodilation: Certain anesthetics can cause profound vasodilation, leading to hypotension, especially if there's hypovolemia.
2. Allergic Reaction: Anaphylaxis to drugs or latex can cause sudden hypotension.

5. Autonomic Dysreflexia:

1. More common in patients with spinal cord injuries, but it can occur due to surgical manipulation, causing a severe autonomic response with sudden changes in blood pressure.

Immediate Management:

Is there a role for tranexamic acid? YES.

1. Helps reduce bleeding by inhibiting the breakdown of fibrin clots.

- It is particularly useful in situations where there is ongoing or anticipated significant blood loss.

2. Timing of Administration:

- Prophylactic Use: TXA is sometimes used prophylactically in surgeries with a high risk of bleeding, including spinal surgeries, to minimize blood loss.
- Therapeutic Use: If there is an acute drop in blood pressure due to bleeding during surgery, TXA can be administered to help stabilize clot formation and reduce further bleeding.

3. Dosing:

- The typical dosing for TXA in the surgical setting is 1 gram IV over 10-20 minutes, followed by a
- continuous infusion of 1 gram over 8 hours if needed. Alternatively, a single bolus dose may be given
- depending on the situation.

4. Safety Considerations:

- Contraindications: TXA should be used with caution in patients with a history of thromboembolic events (e.g., deep vein thrombosis, pulmonary embolism) or those at high risk of thrombosis.
- Monitoring: Patients receiving TXA should be closely monitored for any signs of thrombotic complications, especially if they have underlying risk factors.

When to Consider TXA: During Surgery:

If there is significant bleeding and the source is not immediately controlled, TXA can be

- administered to help reduce the severity of blood loss.
- Postoperative Period: TXA can also be considered in the postoperative period if there is continued oozing or bleeding from the surgical site....
- Not a Substitute for Surgical Control: While TXA can help manage bleeding, it is not a substitute for identifying and surgically controlling the source of hemorrhage.

In summary, tranexamic acid can be an important adjunct in the management of hemorrhage during surgery, helping to reduce blood loss and stabilize the patient while definitive surgical measures are taken.



How to manage this case...

Treatment priorities for this 64-year-old man with unstable angina, has car accident. Has dilated left pupil, pneumothorax, ruptured spleen, open contaminated left tibial fracture, and simple wrist fracture. His BP is dropping.



Response



I'm not a doctor, but I can offer some general information..... given the complex and severe nature of the injuries, here are some potential treatment priorities:

- ABCs Hemodynamic Stability:Intravenous fluids and blood products may be necessary to address the hypotension.
- Cardiac Monitoring: continuous cardiac monitoring is crucial to assess any potential cardiac complications or arrhythmias.
- Pneumothorax Management: A pneumothorax requires urgent attention... involve needle decompression or chest tube insertion to restore normal lung function and prevent further complications.
- Spleen Rupture:surgical intervention may be necessary to stop the bleeding and possibly remove the spleen.
- Head Injury: The dilated left pupil might indicate a head injury. Neurological assessment and potentially a head CT scan are needed to evaluate the extent of brain injury.
- Orthopaedic Injuries: The open contaminated left tibial fracture and simple wrist fracture need immediate attention from orthopaedic specialists. These fractures may require reduction, stabilization, and wound care to prevent infection.
- Infection Prevention:the risk of infection is high...tetanus prophylaxis and antibiotics might be necessary to prevent or treat infections.
- Pain Management:
- Consultation and Collaboration: A multidisciplinary approach....



How to manage this case...

Why does a 23-yr-old man with a L3/4 disc rupture have bilateral spastic gait?



Response

1st answer: I am not a doctor, but I can provide you with some general information that might help you understand the situation better. A 23-year-old man with a large L3/L4 disc rupture and bilateral spastic gait could be experiencing a combination of factors that contribute to his symptoms. It's important to consult with a qualified medical professional for an accurate diagnosis and treatment recommendations. Here are some potential reasons for the bilateral spastic gait:.....

Prompt. *Could it be a tethered cord?*

2nd answer: Yes, a tethered spinal cord could potentially be another explanation for the bilateral spastic gait and other symptoms in a person with a large L3/L4 disc rupture. A tethered spinal cord occurs when the spinal cord is abnormally attached to the surrounding tissues, causing tension and limitation in its movement within the spinal canal. This condition can lead to a variety of neurological symptoms, including gait abnormalities and spasticity. Tethered cord syndrome can result from various factors, including congenital abnormalities, previous surgeries, spinal cord injuries, or even conditions like spinal dysraphism. In your case, a large disc rupture at the L3/L4 level might contribute to the tethering effect on the spinal cord, exacerbating the symptoms.

Symptoms of tethered cord syndrome can vary but often include:.....





What about this...?

“Can computer operations cause CTS?”



