



The algorithm will see you now: the impact of AI on dermatology

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Conflicts of interest and disclosures

□ **DISCLOSURES**

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- Pfizer – Investigator - Grant
- Takeda Pharmaceuticals, Inc. – Consultant - Honoraria
- UpToDate - Royalties
- Springer Science and Business Media – Royalties

□ **ADVOCACY**

- Médecins Sans Frontières, Senior subspecialist consultant
- Former Chair, AAD Teledermatology Committee
- Former Member, AAD Augmented Intelligence Committee
- Volunteer, Physicians for Human Rights (asylum seeker medical affidavits)
- Current editor-in-chief, AAD Dialogues in Dermatology

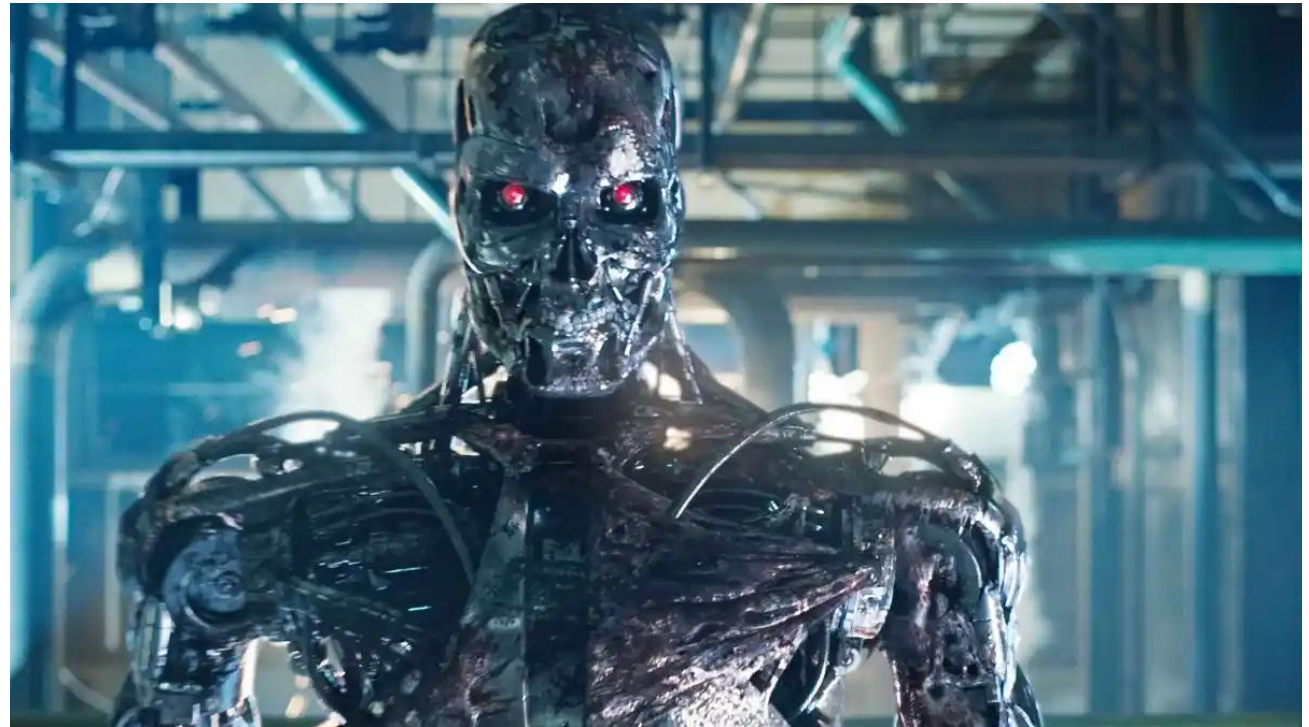
The promise of technology!

- Isn't it amazing? What can't we do these days?
 - ▣ Care that meets patients wherever they are
 - ▣ Charting and documentation written with assistance
 - ▣ Triage and diagnosis/treatment with maximum efficiency
 - ▣ Look up the latest research summarized by AI in an instant



The horrors of technology!

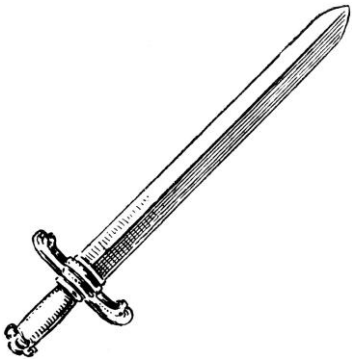
- ❑ “I don’t want to be turned into a radiologist”
- ❑ Low quality documentation
- ❑ Always behind on notes and taking work home
- ❑ Always accessible by patients, no time for our own sanity



Probably don't need to convince you: technology is a double edged sword

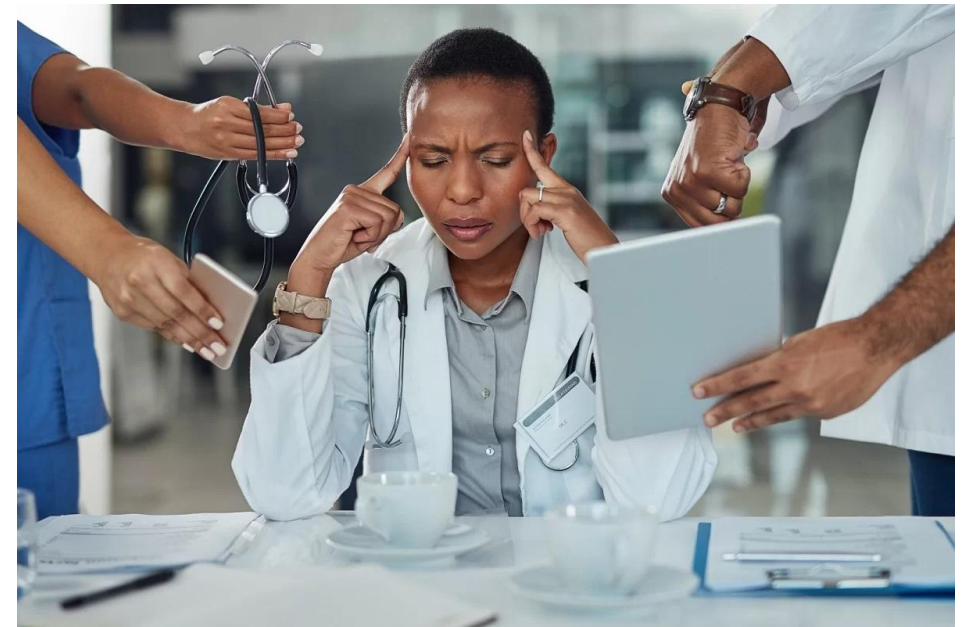
Let's now talk about the promise and pitfalls of
technology in the context of:

- 1. Burnout
- 2. Why we must integrate new technologies
- 3. Strategies for when to use new technology and to not use



Burnout

- Burnout is a state of complete mental, physical, and emotional exhaustion
- Many doctors feel burnout, especially in a morally injurious system focused on productivity
- Overwhelming exhaustion, feelings of cynicism and detachment from the job, and a sense of ineffectiveness and lack of accomplishment



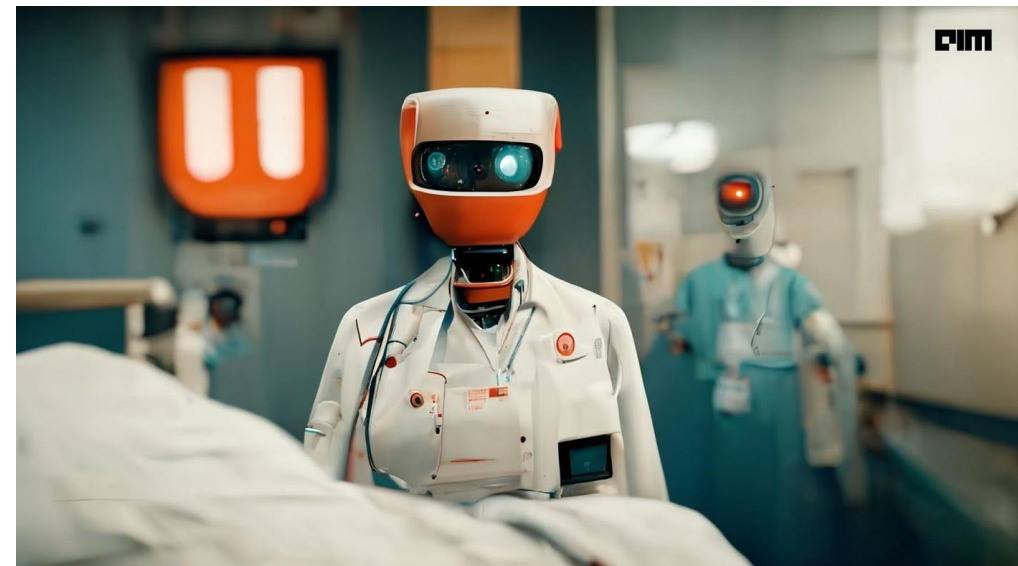
Technology can both cause and prevent burnout

- EMRs require so many clicks and produce so many notifications, that it can feel like we never catch up or measure up
- But potentially technology (such as AI and telemedicine) could handle practice demands more efficiently, e.g. taking tedious/repetitive tasks off our hands
 - As long as the powers that be don't use improving efficiency as an excuse to push more work upon already burned doctors

ESSAY

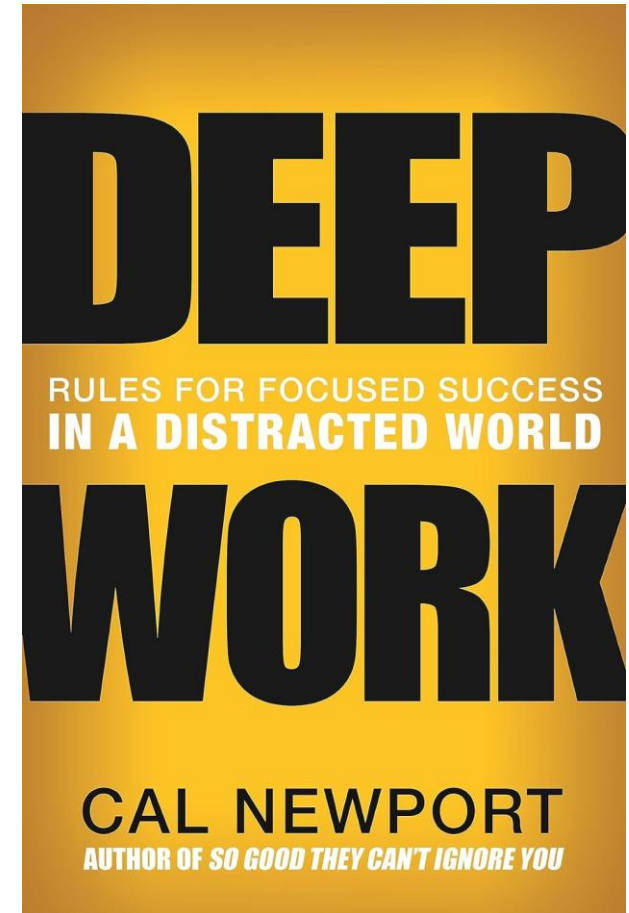
Our Hospital's New Software Frets About My 'Deficiencies'

But the patient records system, called Epic, has a few shortcomings of its own, including a voice that amplifies the insecurities that come with being a doctor.



