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Surprising encounters: how moments of surprise illuminate practitioners' beliefs about AI

Structured abstract

Purpose

The paper develops the concept of surprise as an analytical lens through which to understand practitioners' beliefs concerning Narrow AI adoption in different contexts.

Design/methodology/approach

The paper draws inductively on empirical data collected across pharmaceutical, higher education, and arts sectors, to illuminate how moments of surprise can provide a window to people's beliefs and feelings about the current AI moment. Across the three cases we conducted a mixture of interviews, focus groups and observations with 65 UK-based practitioners. The analytical approach included thematic analysis and close critical reading.

Findings

We examine three categories of surprise that shed light on beliefs: "big surprises" (e.g. encountered in relation to AlphaFold, DALL.E), "everyday surprises" (e.g., unexpected smaller scale successes or disappointments), and instances of "lack of surprise" (e.g. regarding AI outputs and political economy). Together these findings reveal a complex interplay of hope, disappointment and, ultimately, power dynamics around AI development and implementation, that brings widespread AI hype further into question.

Originality

While much prior research focuses on people's expectations and imaginaries of AI, we argue that moments of surprise, i.e. when something happens that contradicts expectations, can illuminate underlying beliefs and how they are challenged in contexts of AI integration.

1. Introduction

Despite surprise being a common human experience, it remains understudied in the social and cultural analysis of data, AI, and other technological advances. While surprise has long been something that researchers might ask participants about, a search for terms about 'surprise' - and related synonyms including unexpected, astonish, wonder, disbelief, startle - in the titles and abstracts of key journals publishing social science research in this field¹ failed to retrieve

¹ Big Data and Society; AI & Society; Information, Communication & Society; Science, Technology & Human Values; Science, Technology & Society

anything of relevance, suggesting a lack of analytical focus on the topic. Similarly, in the context of Information Science, the concept is only really examined in the context of sentiment analysis (Nandwani and Verma, 2021) and serendipity in information retrieval (e.g. Foster & Ford, 2003; Chen et al, 2025). This oversight is particularly striking given the recent surge in technological innovations that have undoubtedly surprised many, for example, generative AI tools such as ChatGPT and DALL.E. In this paper, we adopt an interpretivist approach to explore how moments of surprise experienced by practitioners during the integration of AI techniques and technologies into their contexts of practice can provide a window into their beliefs and feelings around AI.

In a context of ongoing debate about AI developments and futures, social research is often framed in relation to people's expectations and imaginaries, grounded in work on the sociology of expectations (e.g. Borup et al, 2006) and socio-technical imaginaries (e.g., Bucher, 2016; Jasanoff and Kim, 2015). For example, Kerr et al (2020) examine the construction of expectations of 'ethical AI', Bareis and Katzenbach (2022) analyse the imaginaries of national AI strategies, and Jylhä et al (2025) examine young peoples' imaginaries in the context of recommender systems. However, we argue that this focus on expectations and imaginaries while producing valuable insights also has its limitations in terms of understanding the dynamism of people's sense making about technologies such as AI. That is, these contributions tend to pay little attention to how our expectations and imaginaries can shift as we encounter the things that we imagine and hold expectations about, and which sometimes contradict those expectations. Furthermore, even when the unexpected is discussed in this body of work (e.g. Jasanoff's "inequality...of anticipation" (2016, p. 255)), these insights are not considered as moments of surprise that may help to illuminate people's pre-existing beliefs. Yet, in our study on practitioners' beliefs and emotions about the adoption of different forms of narrow AI in their working environment, we found that the emotion of surprise - which indicates an occurrence that is at odds with existing expectations (Alder, 2008) - shed light on practitioners' beliefs, and how they were being challenged in the context of AI adoption.

In this paper, we therefore develop 'surprise' as an analytical lens through which to understand what practitioners' think and feel about the current AI moment. We ask, what can analysis of moments of surprise articulated in inductive qualitative research data tell us about people's underlying beliefs and feelings about the introduction of new technologies such as AI into their working contexts, and what can these insights tell us about the current AI moment? To answer this question, we draw inductively on our empirical research conducted in the UK, which consists of interviews, focus groups and observations with 65 practitioners in the pharmaceutical industry, Higher Education and arts practice. Our research was specifically focused on the adoption of AI such as deep learning models and predictive analytics that are trained on organisational data for a particular task, or individually curated datasets in the case of the artists we spoke with. We use the acronym AI/ML to refer to these specific forms of AI indicating their use of machine learning algorithms. Many of the surprises we identify are therefore related to these forms of AI/ML adoption. However, these instances of AI adoption also sit within a wider context of the arrival of powerful AIs such as DALL.E and AlphaFold that

practitioners also reflected on in relation to their own experiences, and these are also drawn into our analysis.