Response



Yes, repetitive tasks, including extensive computer use or tasks that involve repetitive hand movements, have been associated with the development or exacerbation of carpal tunnel syndrome (CTS). Carpal tunnel syndrome occurs when the median nerve, which runs from the forearm into the palm of the hand, becomes pressed or squeezed at the wrist. This can lead to numbness, tingling, and weakness in the hand and arm. Factors that can contribute to carpal tunnel syndrome or exacerbate its symptoms include:

- **Repetitive Hand Motions:** Continuous typing or mouse use can strain the wrist, especially if done with poor ergonomics or hand posture.
- **Wrist Posture:** Keeping the wrist flexed or extended for prolonged periods, such as when using a keyboard that's too high or too low, can put pressure on the median nerve.
- **Forceful Activities:** Even if they're not repetitive, activities that require a lot of force through the hands and wrists can contribute to CTS.
- **Vibration:** Tools or devices that cause hand and wrist vibration might increase the risk.
- **Anatomy of the Wrist:** Some people might have a narrower carpal tunnel, which can increase the risk of the nerve being compressed.
- **Other Health Conditions:** Conditions like diabetes, rheumatoid arthritis, or hormonal imbalances (e.g., thyroid disorders, pregnancy) can increase the risk of CTS.

Letter to lawyer who sends you a lot of cases but now owes you over \$200,000.

Pl write a brief polite letter for me.

Dear [Lawyer's Name],

I trust you're well. I wanted to bring to your attention that there's an outstanding balance of over \$200,000 for the cases you've referred to me. While I understand the nature of your work, it's essential for me to address this matter.

I value our working relationship and would appreciate it if we could discuss a feasible plan for settling the payments.

I believe that finding a solution that works for both of us will help maintain our positive collaboration.

Please let me know when you're available for a brief discussion on this matter.

Your prompt attention to this request is much appreciated.

Best regards, [Your Name]

Rules being placed around use

Pres Joe Biden, AI Bill of Rights to safeguard American's rights and safety.

7 AI companies agree to limits, NYT, 21/7/23

Elon Musk supports this.

WA Health dept trying to limit young doctors' using for Discharge Summaries.

Jobs to go/stay (for now...)

- Entry level BBC: "The roles"
- Translation
- Entry level graphic design
- Fast food ordering
- Accounting
- Postal service
- Data entry
- Automation/trucks/cars

- CEOs
- Lawyers/doctors/manual skills
- Graphic designers
- Editors
- Computer scientists, software developers
- Event/PR managers
- Marketing managers
- Pathologists/Radiologists
- IME experts but for how long?
- China-robots vs declining pop issues



Benefits

- As a super assistant
- Analyse DATA
- Research the literature (BUT limited)
- Analyse Causation
- Organize your IME
- REMEMBER YOU MUST CHECK
- Use of Prompts (low creativity)



Problems

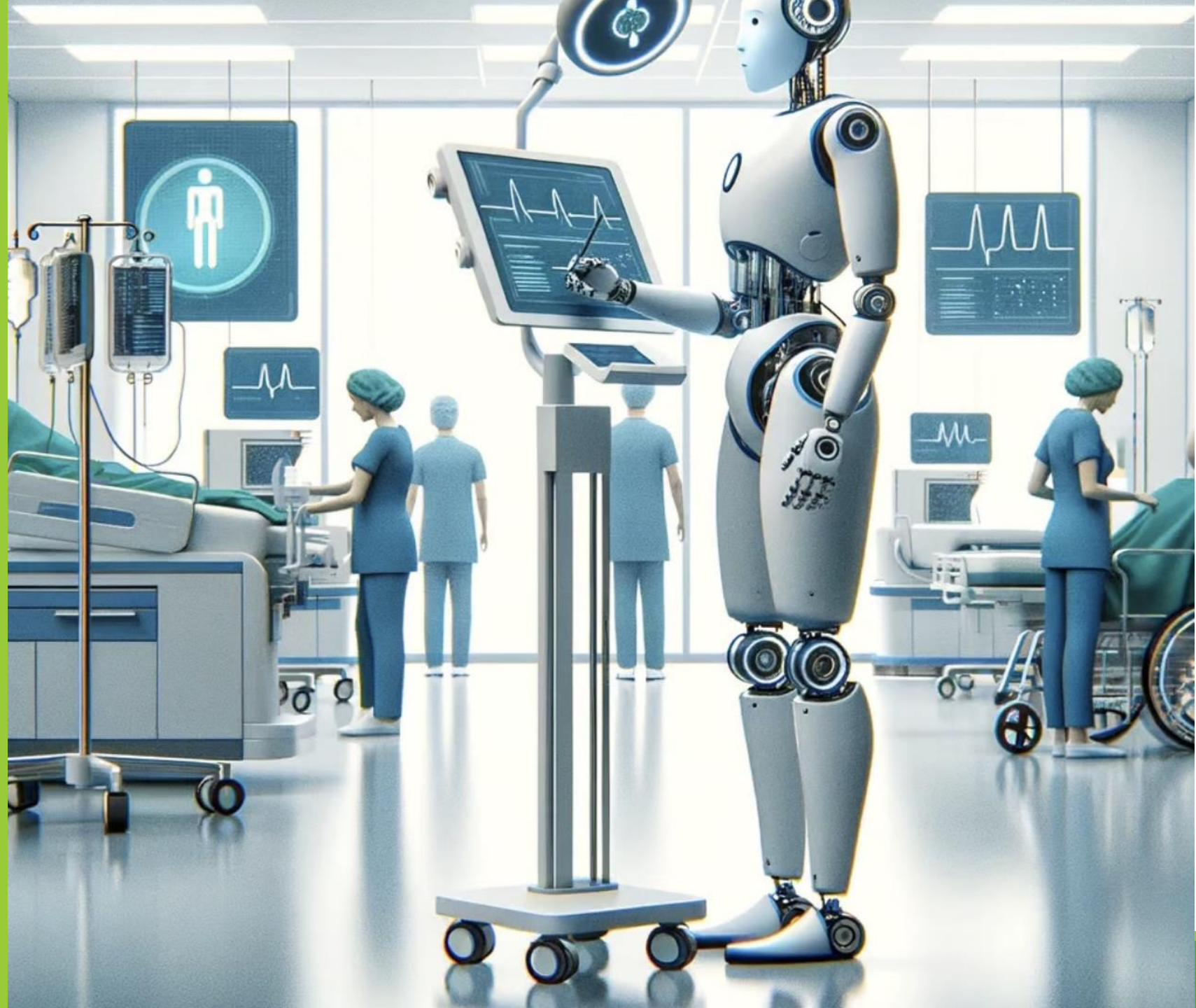
- LIES (hallucinates, Ec mag., 1/3/24.)
 - Good for creativity but dangerous for healthcare)
- Data base to 2021
- Limited access to AMA Guides and to med literature (eg; PubMed)
- Regulations yet to be set (Avant, 13/3/24)