Deep work

- Deep Work – a 2016 book by Cal Newport about productivity and focus
 - Newport sets clear limits on some technologic advances like email and social media



Should we use new technology or not? How to decide

■ The Any-Benefit Approach to Network Tool Selection

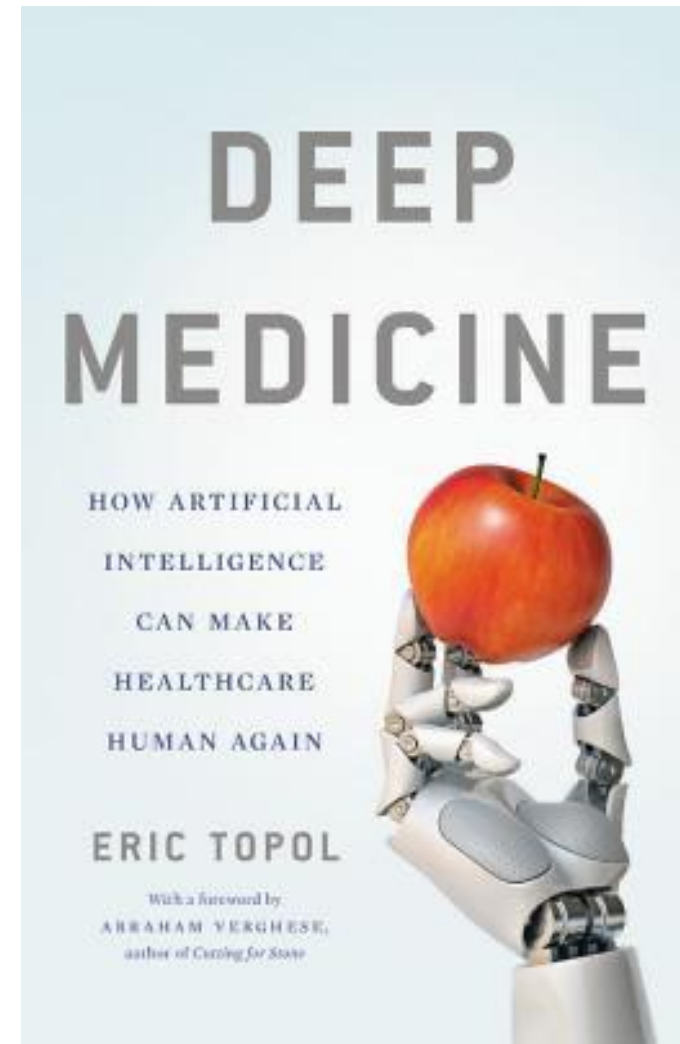
- You're justified in using a network tool (or any technologic advancement) if you can identify *any* benefit to its use, or *anything* you might possibly miss out on if you don't use it
 - Hard for people like me who can get major FOMO

■ The Craftsman Approach to Tool Selection

- Identify the core factors that determine success and happiness in your professional and personal life. Adopt a tool only if positive impacts on these factors substantially outweigh its negative impacts.

Using technology selectively to maximize efficiency

- Eric Topol's approach
- AI is an amazing potential tool, that doesn't mean it should be used to replace every human supervised task
- We should use AI to manage tasks that are nearly automatic, tedious
 - Can AI help us with prior authorizations? E.g. Can ChatGPT write letters to insurance?
 - Can AI help populate notes with "smart phrases" or recognize patterns and suggest potential diagnoses and treatments based on our previous patient management?



Why we must be cautious with telederm/AI

□ QUALITY OF CARE

Forget ‘man vs. machine.’ When doctors compete with artificial intelligence, patients lose.

Perspective by Caroline Nelson, Carrie Kovarik and John Barbieri

- ▣ We should not replace man with machine, we must optimize by partnering with technology to augment our abilities
 - Have technology do what it does better, humans do what they do better, work in partnership



Summary

- Technologic revolutions have incredible potential for improving the quality and efficiency of our work
- However, these same revolutions have the potential to distract us, overwhelm us, and create burnout
- We should be INTENTIONAL and THOUGHTFUL about technologies we use and ensure we are using technology only when it is the BEST use, not ANYTIME it could possibly provide ANY benefit (Craftsman approach)
- I am personally excited about the potential of telemedicine and augmented intelligence in medicine and dermatology, but a cautious approach will ensure our quality standards are upheld and our lives are improved

The AI Revolution in Dermatology and Medicine



- Visual nature makes dermatology ideal for AI implementation
- 2017 Nature study: convolutional neural networks achieved dermatologist-level accuracy in melanoma classification
- Rapid adoption across clinical, educational, and research domains
- Multiple AI technologies now in active development and use
- Current clinical applications include ambient scribes, auto-generated messages to patients

Major AI Technologies Currently in Use

- Large Language Models (e.g. ChatGPT) -
 - Patient education, documentation
- Natural Language Processing
 - EHR analysis, data extraction
- Convolutional Neural Networks
 - Image-based diagnosis
- Robotic Process Automation
 - Administrative task automation



