Understanding and Utilizing Medical Artificial Intelligence

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SUMMARY

Medical artificial intelligence is cost-effective, scalable, and often outperforms human providers. Its adoption by patients is critical for providing affordable and high quality healthcare. One important barrier to its adoption is the perception that algorithms are a “black box”—people do not subjectively understand how algorithms make medical decisions, and we find this impairs their utilization. We argue that a second, less obvious part of this problem, is that people also overestimate their objective understanding of medical decisions made by human healthcare providers.

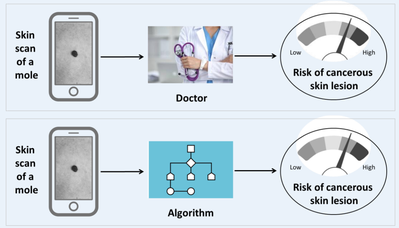
In four pre-registered experiments with convenience and nationally representative samples (N = 2,296), we find that people exhibit such an illusory understanding of human medical decision making. This leads people to claim greater understanding of decisions made by human than algorithmic healthcare providers, which makes people more reluctant to utilize algorithmic providers.

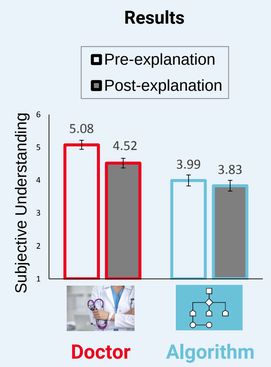
Fortunately, even brief interventions can reduce this illusory gap in subjective understanding by shattering the illusion of understanding for human medical decision making. Moreover, interventions can also increase subjective understanding of algorithmic decision processes, which increases willingness to utilize algorithmic healthcare providers at no expense to the utilization of human providers.

Results from a Google Ads study for an algorithmic skin cancer app with 14,013 impressions suggest that increasing subjective understanding can increase adoption of medical AI in the field. The ad click-through-rate was higher when it briefly explained how the algorithm worked. Reluctance to utilize algorithms is not solely driven by performance concerns, it is also driven by not understanding how they work.

Study 1: Illusion of understanding is greater for a human medical provider than for an algorithmic provider

2 (provider: “doctor” vs. “algorithm; BS) * 2 (pre vs. post-explanation; WS)





Measure: ”To what extent do you understand how a doctor [algorithm] examines the scans of your skin to identify cancerous skin lesions?” (1 = not at all and 7 = completely understand)

Explanation instructions: ”Please explain how do you think a doctor examines skin scans to determine the risk of skin cancer […] What are the steps that a doctor considers […]? What do you know about the order of these steps?“

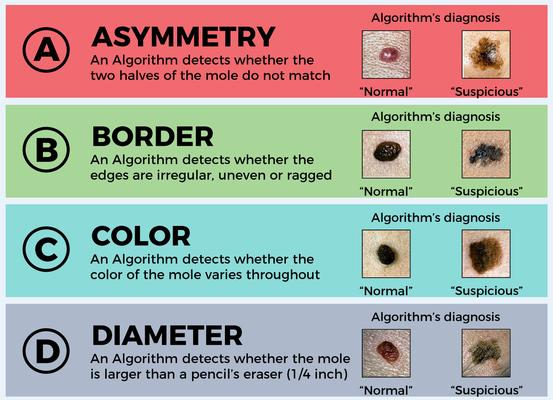
Study 3A-B: Explanations reduce the difference in subjective understanding between algorithmic and human decision making which alleviates algorithm aversion

2 (provider: human “doctor” vs. “algorithm”; BS) * 2 (control vs. intervention; BS)

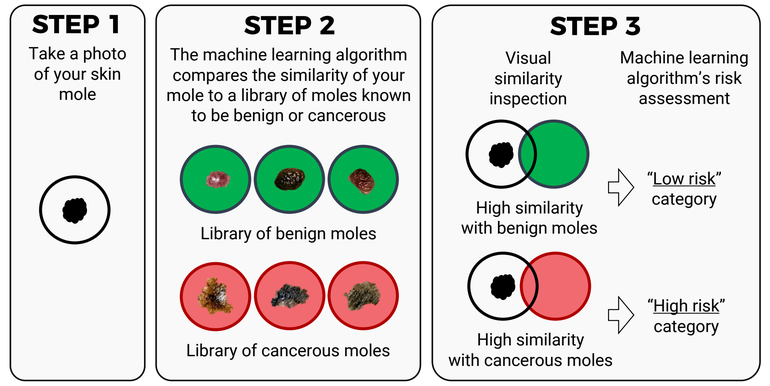
Control condition:
1. Subjective understanding:
2. Utilization intentions: “How likely would you be to utilize a healthcare service that relies on a doctor [algorithm] to identify cancerous skin lesions?”

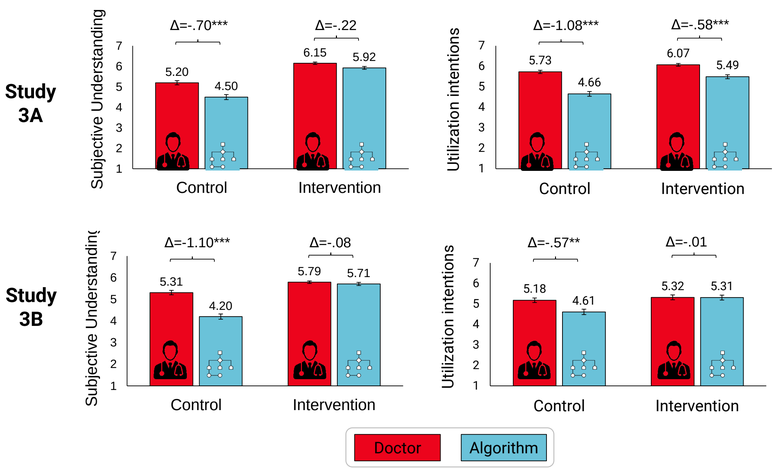
Intervention condition:
1. Subjective understanding
2. Visual explanation of the diagnosis process
3. Subjective understanding
4. Utilization intentions

Visual intervention in Study 3A



Visual intervention in Study 3B





Study 4: increasing subjective understanding can increase adoption of medical AI in the field.

Study using Google Search Ads
- Landing page: Google Playstore page for SkinVision, a skin cancer app
- 5 days, Daily budget of 60 euros.
- Our ads generated 14,013 impressions and 698 clicks.

Control

Skin Cancer Detection App | Checks mole
Ad · play.google.com
Our algorithm checks if skin moles are cancerous moles. Take pictures of your skin with this smartphone app and get a skin cancer risk assessment

Intervention

Skin Cancer Detection App | Checks mole shape/size/color
Ad · play.google.com
Our algorithm checks how similar skin moles are in shape/size/color to cancerous moles. Take pictures of your skin with this smartphone app and get a skin cancer risk assessment

Click-through rate

3.29%

6.36%

OR = 1.99
d = .38
p <.001