What should I do?

- Don't ignore AI or risk becoming a dinosaur
- Learn how to use it
- TAFE, NSW runs free courses
- AI computers coming

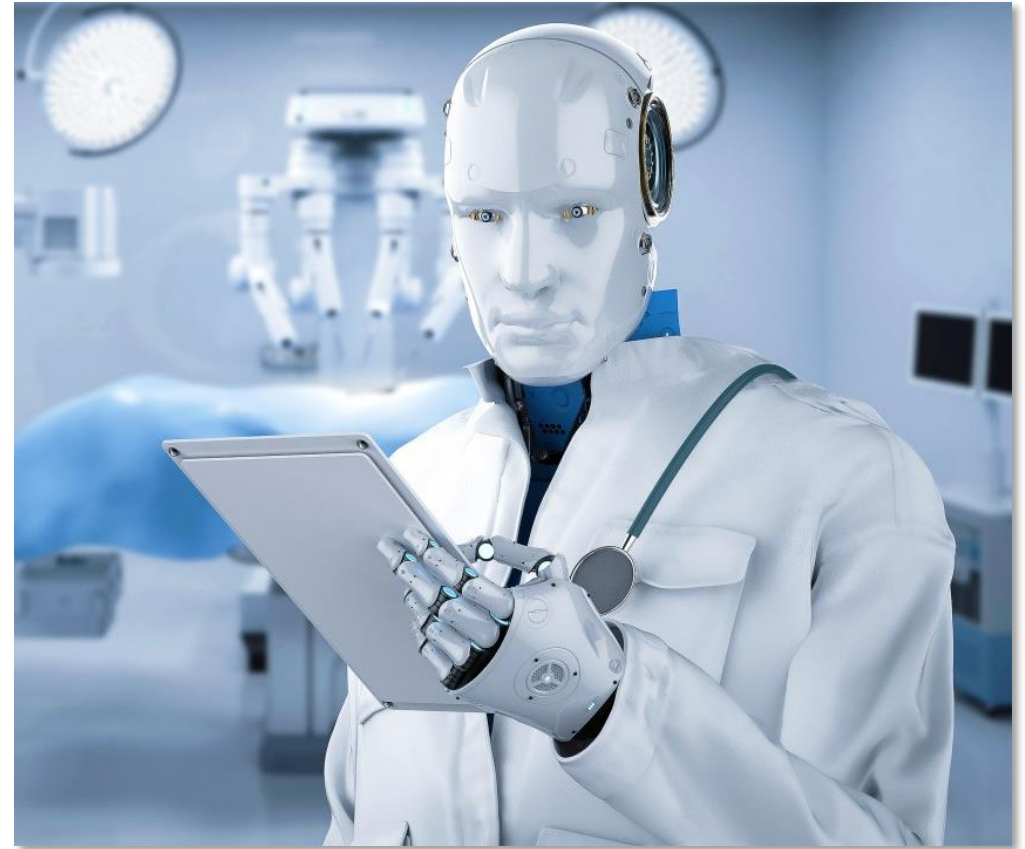


AI may be
taking over
most/all aspects
of medicine
BUT THERE ARE
GOING TO BE
DISASTERS.



The AI doctor will see you...eventually

- Better diagnosis
- Personalised support for patients
- Faster drug delivery
- Greater efficiency
- Save 100,000s of lives
- Save money
- Been slow and mediocre
- BECAUSE- patient safety, accuracy, management/regulation



ChatGPT for medical advice

- CSIRO/U QLD study
 - Correct 80% of the time
- As good as the information they are trained on
- It is untested/unregulated
- “We can’t take it as gospel”



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA



IT'S NOT THE MERCK MANUAL

WARNING!