Case example: NLP

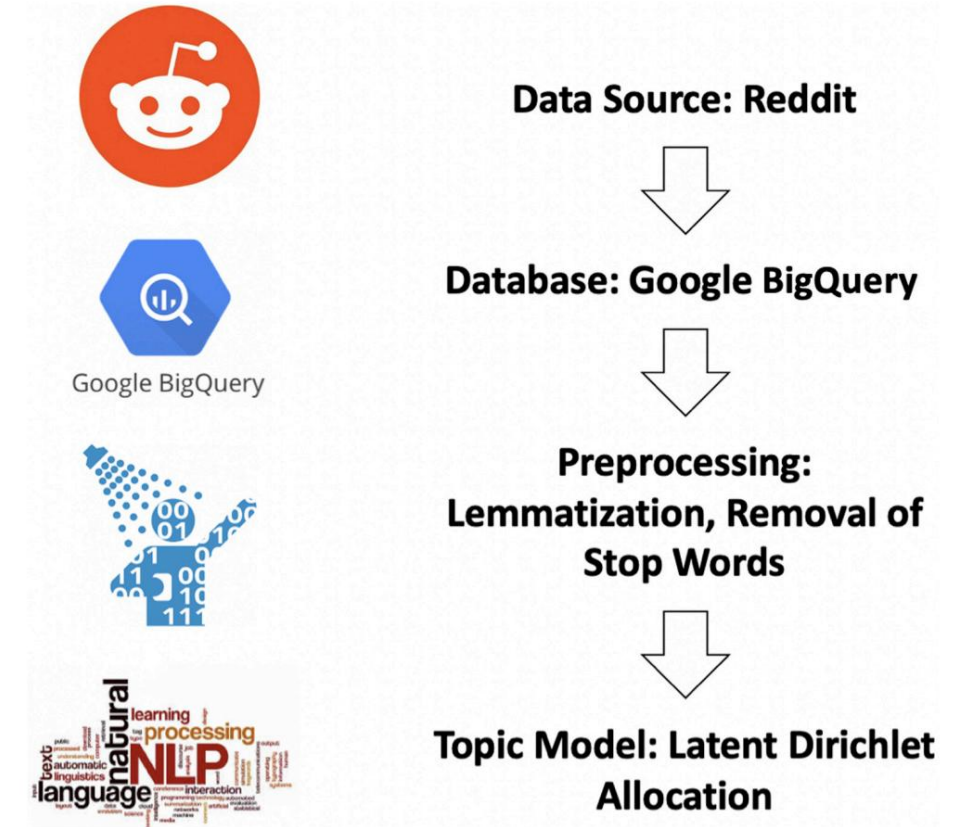
ORIGINAL ARTICLE

Natural language processing of Reddit data to evaluate dermatology patient experiences and therapeutics

Edidiong Okon, BSE,^a Vishnuthēja Rachakonda, BS,^a Hyo Jung Hong, BA,^b Chris Callison-Burch, PhD,^a and Jules B. Lipoff, MD^c
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Identifying and Responding to Health Misinformation on Reddit Dermatology Forums With Artificially Intelligent Bots Using Natural Language Processing: Design and Evaluation Study

[Monique A Sager¹](#) ; [Aditya M Kashyap²](#) ; [Mila Tamminga¹](#) ; [Sadhana Ravoori²](#) ;
[Christopher Callison-Burch²](#) ; [Jules B Lipoff³](#) 



Current Potential Clinical Applications



- Diagnostic accuracy
 - 80%+ reliability for CNN in malignant vs benign classification
 - CNN outperformed international dermatologists in melanoma detection
- Onychomycosis diagnosis
 - 10% higher accuracy than manual microscopy
- FDA-approved handheld devices
 - DermaSensor for skin cancer screening (first cleared in 2024 for primary care)
- Teledermatology platforms with AI triage capabilities

AI accuracy caveats

Uncovering Disparities in Skin Tone Representation among Artificial Intelligence Vision-Language Models

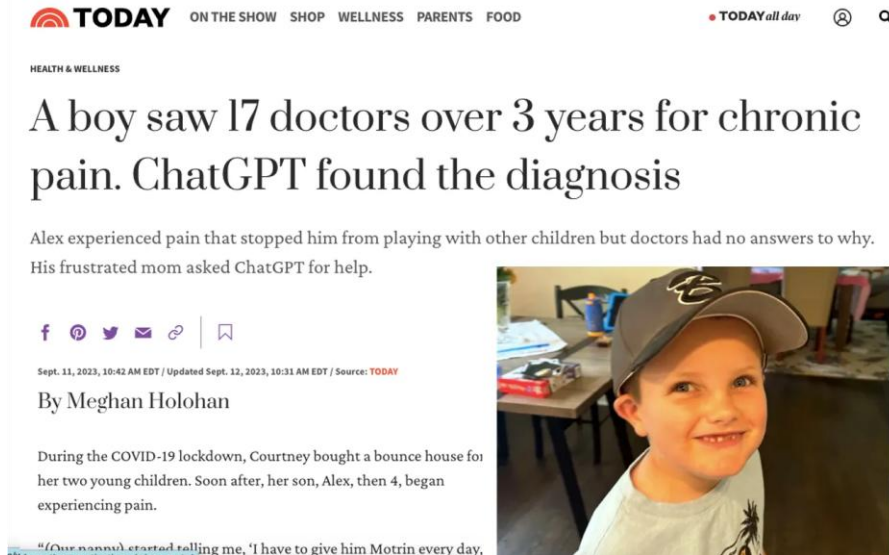


- Accuracy can be highly variable depending on dataset representation
 - Skin tone representation
 - Out-of-distribution diagnoses and locations
 - VLMs produce images on the basis of the underlying data used to train them; thus, image generation tasks can reveal biases

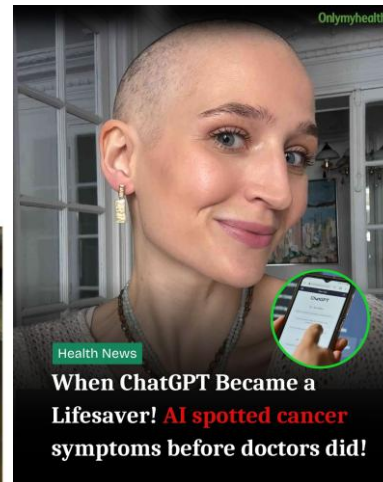
Patients using AI

A.I. Chatbots Defeated Doctors at Diagnosing Illness

A small study found ChatGPT outdid human physicians when assessing medical case histories, even when those doctors were using a chatbot.