Through consideration of what is and is not surprising to practitioners and why, we open up new ways of capturing what is happening on the ground in different work contexts and how cultures of practice are navigating the ethics and politics of the introduction of AI into their domain. A focus on surprise, we argue, illuminates not only the beliefs of practitioners, but also the moments when the expectations they produce encounter the “truth logic” (Moreira and Palladino, 2005) that AI is not always as easy or powerful as the hype leads people to believe, and that power ultimately remains centralised within large technology companies such as OpenAI and Deepmind. Our findings lead us to argue that these firms' surprising innovations not only perpetuate hype and influence policy and investment decisions, but that this hype works to obscure the myriad of disappointments, frustrations, and anger that we observe is experienced by practitioners on the ground. We therefore demonstrate how examining moments of surprise can be a valuable technique for unpacking how ideational-material dynamics (Medina Perea et al, 2024) that shape AI futures cohere and evolve. Understanding these dynamics, we argue, is essential for a more grounded account of AI in practice which can better inform investment and policy decision making.

In the following sections, we begin by exploring the nature of surprise from different disciplinary perspectives, prior to discussing the methodological approach we took in our empirical research with 65 UK based practitioners across three distinct sectors. We then go on to present and discuss our findings, focusing on three thematic areas - big surprises, everyday surprises and lack of surprise.

2. Understanding surprise: a review of the literature

The lack of existing research on surprise in the critical data and AI studies field prompted us to look across disciplines into the nature of surprise: when it arises, when it does not, why, what this feels like and what this can tell us in the context of AI/ML integration.

2.1 Unexpected encounters with AI/ML

While common dictionary definitions often equate surprise with unexpectedness, academic definitions offer slightly more nuanced perspectives. For example, Alder (2008) argues that surprise occurs not merely when something unexpected happens, but when it contradicts our established expectations. Lorini et al (2007) further elaborate, suggesting that surprise is an “automatic reaction to a mismatch” between the new event and a person’s existing knowledge, and that it therefore has the potential to result in a shift in beliefs. This understanding of surprise as resulting from information that contradicts expectations, positions it as an “epistemic emotion”: that is, an emotion that is focused on the incongruity experienced when incoming information conflicts with existing beliefs (Muis et al, 2015).

In the context of Information Science, unexpected encounters with information are examined in the context of research on serendipitous information acquisition. Of particular relevance here is later work on information encountering which includes experiences of encountering information outside of information seeking tasks. For example, Erdelez and Makri's (2020) updated model includes information encountered during everyday (non-informational) activities, as well as passive and active information acquisition tasks. Furthermore, building on Jiang et al (2019), they draw attention to how the emotional state before and after the information encounter impacts how people act in response to such events. Research in this field has examined how people feel about such surprising encounters with information e.g. Yadamsuren and Erdelez (2016) reported that people tend to have positive responses to incidental exposure to online news stories, and Bird-Meyer and Erdelez (2018) report journalists enjoy coming across unexpected story leads. Others have examined whether surprising - belief inconsistent - information is more or less likely to be shared online, with Goebel et al (2024) finding that it is unsurprising, belief consistent, information that is most likely to be shared.

However, this body of research does not focus specifically on surprise and how it can illuminate beliefs and feelings in the context of interpretivist, culturally oriented research. Perhaps the most relevant work to such questions in Information Studies comes from research that addresses how infrastructural breakdown can illuminate how a normally invisible infrastructure operates (Starr, 1999). Similarly, the notion of 'glitch' in media studies (e.g. Menkman, 2011), alludes to how errors in digital systems can distract the user into realising they are interacting with a fallible technological object. Building on these various insights from Information Science, Haider and Sundin's (2019) concept of 'frictions of relevance' - which alludes to situations when an information retrieval system delivers something particularly unexpected or against societal values e.g. racist imagery - examines how such occurrences make visible underlying infrastructure and draw awareness to how usually invisible systems function. Such research points to how unexpected events can be methodologically valuable for illuminating things that are not always easily visible, in our case pre-existing beliefs.

Looking beyond Information Studies work, the emphasis on expectations in the definition of surprise leads us to consider the sociology of expectations as a potential source of further insight. The sociology of expectations addresses the performative nature of expectations and their politics, pointing to the ways that some groups have more power than others to make their expectations a reality (Borup et al, 2006; Tutton, 2022). As with the related concept of imaginaries, the emphasis is on how particular visions of the future are constructed and come into being. As Jasanoff (2016) observes there is a powerful politics of anticipation at play in socio-technical expectations and imaginaries, whereby technological elites empowered by readily available venture capital and political support experience a "luxury of positive anticipation" (p. 255), while on the other hand most people can only "accept the promise of benevolent outsiders" (p. 256) that the technological innovations they deliver will be life enhancing. In framing this as an "inequality of anticipation", Jasanoff alludes to how less powerful groups might be faced with unexpected (and therefore, we can surmise, surprising) encounters with new technologies. However, she does not take this further to consider the potential for insight these moments of surprise might have for understanding how they can

illuminate people's pre-existing beliefs, and how these relate to some of the power dynamics Jasanoff alludes to that provide context for the surprise. And, while some in the sociology of expectations - and the related field of hype studies - have examined the disappointment and backlash that can come with unmet expectations (e.g. Borup et al, 2006; Gardner et al, 2015), there has been less attention from Science and Technology Studies (STS) scholars on the moments of surprise when our expectations are challenged. While these insights frame surprise in the context and politics of expectation, they say little about what might be surprising about what AI/ML delivers and what types of flaws in our underlying beliefs might result in a surprising encounter.