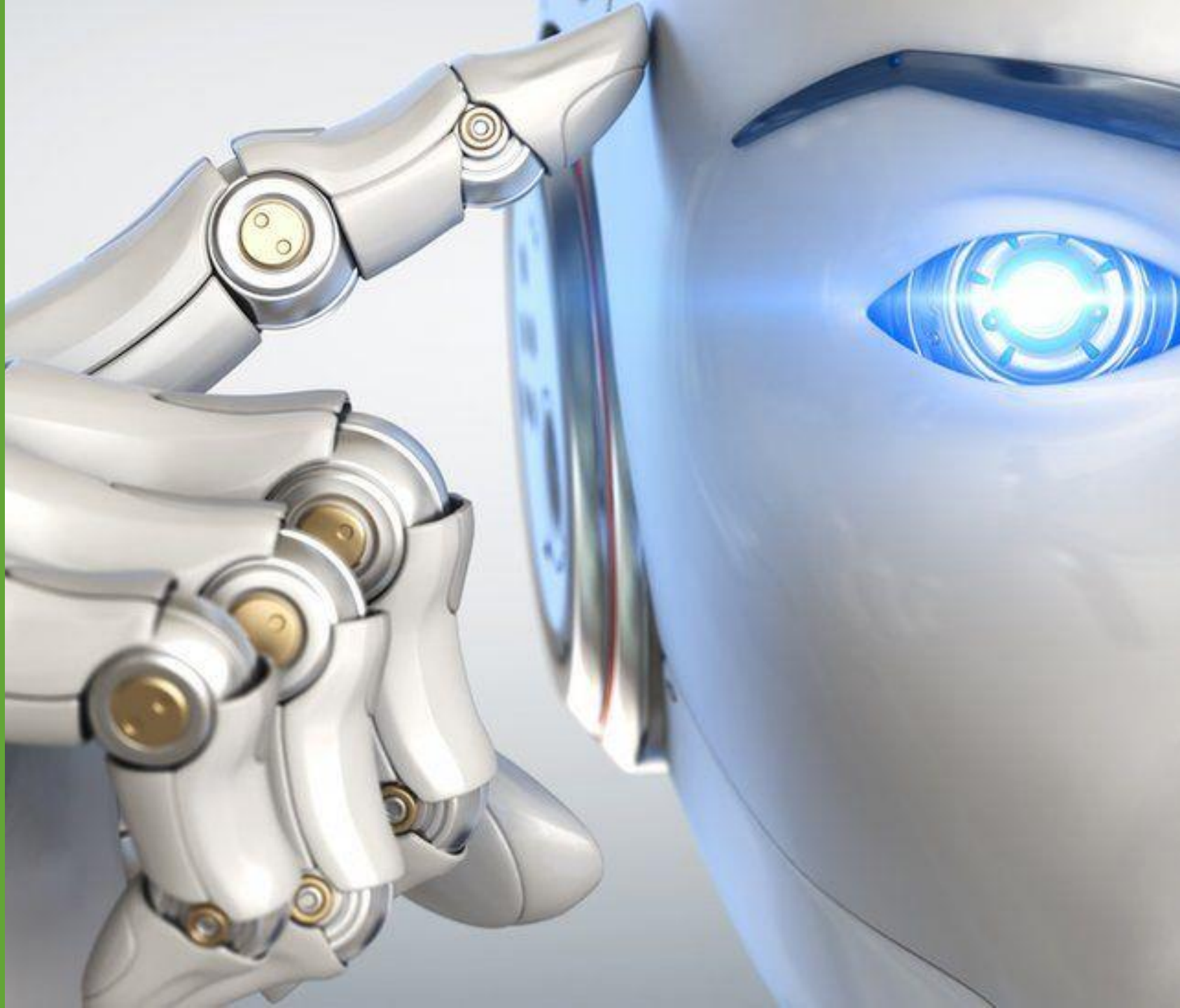
Don't sell/donate your soul and knowledge base to AI (which is counting on this).

NYT already suing AI groups for using their copyright material.

FB has monetarized your personal data.

Don't Trust AI

- It really does lie and cannot be trusted
- Check... check... check...
- Avant webinar update from 4/9/24



Webinar AVANT 4/9/24

- **Clinician takes final/full responsibility**
- Be transparent/get consent/confidentiality/privacy
- Rules based
- Check, as developers lack control
- Several spectacular failures/hackers eg EPIC and Babylon Health
- Radiology- may empower radiographers
- Improves diagnosis and Treatment