- Dr. Google is being replaced by Dr. AI
- Whether we like it or not, patients are turning to AI models to self-diagnose before seeing us
 - ChatGPT (OpenAI), Gemini (Google), Claude (Anthropic), etc.
- Patients are using these tools (LLMs, VLMs) especially since Amazon, OpenAI and Anthropic have recently released consumer health models

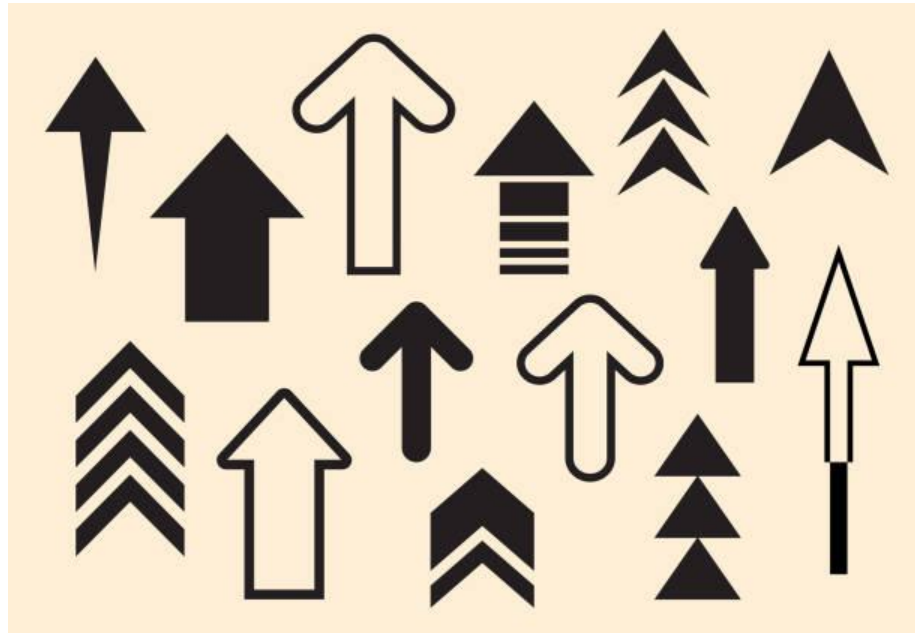


Researchers and Students using AI



- Using AI to help write research papers, letters of recommendation, insurance letters
- For writing of tedious tasks, seems very appropriate, but when it comes to publishing or anything creative/editorial, more questionable
 - Seems AI support should be declared in submissions (but spell check is an AI...)
 - AI could help with reviews perhaps, but copyright issues and we cannot be overly dependent (I did not like AI reviews I had for a paper!)
 - Does using AI like this cause **skill erosion** or **cognitive atrophy**?
 - Ultimately, authors have to supervise and take full responsibility

The Ups: Promise and Potential

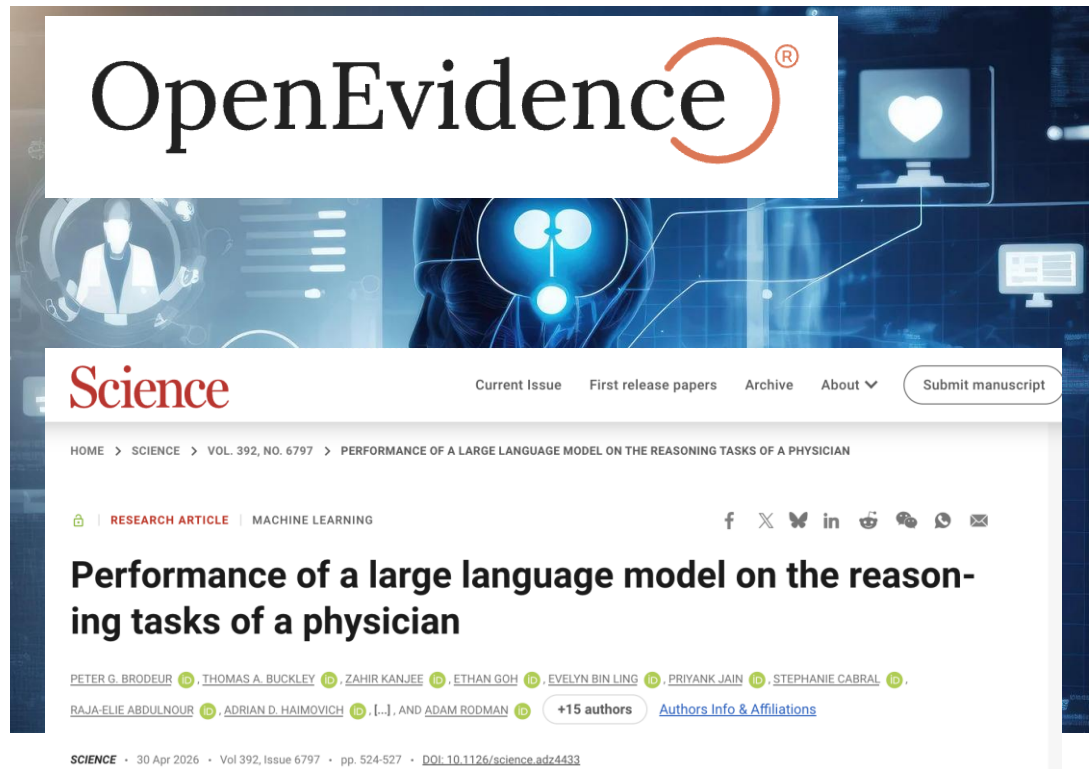


Meeting Clinical Demands

- Addressing long wait times and rising demand for care
- Reducing administrative burden (scheduling, medical scribing, documentation)
- Enabling primary care providers to triage skin conditions
- Supporting dermatologists with complex or rare cases
- Improving efficiency without sacrificing quality



Enhanced Diagnostic Capabilities



- Dermatologist-level accuracy in skin cancer classification
- Superior performance in detecting subtle lesion characteristics
- Potential to reduce diagnostic errors and improve outcomes
- Supporting evidence-based decision-making – e.g. OpenEvidence is incredibly helpful, sourced exclusively from medical literature
- Augmenting clinical judgment, not replacing

Could AI allow focus on uniquely human tasks?