2.2 What is surprising about AI/ML and why?

While researchers such as Shank et al (2019) have identified that people can experience a range of emotions, including surprise, when encountering certain types of AI, there is less research that looks behind moments of surprise to question what it is about AI/ML that can surprise a person. To better understand the nature of surprise in the context of AI/ML, we turn to the field of Computer Science where Franceschelli and Musolesi's (2024) analysis of the creativity of Large Language Model's (LLM) such as ChatGPT provides perhaps the most thorough reflection on the topic of whether AI can take people by surprise. While LLMs were not the focus of our empirical research specifically, Franceschelli and Musolesi's (2024) argument translates to examples of AI such as the outputs of deep learning models or text-to-image generators. They note three forms of creativity with related forms of surprise:

1. *Combinatorial creativity*, where the surprise comes from "combining existing elements"
2. *Exploratory creativity*, where surprise comes from "exploring new elements coherent with the current state of the field"
3. *Transformational creativity*, where surprise comes from "transforming the state of the field to introduce other elements"

They conclude that LLMs "might at most" be able to achieve (1) and (2), because of the way that they are trained. Further, they observe that most surprise in response to LLMs is due to either a creative user, i.e. the user prompted the LLM to do something that would surprise another person, or because a person is simply astonished that a machine can do whatever it has done. The mismatch in expectations resulting in surprise therefore is more about unexpected user behaviour or pre-existing knowledge than something within the computation itself being fundamentally unexpected.

This suggests that there are various reasons that a person might experience a surprise in relation to an encounter with AI/ML. A useful framework is found if we shift focus to the field of intelligence studies briefly. Pili's (2022) five categories of surprise aim to account for the different reasons that expectations may be unmet. These five explanations for a surprising encounter are, (1) when something is so novel a social group would have had no inclination of it and therefore no expectations about it. This type of surprise overlaps with Franceschelli and Musolesi's 'astonished' users as well as Jasanoff's notion of 'inequality of anticipation'. (2) when there are two possible outcomes, e.g. a coin flip, and a person expects the wrong outcome they

may experience weak surprise. Next, when something that is perceived to be unlikely due to good subject knowledge happens anyway, yet (3) this subject knowledge is still seen to be accurate or (4) the reason for it being perceived as unlikely is that the person had “incomplete theory to ground [their] belief” (p. 695) i.e. part of their underlying knowledge base is incorrect and needs reworking. And, (5), when an occurrence that is assumed not to be possible happens, and the cause of error in the underlying knowledge base is uncertain and complex to resolve. Pili’s framework, with its emphasis on explaining surprises based on beliefs about what should be expected, thus brings us back to Lorini et al’s (2007) observation that surprise can result in a shift in beliefs. While it is useful to understand what it is about AI/ML that might surprise and the different qualities of underlying knowledge that might result in a surprise, such insights say little about the actual experience of being surprised.

2.3 Experiencing surprise about AI

Critical data studies has a body of work focusing on the emotions and feelings about data and related technologies such as AI. However, similar to the STS literature this work also has little to say about surprise. Scholars such as Kennedy and Hill (2017) have argued for the importance of understanding emotions in our everyday encounters with data, and this is a topic that has been examined in depth in related work. However, there has been no focused attention on the experience of surprise, other than incidental findings. For example, Kennedy (2016, p. 176) reports how participants were surprised to hear about cross platform tracking and Ruckenstein (2023) notes that people may be “pleasantly surprised” (p. 154) by product recommendations among other things. However, the analysis of these feelings of surprise is not taken further, the observations therefore remain incidental rather than a series of moments that can be analysed in more depth for what they can tell us about people’s beliefs, and the contexts they are shaped within.

In disciplinary areas beyond data studies, the nature and experience of surprise as an emotion has been considered in more detail. Sociologists for example have explored the “expressive gestures” of surprise and their relation to “impression management” (Scott, 2021, p. 191), and in psychology there is a longstanding debate about whether or not surprise is neutrally valenced, and if so whether it can be defined as an emotion e.g. Ortony (2022); Vanhamme and Snelders (2001). In the context of this debate, Neta and Kim (2022) argue that rather than being free of valence, surprise is “ambiguously valenced” - it can be experienced as either positive or negative - thus still meeting the ‘valenced criteria’ for being an emotion. Further, Noordewier (2016) notes that surprise has a specific temporality, only occurring as an initial response to events rather than the wide range of positive or negative emotions that can arise after the initial surprise as people process the unexpected event. These insights point to how moments of surprise need to be understood in context, capturing how an experience of surprise is valenced as well as the emotions that might surround it, whether positive or negative.