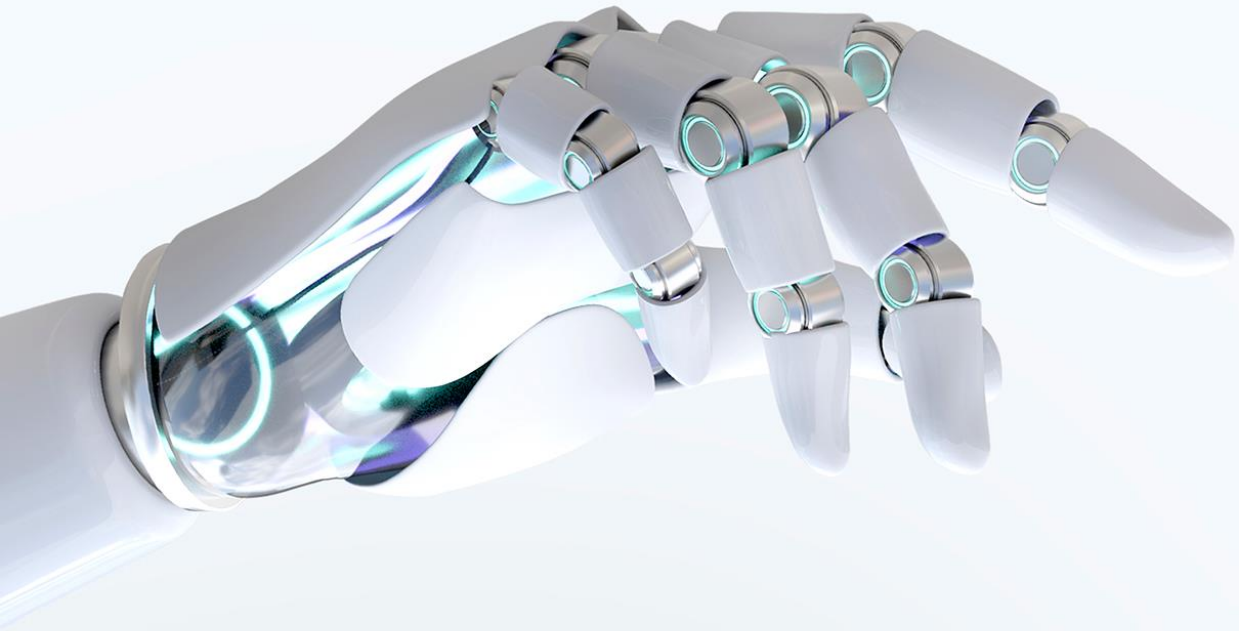
How long?

John Dillinger 1903-1934



AI 1950 -





The background features a complex network of thin grey lines connecting various sized nodes. Some nodes are solid black, some are solid blue, and some are white with black outlines. The overall aesthetic is clean and technical, suggesting a digital or data-driven theme.

AI : HOW CAN IT BE USED IN ORTHOPAEDIC PRACTICE

Dr Anthony Cadden



AOA
AUSTRALIAN
ORTHOPAEDIC
ASSOCIATION

Declaration of Interest

I declare that in the past three years I have:

- held shares in: Healthmemo
- received royalties from: Healthmemo
- done consulting work for: Stryker, Arthrex
- given paid presentations for: Stryker, Arthrex
- received institutional support from:

Signed: Dr Anthony Cadden

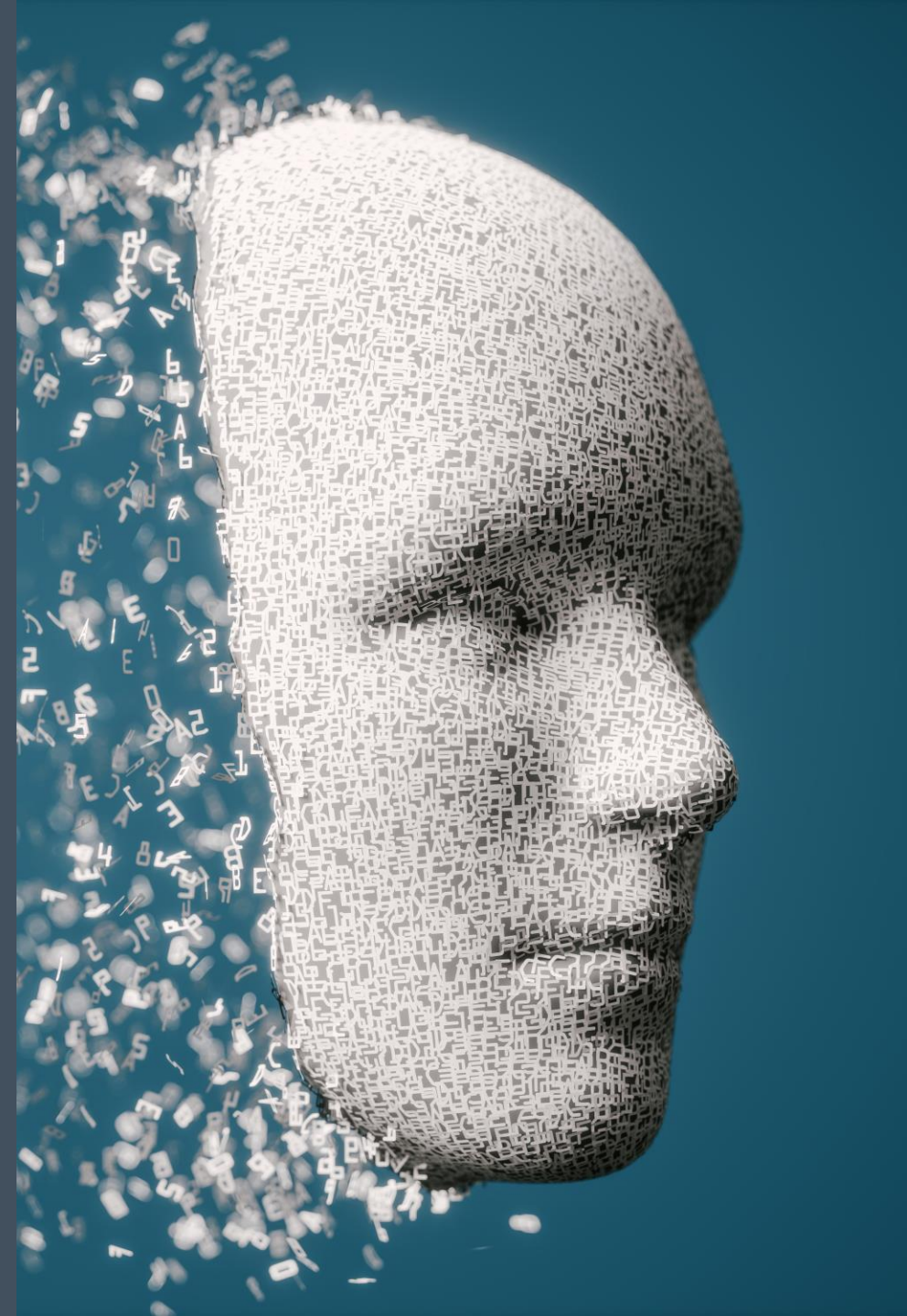


WHAT ARE LARGE LANGUAGE MODELS

- A sophisticated computer program that understands and generates human-like text
- Think of it as a highly advanced autocomplete system that can understand context and generate coherent responses
- Processes and generates text based on vast amounts of training data

GENERATIVE AI

- Most common use with closed source models
 - Chat GPT
 - Claude Anthropic
 - Google Bard
- Users given a chat interface
- A question is asked to the model
- The model gives an answer in conversational English



WHAT IS HAPPENING IN THE BLACK BOX?

- Text is converted to number format for processing
- The model predicts the next most likely token based on the context
- It's like playing a word guessing game, but with incredible accuracy
- Example:
 - Given: "The orthopaedic surgeon examined the patient's..."
 - Model might predict: "knee", "shoulder", "x-ray", etc.
 - It chooses based on probabilities learned from its training data



HOW IS THE MODEL TRAINED? WHAT ABOUT MEDICAL KNOWLEDGE

- Vast amounts of text data are collected from the public internet, including medical websites, journals, and databases
- The model is trained on pairs of questions and answers
- Teaches model to understand questions and provide relevant answers
- Identifies patterns and connections between words and concepts