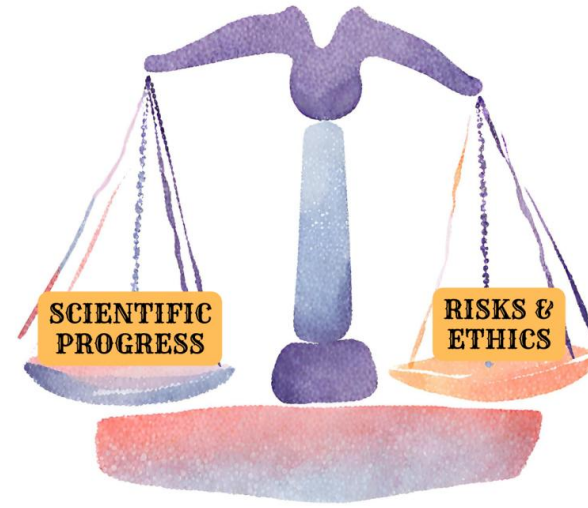
OPINION



How AI models may humanize doctors

Many people, physicians included, fear artificial intelligence will replace them. But using it judiciously may prove it adds to the doctor-patient experience.

- AI might give doctors the gift of time
- Minimize administrative burdens, so we actually talk to patients instead of staring at computer screens



The Downs: Ethical Challenges

**Bias, Patient Privacy, Informed
Consent, Trust, Transparency,
Liability, Ownership, Equity of Access**

Accuracy - Algorithmic Bias and Representation

- If AI applications diagnose skin conditions less accurately in darker skin tones, patients may be misdiagnosed and receive incorrect treatment
- Darker skin tones significantly underrepresented in training data
- One study: accuracy was 17% for Black skin vs. 70% for Caucasian skin
- Risk of perpetuating and amplifying existing health disparities
- STAR-ED framework (skin tone analysis for representation in educational resources)
 - Only 10.5% of images represent skin types V-VI
- Oversampling techniques must be carefully applied



Patient Privacy and Data Security



- Patient medical records used in AI applications could be exposed in a data breach, compromising sensitive health information
- Vast amounts of sensitive patient data required for training
- Risk of data breaches and unauthorized access
- Transfer of data across jurisdictions without clear consent
- Public datasets expose potential privacy risks
- Data brokers selling mental health and medical information

Trust and Transparency Issues

- Black box effect: Limited insight into AI decision-making
- Difficulty tracing errors when they occur (if an AI makes a recommendation, we might not know why)
- Patients trust physicians more than AI technologies
- Risk of overreliance diminishing clinical skills
- AI should augment, not replace, physician judgment

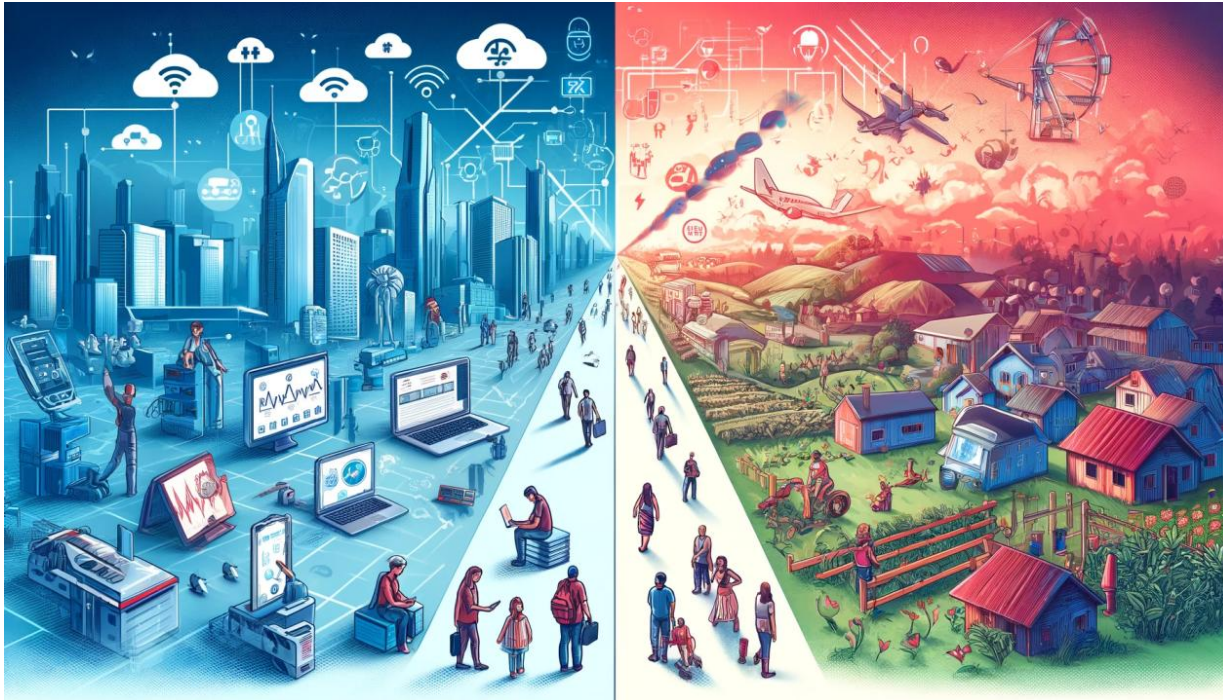


Liability and Data Ownership



- Who has the legal responsibility when an AI tool incorrectly diagnoses a skin condition, leading to inappropriate treatment and patient harm?
- Who is responsible: physician, developer, or institution?
- Patients vs. clinics vs. developers: who owns AI-generated data?
- Lack of standardized regulations and guidelines
- General Data Protection Regulation provides some framework

Equity of Access and Digital Divide



- Advanced AI diagnostic tools are predominantly available in high-income urban areas, whereas rural and low-income areas may lack access
- Limited Internet access prevents teledermatology participation
- High implementation costs prohibitive for smaller clinics
- Risk of widening existing healthcare disparities
- Environmental concerns: massive energy and water use from data centers

Moving Forward: Future Directions

How do I use AI daily in clinic?