Through examining practitioners’ experiences of AI/ML integration through these lenses of surprise, we aim to demonstrate how people make sense of the potential of AI/ML to deliver

transformational surprises, as well as illuminate moments when practitioners existing beliefs, i.e. their existing expectations, about AI/ML are challenged, and what this means for understanding the power dynamics of AI/ML adoption and the hype that circulates about its transformational potential.

3. Capturing moments of surprise in AI/ML practice: research methods

The empirical research that we draw on was collected as part of the Patterns in Practice project (<https://lifeofdata.org/site/patterns-in-practice/>), which adopted an inductive, critical interpretivist approach to understand how practitioners' beliefs and emotions interact to shape how they engage with different and contrasting types of applied machine learning and related forms of AI. By practitioners we mean people who work in professions that involve a high level of training and skill, and this meant that all our participants had at least a few years experience in their careers to draw on, with some having decades of experience. In order to gain a diverse range of insights, we worked with practitioners who engage in the computational and technical work behind machine learning systems and their implementation, as well as those whose profession means they engage with the outputs of such systems in their work and those that manage this integration of AI/ML into workflows.

The project focused on UK-based practitioners in three distinct and contrasting sectors: pharmaceuticals, higher education and the arts. The specific AI/ML applications we focused on were machine learning for drug discovery, learning analytics in universities, and artists' use of machine learning and related techniques in their practice. These three sectors were selected as representative of scientific applications involving no data about people, social applications involving data about people, and creative applications that may or may not involve data about people. They were also selected due to their contrasting business models, with pharmaceuticals representing a highly competitive and profitable private sector, higher education a regulated and marketised public service, and the arts a largely independent freelance based sector. Through our selection of cases with contrasting material conditions shaping AI/ML adoption and practitioner experiences, we aimed to capture a nuanced understanding of what was happening across different parts of the economy, as well as identify general themes that cut across these very different contexts of practice.

We recruited participants differently depending on the sector and how it was organised. For the pharmaceuticals case we worked with one multinational pharmaceutical company where we recruited people across three projects working towards new forms of machine learning integration in the small molecules part of the industry (Interview codes Px). For the higher education case we examined efforts to integrate predictive learning analytics into university processes with a non-profit organisation in the UK that supports IT and digital provision in further and higher education (Interview codes EOx), two universities with different experiences of learning analytics adoption (Interview codes EU1.x and EU2.x), and also practitioners in the the non-profit organisation's wider learning analytics network (Interview codes ENx). For the arts case, reflecting the much more independent nature of the sector, we recruited practitioners who

were experimenting with different types of AI/ML techniques through desk research and snowball sampling (Interview codes Ax). All the computational techniques and technologies practitioners were reflecting on (i.e. machine learning, predictive learning analytics) can be defined as forms of narrow AI, that is AI that is programmed to perform a specific task such as predicting student achievement or generating content.

Across the three cases we conducted a mixture of interviews, focus groups and observations with 65 UK-based practitioners. This involved 18 interviews and 2 focus groups in the pharma case conducted by two of the authors (Medina Perea and Fraczak), 33 interviews and 4 focus groups in the Higher Education case and 14 interviews and 3 focus groups in the arts case. Interviews and focus groups were around 60-90 minutes each. The higher number of participants in the Higher Education case reflected our decision to engage with two different universities. Focus groups each had between 3-6 participants who had already been interviewed, and topics focused on emerging themes coming out of interview analysis. All interviewees were invited to be part of a focus group, and they accepted based on their availability. The same two researchers also observed staff and network meetings in the pharmaceuticals case (2 staff meetings) and education case (2 staff meetings; 1 network meeting), as well as a number of arts events (1 festival; 1 exhibition; 3 panels). We used these observations to sensitise ourselves to practitioners' contexts of practice, rather than for formal thematic analysis. Our data collection started in Summer 2022 and finished in Summer 2023.

We initially analysed data from interview and focus group transcripts using thematic analysis (Braun and Clarke, 2006) to draw out the key topics that emerged when practitioners talked about their beliefs and emotions in relation to AI integration into their workflow. Transcripts were inductively coded in Nvivo by the two team members who conducted interviews, prior to extraction of the codebooks for each case for use in two full team workshops aimed at theme generation. In these workshops we identified both sector specific and cross cutting themes, with 'Surprising Encounters' (the focus of this paper) being one such cross-cutting theme. Once themes had been identified, the lead authors re-analysed transcripts to check they were coherent themes and undertake a close critical reading in relation to each identified theme. Ethical approval for the study was gained from University of [anonymised].

4. Surprising encounters with AI/ML on the ground

In the following section we present three key findings related to the 'surprising encounters' theme. We begin by introducing some of the 'big surprises' participants referred to within their industry context, and relate these to Jasanoff's concept of inequality of anticipation. We then move on to discuss 'everyday surprises' that practitioners were experiencing in their practice as they tried to integrate AI/ML into their work flows, which reflect a pattern of some positive surprises alongside many disappointments. Following this we discuss situations that practitioners found themselves unsurprised about, perhaps as a result of experience or because of the nature of the AI/ML they were working with.