 - Eg “knee”, “pain” and “osteoarthritis” are related



LIMITATIONS IN MEDICAL DATA

- Quality and availability of medical data can be limited – limited to public available resources
- Some rare conditions may have less representation in the training data
- Recent medical discoveries might not be included if they occurred after the model's training cut-off date
- Privacy concerns can limit access to detailed patient data for training
- Model cannot gain crucial experience through clinical practice



HOW CAN WE USE AI IN MEDICOLEGAL PRACTICE

- AI transcription platforms
 - Listening to the conversation
 - Making notes
 - Creating the letter
- Concerns
 - Accuracy
 - Unregulated space – no TGA like other medical devices
 - How is it trained
 - Quality for medicolegal



HOW CAN WE USE AI IN ORTHOPAEDIC PRACTICE

- Custom GPT's
 - Add web search capabilities to ChatGPT
 - Given specific instructions
 - Will search for topic on web
 - Can provide summary and reference
- Limitations
 - Will do Bing search, often getting info from general websites
 - If article will return free access article – often only 1
 - Will not do search of PubMed articles



WHAT ABOUT MY PRACTICE

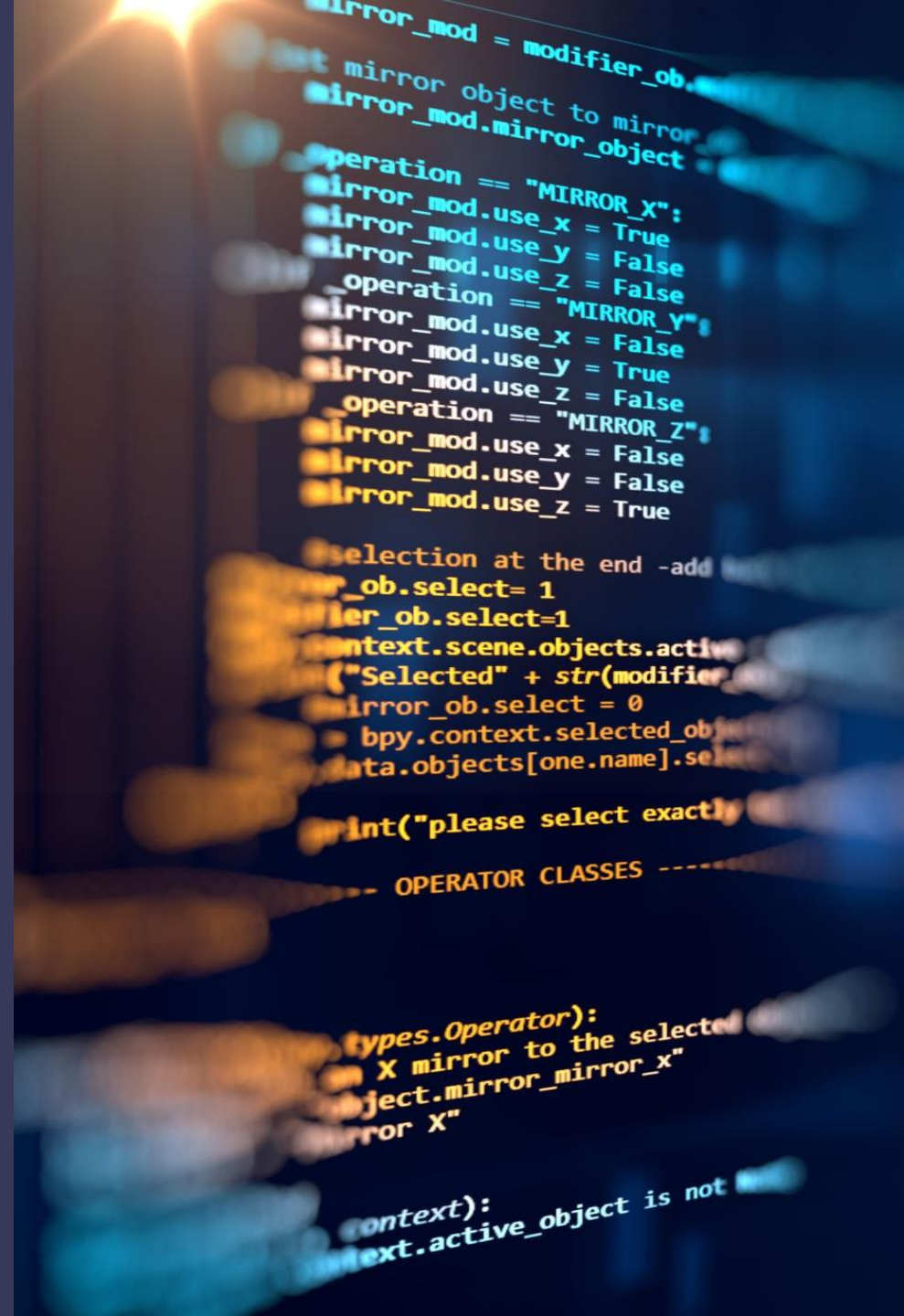
- Changed over the years
- Now Clinical / Medicolegal
- Goal - How can I automate tasks?
 - Reading PDF's for medicolegal
 - Searching through PubMed
 - Communication with patients
 - Keeping up to date with literature