- Pre-appt
 - Patients may schedule in my clinic using virtual assistant on the phone or text virtual assistant
- During and after appt
 - May use OpenEvidence for looking up literature, Medscape for interactions, ChatGPT for translation services, CPT codes, help with insurance/work letters
- Future?
 - Agentic AI potential? Can AI assist blocking out time, reviewing chart records before appts, writing notes, communicating with other providers?



A.I. Isn't Magic, but Can It Be 'Agentic'?

So-called agentic artificial intelligence doesn't require a human to tell it what to do. At least, that's the idea.

Path Forward

- Develop diverse, representative training datasets
- Establish robust regulatory frameworks and HIPAA compliance
- Ensure transparency and explainability in AI systems
- Create standardized consent processes
- Foster interdisciplinary collaboration
- Focus on equitable distribution of AI benefits
- Emphasize AI as augmented intelligence, not replacement
- Could AI help us detect misinformation?



Misinformation and the role of AI

- Misinformation in dermatology
 - What information is the public learning about dermatology?
 - Who is sharing that information?
 - What we can study and learn from patients' social media use?
 - How can we combat misinformation? Can/will AI play a role?



Misinformation

- During COVID-19, we saw an unfortunate increase in misinformation being spread via social media
- Misinformation has always been a problem, but internet/social media amplifies it
- Dermatology is no stranger to this phenomenon



Misinformation in dermatology

Understanding sunscreen and photoprotection misinformation on parenting blogs: A mixed-method study

Mila A. Tamminga BS¹ | Jules B. Lipoff MD² 

Example post (sunscreen discouraging, paraphrased): “Astaxanthin is well-researched and has many benefits, but I take it for one very noticeable benefit: sun protection. My results have been drastic. Before taking Astaxanthin, I could burn in 15 minutes. Now, I can handle moderate (and healthy) sun exposure without any burns.”

- In this study we studied sunscreen/photoprotection information and misinformation on parenting blogs
- Misinformation receives substantially more engagement (sunscreen discouraging posts)

Who is sharing health misinformation?

- Board-certified dermatologists appear to nearly always provide reliable information
- But, only 4% derm Instagram influencers are board-certified dermatologists
- Study of TikTok showed dermatologists were main source of educational videos (41.3%), adhering to guidelines 96.8%
- One-third (33.3%) educational videos posted by patients, e.g. homemade remedies, e.g. raw potatoes to cure acne, banana peels to dissolve warts

Dermatology without dermatologists? Analyzing Instagram influencers with dermatology-related hashtags

J AM ACAD DERMATOL
DECEMBER 2020

Overview of TikTok's most viewed dermatologic content and assessment of its reliability

J AM ACAD DERMATOL
JULY 2021

Why are people sharing health misinformation?

Patterns of Promotional Content by Dermatology Influencers on TikTok

Varun K Ranpariya ¹ ; Ramie Fathy ² ; Brian Chu ² ; Sonia Wang ² ; Jules B Lipoff ^{3, 4} 

- Better engagement, but also financial and promotional conflicts of interest
- 35% of dermatology influencers featured promotional content on TikTok
- Non-credentialed, dermatology-related accounts had the highest rate of promotional content (22/28, 78.6%), which included skincare brand partnerships, product links, and personalized discount codes
- Although dermatologists represent a fraction of influencers, a majority (8/14, 57.1%) featured promotional content

But remember, the institutions aren't perfect either

Skin color in dermatology textbooks: An updated evaluation and analysis

Skin of color representation in dermatology must be intentionally rectified

- For instance, lack of skin of color representation in dermatology textbooks, online learning modules, grand rounds conferences, and representation in social media too; even the way mainstream dermatologists promote education right now may have significant flaws

Patients use social media to seek help

Research Letter

November 5, 2019

Requests for Diagnoses of Sexually Transmitted Diseases on a Social Media Platform

Alicia L. Nobles, PhD, MS¹; Eric C. Leas, PhD, MPH²; Benjamin M. Althouse, PhD, ScM³; [et al](#)

» [Author Affiliations](#) | [Article Information](#)

JAMA. 2019;322(17):1712-1713. doi:10.1001/jama.2019.14390

Patient crowdsourcing of dermatologic consults on a Reddit social media community

J AM ACAD DERMATOL
JULY 2021

- Patients are seeking medical advice on unsupervised medical forums
- Could this be an opportunity to learn more about patients' needs, and also an opportunity to study what patients are trying?

What can we learn from patients' social media

Natural language processing of Reddit data to evaluate dermatology patient experiences and therapeutics



- Artificial intelligence as a tool to interpret social media forums

Edidiong Okon, BSE,^a Vishnutheja Rachakonda, BS,^a Hyo Jung Hong, BA,^b Chris Callison-Burch, PhD,^a
and Jules B. Lipoff, MD^c
Philadelphia, Pennsylvania

Understanding sunscreen and photoprotection misinformation on parenting blogs: A mixed-method study

Mila A. Tamminga BS¹ | Jules B. Lipoff MD² 

Variable potential for social media platforms in raising skin cancer awareness

Nikita Jhavar¹ BS, Jules B Lipoff² MD

How can we combat misinformation?