4.1 The big surprises

The first type of surprises we identified centered on the unexpected emergence of new AI technologies with significant potential to disrupt sectors, specifically AlphaFold in the pharma sector and text-to-image generators such as DALL.E in the arts. AlphaFold is an AI based on deep learning that was developed by Deepmind. It is trained to predict protein structures, something which is of high relevance within the pharmaceuticals sector. The first version AlphaFold 1 was launched in 2018, and while the results were impressive it was AlphaFold 2, released in 2020, that was widely perceived as groundbreaking, far surpassing the results of other protein structure prediction models. Similarly, while text-to-image generators began to emerge in the mid-2010s, it was 2021 when Open AI's DALL.E became the first to capture widespread attention, with more powerful releases in 2022 and 2023, alongside similar models from competitors such as Stable Diffusion and MidJourney. While 'big surprises' have also hit the higher education sector e.g. ChatGPT, our participants rarely mentioned them. This was likely due to ChatGPT and similar technologies having little direct connection to learning analytics, and therefore not being a key point of reflection in relation to our interview questions unlike in the other cases.

In the pharmaceutical and arts sectors, on the other hand, such developments in AI technology were experienced as highly surprising, yet how this surprise was valenced varied across the two different domains. In the pharmaceutical sector surprise tended to be positively valenced in that practitioners were impressed by the scientific advance they observed with AlphaFold despite some voicing concerns about the growing role of big tech in the industry. Arts practitioners on the other hand tended to express more negatively valenced surprise with concerns arising about the extractive data practices underlying GenAI.

Pharmaceutical practitioners were somewhat awed by the capabilities of AlphaFold (P01; P02; P07; P09), describing it as a "massive breakthrough" (P14). They explained the scale of the protein folding problem that was being targeted:

"It's been described as the most challenging problem in molecular biology for decades now." (P01)

And, while some questioned the hype that this problem had been entirely solved by AlphaFold (PP14), they were nonetheless surprised by the powerful capabilities of Deepmind's algorithm:

"It took me by surprise when it happened... I haven't seen [...] something that will take my breath away quite as much." (P01)

"People are excited, and I think that's a great thing... I think everyone was surprised by quite how well [Deepmind] did." (P14)

Yet, the big tech driven context of these developments did raise some concerns:

"Maybe it could be that in pharma things move slowly and they move slowly for a reason. And the company understands there's a lot of regulations, and there's a lot of moral issues ... Which I don't think that that sort of culture of obeying regulations exists inside Google, or Facebook, or any of these companies." (P01)

On the other hand, the surprise we observed in the arts sector regarding the release of text-to-image generators was very differently valenced. For some of the artists we spoke with the fact that image generation had been automated had taken them by surprise:

"Certain things like illustration...actually, it's very surprising that that's one of the first things that could be, in theory, automated. It's not what I would have predicted even a few years ago. So, it's been quite a surprise to me." (A10)

Similar to the practitioner that framed the surprise of AlphaFold in the context of risks from big tech involvement in the pharmaceutical industry, the arts practitioners tended to frame their surprise in relation to a challenging social context of economic austerity and corporate power, leading some to voice dystopian concerns about what further surprises may result in the future:

"What's kind of alarming is that you tend to be surprised by things large corporations are doing. So Midjourney...and so on." (A09)

"I think that there's some very weird, scary surprises I think possible from AI as well." (A11)

For many in the arts, the surprise also turned to anger with concerns arising about the extractive data practices underlying GenAI:

"And so, yeah, I guess there is an anger there about these tools being misused and a concern, and like a need to do some kind of intervention." (A02)

"I think just the way that, you know, the datasets of these models are just being used, without really any respect for the people who've created the things that are going into the dataset...it really doesn't sit well with me." (FG 1, A10)

Across both contexts, practitioners' surprise in response to the release of AI models such as AlphaFold and DALL.E aligns with Jasanoff's (2016) concept of inequality of anticipation. While Jasanoff's primary focus is on the global poor, we also observed this same phenomenon among skilled practitioners in the Global North. In this context, tech companies such as Deepmind and OpenAI were clearly cognisant of the capabilities of the models they were developing while many people, including those that would be impacted - either positively or negatively, were in the dark, leaving them to be caught by surprise when the models became public knowledge. In both cases, we see people "astonished" (Franceschelli and Musolesi, 2024) by machines that can predict protein structures and illustrate images. These surprises can be understood in terms of a "lack of expectations" (Pili, 2022) around advances in text-to-image generators in the arts

and “incomplete theory to ground belief” (Pili, 2022) that such fast improvement in predictive capacity was possible in the case of AlphaFold.

4.2 Everyday surprises

Beyond the politics of anticipation, we also observed more mundane, everyday forms of surprise. The nature of these surprises was often similar to the incidental forms of surprise mentioned in the literature e.g. Ruckenstein’s (2023) brief observation that participants were “pleasantly surprised” by recommendation algorithms. However, when we dug deeper behind these types of surprise we found that, similar to the big surprises, they also illuminated practitioners’ existing beliefs that had been punctured by the moment of surprise. These types of surprises tended to fall into two key groups: surprises related to AI/ML technology and surprises about people and society.