HOW AM I USING IN MY PRACTICE

Custom Software Application

1. Medicolegal document processing
2. Question sentiment analysis
3. PubMed research Agent
4. Document summarization
5. Agentic AI with memory



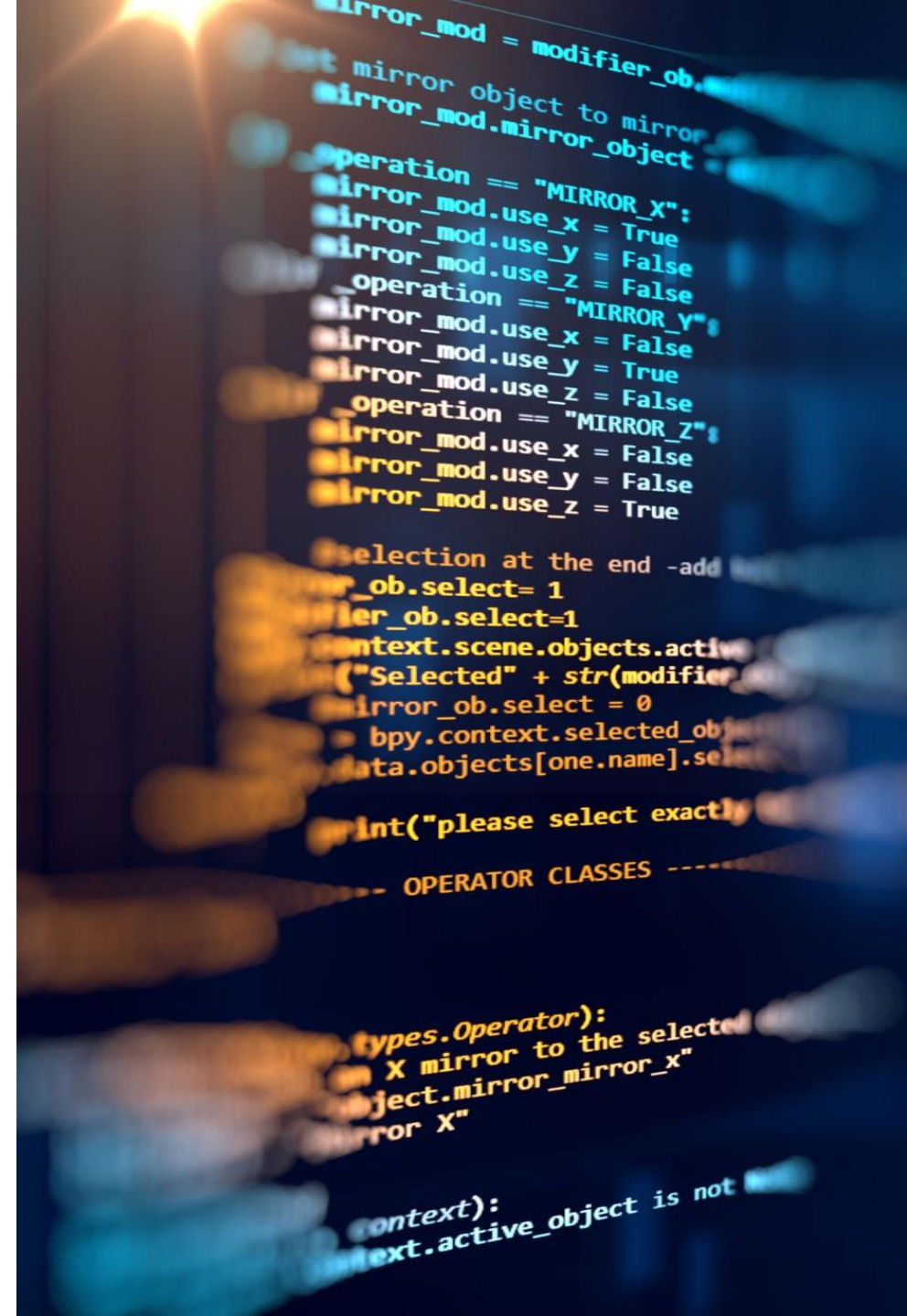
DOCUMENT ANALYSIS

- Time taken to review 10 – 2000 pages
- PDF mixture of text and scans
- Documentation rarely in chronological order
- Easy to miss information
- Time taken to find needle in haystack
- Difficulties searching across several PDF's



HOW CAN AI BE APPLIED

- Goal to keep data private
- Use PDF libraries and OCR models
- Convert unstructured to structured text
- Specialized models and text analysis
 - Categorize Pages
 - Keywords for searching
 - Entity Extraction for Knowledge Graphs
 - Text Embeddings for Semantic searching
- All of this done without the use of LLM



WHAT CAN BE DONE WITH THE TEXT

- Able to search across the pages / multiple files
- Filter for matching pages
- Hybrid Search
 - Use of Keywords and Semantic Embeddings
 - Finds text of similar meaning
- Use of smaller private LLM
 - Create timelines
 - Create summaries
 - Agentic Search
- Calculation of Whole Person Impairment





From:
Emily
Best Legal
123 Legal Lane
Carryon, Plane 2024

To:
Dr. Ju Clair
Mediolegal Reports
456 Assessment Road
Surgoville, Plane 2024

Date: 05/01/2024

Re: Request for Medicolegal Report – Joe Bloggs, DOB 12/12/1987

Dear Dr. Clair,

I am writing to formally request a medicolegal report concerning my client, Mr. Joe Bloggs, who sustained a significant right ankle injury on 01/02/2024, while working at a construction site. The purpose of this report is to assess the extent of Mr. Bloggs' injury, its impact on his ability to work, and any potential permanent impairment resulting from the incident.

Patient Details:

- **Name:** Joe Bloggs
- **Date of Birth:** 12/12/1987
- **Address:** 123 Smith St, Carryon, Plane 2024
- **Occupation:** Construction Worker

History of Injury:

Mr. Bloggs injured his right ankle on 01/02/2024 after stepping into a pothole at his work site. He experienced immediate pain, swelling, and was unable to bear weight on the affected ankle. Initial imaging, including X-rays and an ultrasound, revealed a complete tear of the anterior talofibular ligament (ATFL) and a partial tear of the calcaneofibular ligament (CFL). An MRI later confirmed these findings, alongside moderate joint effusion.

Review and Treatment Summary:

Medicolegal Cases



Cases



New













Search



Status ▾

Client ▾

Doctor ▾

Created	Status	Client	Doctor	Files	Reports	
July 13	processed	Dave Lawson	Anthony Cadden	1	0	  
July 14	processed	Kevin Costigan	Dr Anthony Cadden	1	0	  
July 14	processed	Lisa Davis-Bell	Dr Anthony Cadden	9	0	  
August 10	processed	Joe Bloggs	Dr Anthony Cadden	1	0	  



Timeline of Events

Date: 01/02/2024

Event: Injury Occurred

Practitioner: N/A

Brief Summary: Joe Bloggs sustained a right ankle injury after stepping into a pothole at a construction site.

Treatment: Immediate application of ice, compression, elevation; referred for imaging.

Investigation: N/A

Date: 01/03/2024

Event: Initial GP Visit

Practitioner: Dr. [GP's Name]

Brief Summary: Joe presented with severe ankle pain and swelling following the injury. Suspected ligament damage.

Treatment: Referred for X-ray and ultrasound, prescribed NSAIDs, advised on RICE protocol.

Investigation: X-ray, Ultrasound

Date: 01/09/2024

Event: Follow-Up GP Visit (Post-Imaging)

Medical Appointments and Examinations

- Calendar
- Examination Form**
- WPI Form

Body Diagram

R L

Examination Details

- General Notes
- Body Part**
- Impairments

Right Shoulder

- Motion
- Amputation
- Vascular
- Other Impairments
- Peripheral Nerve
- Notes

Flexion

50 | 180

140

Enable Deduction

Extension

180 | 50

20

Enable Deduction

Abduction

PUBMED SEARCH

- Takes time to get right question
- Filter through abstracts
- Identify relevant abstracts
- Make list of articles to obtain
- Then read through articles
- Apply inclusion or exclusion criteria
- No memory of other searches and findings



AI PUBMED SEARCH AGENTS

- Technique of using agentic flows for research
- Give Question
- Converts to 5 – 10 similar questions
- Keyword and MeSH analysis
- Using API does large search
- The agents can critique abstracts for relevance score
- Produce list, summaries
- Can work on a Sunday !



CONCLUSION

- Can be effective tool
- Make use of its text analysis capabilities
- Learn to prompt – improve results
- Not just limited to ChatGPT or Claude



QUESTIONS