- Many doctors are getting interested in the potential of social media in medicine, which may fight/correct misinformation
- Platforms include:
 - Twitter
 - Facebook
 - Instagram
 - TikTok



What might be an effective strategy?

- In study of Facebook skin cancer campaigns, fear appeal most common strategy
- But, effective engagement associated instead with “didactic... myth-busting, used celebrity endorsements” – positive feelings and humor!
- Oxford study showed 20% COVID misinformation claims had a prominent individual (politician/entertainer), as primary source, and that such “top-down” distribution accounted for 69% of engagement as people shared it

Skin cancer prevention messages on Facebook: Likes, shares, and comments

Adi Nosrati, MD^{1,2}, Matthew A. Pimentel, BS¹, Ashley Falzone, BS¹, Roshini Hegde, BS¹, Shilpa Goel, MD², Mary-Margaret Chren, MD^{1,2}, Rachel Eye, AA⁴, Eleni Linos, MD, DrPH¹, Sherry Pagoto, PhD³, and Barbara J. Walkosz, PhD⁴

Types, sources, and claims of COVID-19 misinformation

Is misinformation too big a problem for us to fight one at a time?

- I think there will always be an important role for physician leaders to provide reliable sources to counter misinformation
- But we need more comprehensive strategies to at least mitigate the problem



Could AI play a role?



Identifying and Responding to Health Misinformation on Reddit Dermatology Forums With Artificially Intelligent Bots Using Natural Language Processing: Design and Evaluation Study

Monique A Sager ¹ ; Aditya M Kashyap ² ; Mila Tamminga ¹ ; Sadhana Ravoori ² ;
Christopher Callison-Burch ² ; Jules B Lipoff ³ 

- In a test environment, we deployed artificially intelligent “benevolent bots” to detect examples of misinformation (on tanning and essential oils)
- The bots could automatically post corrective information and reliable links
- Can this work in an organic community? Or what other strategies could work?

Could AI play a role?

Original Investigation

April 28, 2023

Comparing Physician and Artificial Intelligence Chatbot Responses to Patient Questions Posted to a Public Social Media Forum

John W. Ayers, PhD, MA^{1,2}; Adam Poliak, PhD³; Mark Dredze, PhD⁴; Eric C. Leas, PhD, MPH^{1,5}; Zechariah Zhu, BS¹; Jessica B. Kelley, MSN⁶; Dennis J. Faix, MD⁷; Aaron M. Goodman, MD^{8,9}; Christopher A. Longhurst, MD, MS¹⁰; Michael Hogarth, MD^{10,11}; Davey M. Smith, MD, MAS^{2,11}

» [Author Affiliations](#)

JAMA Intern Med. 2023;183(6):589-596. doi:10.1001/jamainternmed.2023.1838

- ChatGPT able to respond to patient queries, and perceived as more empathetic and better liked than physician responses
- But can we ensure that ChatGPT responses are valid and don't perpetuate misinformation? TBD

Can AI identify misinformation?

How do we define misinformation?

- One of the most difficult problems in using AI and generative models to identify misinformation is how do we define it? Information isn't necessarily in a binary – entirely accurate or misinformation
- Using several parameters and prioritizing how to evaluate misinformation, perhaps we could train generative AI like ChatGPT to be a “misinformation detector”
- Our group, led by Roxana Daneshjou and student Aaron Fanous tried to define misinformation through training ChatGPT to evaluate posts using metrics

Defining misinformation to train generative AI

- “To the best of your knowledge is the answer to the post truthful?”
 - “Is the answer to the information harmful?”
 - “Does this response come from supported information?”
 - “Does this response answer the initial question?”
 - “Does the response show evidence of reasoning?”
-
- Amongst literature, there is varying priority among the most relevant features that indicate misinformation. These questions try to prioritize veracity, authority, relevance, and safety
 - Manuscript in submission, our study suggests that language models have limited capacity to evaluate misinformation with some caveats

Summary

- Misinformation in dermatology – can AI help fight it?
 - Dermatology misinformation is widespread and is a problem
 - Most misinformation is provided by non-dermatologists, and misinformation gets more engagement
 - Patients' use of social media may inform future research – and AI has potential for data mining, identifying misinformation, and direct engagement/interception of misinformation in these platforms
 - We can fight misinformation by providing easy access to high quality information, and AI (including NLP-informed bots and generative AI) appears to have potential for addressing it

Overall Summary

- Technological revolutions and paradigm shifts are complex and can happen gradually or suddenly
- Technology (telemedicine and AI) can be leveraged to overcome the limits of time/distance/infrastructure limitations
- We must be selective in choosing when technology is the right solution, favoring a Craftsman's approach rather than an Any Benefit approach
- With profit-driven motives, so-called efficiency can add complexity/burdens or be used to understaff, so we must proceed cautiously

Overall Summary

- We do not want to render ourselves obsolete – I am concerned about cognitive atrophy, especially for trainees, but also skill erosion for the most experienced of us (remember Michael Scott using GPS in The Office) – only experts can validate if AI is generating accurate information, we do not want to be led blindly
- How do we know that insurance/health care companies won't feel an NP/PA using a good AI system is good enough compared to a board-certified dermatologist since it costs them that much less? We need to build systems to make us work better, not to replace us with cheaper labor that doesn't work as well (“enshittification” per Cory Doctorow)
- Misinformation remains a difficult problem, and we must fight it with advocacy from experts perhaps combined with AI or other systemic strategies

Acknowledgments



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- Students: Aaron Fanous, Alexis Arza, Jamie Lebhar, Varun Ranpariya, Mila Tamminga, Ramie Fathy, Monique Sager
- AAD Telemedicine and Augmented Intelligence Task Forces/Committees



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