Positively valenced everyday surprises

Beyond the big surprises experienced in relation to the advent of technologies such as AlphaFold, practitioners across sectors identified occasional examples of surprises they had encountered in their everyday practice:

“Internally in my work, I haven’t seen...something that will take my breath away quite as much, but there still have been a few projects where the algorithms have clearly found things, patterns in the data that the human mind has been unable to see... so that always surprises me.” (P01)

“We picked one up early on and looked at it and I was really surprised at what it could do...surprised deep learning for molecule generation worked.” (P03).

“The predictions on a couple of occasions have been surprisingly good, but only very few...I haven’t really had many moments of, wow, I didn’t know this was going to happen.” (P04).

These surprises suggest prior beliefs that AI/ML would not be able to deliver results in particular parts of the industry, particularly in the area of the industry we were researching which has a long history of machine learning adoption meaning the easier tasks with higher potential had already been tackled.

Similarly, artists spoke of everyday moments of surprise as they engaged in new human-machine collaborations, reflecting forms of “combinatorial”, or potentially “exploratory”, creativity (Franceschelli and Musolesi, 2024) resulting from their work:

“There is room for interesting things to happen... allow you to recombine concepts, to fuse styles, to imagine things that you might never have been able to imagine or visualise, to have a conversation between an artist and a piece of technology that is surprising.” (A13)

“You want to sort of figure it out through experimentation. And those kind of like surprising things that happen through that process, is – yeah.” (A10)

“We switch it on and then we’ve got hands off. It’s then just down to the audience and the AI..... we’re often surprised by the direction it takes.” (A12)

Disappointing everyday surprises

In the education context these positive surprises tended to appear as occasional anecdotes about a learning analytics system making a surprise prediction about a student who was struggling without staff being aware. However, in practice such surprises were rare, and more often the surprise was in experiencing disappointment that the predictions were not more insightful:

“I went into the project expecting far more examples like that. [But] what we were finding was [the tutors] were telling us that the [system] information is...really just confirming what we already know.” (EU105)

These disappointing surprises, caused by AI/ML not living up to the promises made of it, were also experienced in a different way by an artist who, when asked if anything had surprised them, spoke about the way the shiny interfaces of AI/ML betray a more clunky experience of getting the machine to work well:

“I mean it’s quite nightmarish to be honest, like [laughs]...everything breaks constantly and you realise how ‘hacky’ everything is in this software world.” (A14)

One significant source of surprising disappointments related to the underlying data needed to train AI/ML models, particularly when practitioners were in a context where organisational data was being used (see also Bates et al, 2026). Many in the pharmaceutical sector spoke about not having sufficient high quality data to train, for example, new deep learning algorithms, and for some this challenge came as a surprise:

“I was expecting it to be easier. I was expecting everything to be in place, all the data would be very well kept and all I had to do was build the models and it would just work. I think things have been a lot more challenging building the models than I thought. Making sure the data’s correct and it’s clean and it’s – you know, interpreted by the algorithms very well. So that’s been a small source of frustration.” (P01)

Similarly in the Higher Education sector, learning technologists were surprised to find that the quality of data that could be used to train algorithms to predict students’ likelihood of success was insufficient:

“Honestly, so we thought our data was quite good....[we were going] to bring those data fields - mainly from your student record system, [we] were going to bring them all into the

learning analytics solution, and it should have been really, really easy. But when we started to look at it, we realised how unclear our data was.” (EO02)

These surprises around the technology point to a mixed experience of navigating ‘true’ (Moreira and Palladino, 2005) AI/ML in the context of AI hype which promises so much. While the skeptical were surprised to find some valuable uses in this context, many others found themselves to be surprised to experience disappointments around things such as the outputs, experience of using AI technologies, and the availability of data needed to train models.

Surprise about others actions

These everyday surprises sat alongside further surprises they experienced in relation to how other people and society more broadly were engaging with and changing in response to these new technologies, often in ways that were judged negatively given misalignment with the participants' own values.

Some pharmaceutical and arts practitioners spoke of surprise regarding industry developments, voicing skepticism about the things they were observing:

“Maybe a little bit surprised about some of the rate of growth of some of the smaller specialist companies in this area...I think there is a bit of hype and a bit of a bubble around this at the moment. I don't think the rate of growth of some of this stuff is sustainable.” (P02)

“I mean...the Rembrandt selling for a huge amount of money, that was surprising, but it was kind of funny.” (A05)

And, in the education sector, one participant spoke of their surprise about higher education institutions contributing to the hype around predictive learning analytics by making false claims about the power of such technologies

“I am a bit puzzled that some of the studies coming out of the [university] claim to have made discernible impacts on retention because...yeah, that was not our experience is all I can say.” (EU103)

Practitioners in the pharmaceutical sector also shared their surprise about how other practitioners in their sector were engaging with these developments:

“I'm a little surprised [about] how much draw those startup companies, the AI specific technical companies, have....I'm quite surprised how drawn some people are to the specific machine learning side of things rather than the machine learning and drug discovery context because I would have thought more people would like to be in an environment where they can do AIML and they see the end product is a drug that could help patients rather than it's just, you know, a computer programme.” (P02)

Similarly, artists spoke of surprises about how fellow practitioners were drawn towards AI in ways they wouldn't have expected:

"I think the maybe shocking thing is that – is artists using data mining, but like, but not necessarily in an opaque way. So basically, making pieces of art but not necessarily talking about how that sits with the rest of society." (A02)

"I've been surprised that even some of my contemporaries, who I wouldn't have imagined to get involved in this ["rouge art world"], have done so, and they've done so at the expense of institutional critique, at the expense...of critique in many forms, and I don't blame them, you know, 'cos if they can make money where previously they couldn't...I don't bear a grudge. We all have to survive." (A13).

These different forms of everyday surprise in response to work around AI/ML, point to the complex "data assemblages" (Kitchin, 2014) that these developments are evolving within, with surprise occurring as people make sense of existing data infrastructures, new marketplaces, changing practices, financial investments and so on. The everyday nature of these surprises points primarily to them being the result of people having "incomplete theory" about AI/ML to ground their pre-existing beliefs (Pili, p. 695), resulting in either positively or negatively valenced surprises when things happen that counter expectations. These incomplete theories, or beliefs that pre-existed the moment of surprise, include beliefs about the potential of AI/ML techniques, the availability of training data, people's actions, and the nature of business in the sector. In some cases the surprises contributed to an ongoing recalibration of beliefs e.g. to become a bit less skeptical about the potential of AI/ML to deliver useful results, take away a deeper understanding about how capitalist economies function, or provide a reminder that their peers may hold significantly different values when it comes to selling their labour or engaging uncritically with AI/ML developments.

4.3 Lack of surprise

While the above two sections focus on what practitioners perceived as surprising in their encounters with AI, in this final section we discuss what practitioners said they were not surprised about and consider what this may illuminate about how people are making sense of the current AI moment in the context of their work. Our findings point to the ways that the outputs of AI can be quite conservative with practitioners not experiencing them as surprising, as well as, for some, a critical appreciation for the capitalist context that AI is developing in.

Across the three sectors practitioners noted that people tended not to be taken aback by the results of AI/ML. While they may have had moments of surprise about what it was possible for an AI machine to do and had experienced the occasional positively surprising output as discussed above, in their everyday practice the outputs were more often seen to be uncreative and conservative, rather than surprising:

"It's very rare to find something that is going beyond the current... beyond what's actually currently available." (A09)

“If I could change something it would be more focus on predicting things we don’t know - it’s quite good at predicting things that we could predict more slowly before. In medicinal chemistry the best things are the ones that are surprising and unexpected - we need that opportunity for serendipity.” (P07)

These points suggest that there is some underlying hope about the creative affordances of AI/ML that leads some practitioners to believe that it may be possible for AI/ML to “transform[...] the state of the field” (Franceschelli and Musolesi, 2024). However, such beliefs would contradict Franceschelli and Musolesi’s claims about the limits on the creative potential of AI, suggesting such hopes may not be entirely grounded in current AI capabilities.

Ultimately, many practitioners spoke of how the outputs of AI models they engaged with tended to tell people what was already known, rather than providing surprising information. In the pharmaceuticals context this was framed as providing some efficiency whereas in Higher Education it was more often perceived as reassuring:

“There was a real kind of explosion in the hype for machine learning in order to reduce cycle times so we can make molecules faster. And ...I think it’s happened to most [“cases”], but I don’t think it’s been as rapid as what machine learning AI, AIML or whatever, kind of implies that it’ll be.” (P05)

“[educators] were like, yes, it’s reassuring that I am doing my job correctly.” (EU104)

“I look at it occasionally as quite sporadic and it has been kind of helpful but often it just confirms what I already know...So it gives you more confidence, I suppose.” (EU108)

We also observed that some practitioners, perhaps as a result of different knowledge or experience, were less taken aback by things that others were initially surprised by. For example, an experienced machine learning expert did not find the developments in the pharmaceuticals sector surprising and felt that many of the surprises outlined above were fairly predictable

“I wouldn’t say there was anything that was really unexpected, no.” (P07)

Further an artist, reflecting on the extractivist practices of big tech companies to train text-to-image generators indicates that while “disgusted”, they don’t find the behaviour surprising:

“Especially this kind of massive data scraping...it’s not shocking because I’ve grown up in the United States and I know what capitalism looks like, but it’s shameless and shameful... I really am not shocked by anything any more [both laugh].” (A04)

What we see in these experiences of being unsurprised by AI/ML is how the everyday experience of working with AI/ML in different contexts of practice often disappoints hyped accounts of AI adoption. The things practitioners find unsurprising are the results provided by the predictive models, which deliver efficiencies and reassurance, but lack surprising insights.

Some also find themselves unsurprised by the political economy of AI and the actions of firms within capitalism. These experiences of AI/ML in practice tend to counter the narrative of the transformational potential of AI and reflect a growing awareness that AI/ML is likely not capable of the transformational creativity that some people might hope for.

5. Conclusion: Hope, disappointment and power

In shifting focus from people's explicit expectations and imaginaries related to AI, to the surprises experienced by practitioners as AI/ML is integrated into different contexts of practice, we reveal a nuanced pattern of frequent disappointment and frustration, as well as anger in the case of data extraction in the arts, punctuated by occasional moments of awe and excitement. As psychologists observe, surprise is an ambiguously valenced emotion (Neta and Kim, 2022), often triggering subsequent emotions (Noordewier, 2016). We argue that the lens of surprise offers valuable insights into how existing beliefs are validated and challenged during attempts to integrate, interpret and otherwise engage with AI/ML in diverse contexts of practice each with different material conditions that practitioners are navigating. As an "epistemic emotion" (Muis et al, 2015), arising from the incongruity between incoming information and existing cognitive frameworks, moments of surprise give us some insight into how someone might have previously imagined things otherwise.

Our research demonstrates that practitioners across sectors have encountered "big surprises" in relation to e.g. AlphaFold, DALL.E, experiences that disrupted their foundational beliefs about technological capabilities. These surprises surface as astonishment at the possibility of certain AI functionalities, rather than awe at the "transformational creativity" of AI (Franceschelli and Musolesi, 2024). This underscores the "inequality of anticipation" (Jasnoff, 2016) inherent in the current AI moment, where most people had no expectations about the arrival of GenAI and what this might mean for practitioners in different contexts.

While smaller, everyday surprises regarding AI/ML efficacy and value in specific use cases occur (e.g., deep learning for molecule generation in pharmaceuticals, human-machine collaboration in the arts), the dominant pattern we observed involves surprises that arise when reality contradicts the widespread promise of the transformational potential of AI. This reflects the type of surprise that Pili (2023) relates to having "incomplete theory to ground [a] belief" (p. 695), in this case a prior belief system influenced by AI hype. These include challenges with having suitable data to train AI/ML algorithms, and outputs that are perceived as reassuring or efficient but lacking original insight or creativity. This suggests that practitioners often hold existing beliefs and hopes about AI/ML that are subsequently challenged, reflecting a widespread discourse that tends to suggest that the hard work of AI (i.e. model development) has been done, without giving much - if any - consideration to the complexities of practical application or the implications of unregulated scraping of training data. Surprises also extend beyond technological capabilities to include the actions of others within each sector that are seen to contradict practitioners' own values. Artists, for instance, express surprise at some

peers' uncritical engagement with AI, while a pharmaceutical practitioner questions why some individuals are now drawn to work for pure AI firms rather than to the perceived purpose and value of pharmaceutical work, and educational practitioners question the role HE institutions are playing in contributing to hype around predictive learning analytics.

These many everyday surprises are, in essence, the surprise of disappointment, revealing a dynamic between initial hopes for AI/ML as well as the values of people in the sector, and subsequent disappointments as data, technology, companies and people fail to meet expectations. Some practitioners employ skepticism as a defense against disappointment, effectively disavowing hope to mitigate potential letdowns, but many find themselves experiencing surprising disappointments as their hopes for AI/ML are brought into question. This dynamic is something that is explored in what Gardner et al (2015) calls the “sociology of low expectations”. Here researchers have observed that innovation often emerges from “a complex intertwining of low and high expectations; an interplay of promise, hope, and optimism, and uncertainty, pessimism, and ambivalence” (p. 1003), or what Moreira and Palladino’s (2005) refer to as two logics: the “regime of hope” and the “regime of truth” - a sort of modern-postmodern dance that Mack (2020) explores in Spinoza’s writing on the nature of modernity. Yet, despite disappointment being built into how expectations function in relation to technology (Borup et al, 2006), many of our participants still found themselves being surprised by disappointment - for the practitioners it was largely unexpected. A focus on surprise thus captures those moments that people begin to recognise this hope-disappointment innovation dynamic in their own practice - moments when their expectations may begin to shift. In our findings, we can see indications that these everyday moments of surprise can contribute to an ongoing recalibration of beliefs, moving away from both idealised and overly sceptical visions of AI/ML towards a more realistic understanding of its friction-laden realities.

Ultimately, the surprises experienced by practitioners in their engagement with AI/ML tend to be small-scale or disappointing, and reflective of practitioners becoming aware of the hope-disappointment dynamic, while the “big surprises” we identified – related to transformative breakthroughs like GenAI and AlphaFold – remain elusive or beyond their control. This raises critical questions about the power dynamics of AI integration. The adoption of AI/ML that is trained on organisational and self-curated data, rather than e.g. pre-trained platform based LLMs, proves significantly more challenging than adopting a tool such as ChatGPT or DALL.E - particularly in contexts where the outputs need to be scientifically or socially meaningful. In this context, power remains centralised with the large technology companies such as OpenAI and Deepmind whose “surprising” AI innovations perpetuate hype, influence policy and investment decisions, but obscure the disappointments, frustrations, and anger experienced by practitioners on the ground.

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