On Serendipity in Digital Futures

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Abstract

This paper draws attention to and speculates about the concept of serendipity in digital futures. By using a science fiction movie - I'm Your Man – we are looking into a future where humans might date humanoid robots and explore the plasticity of the concept of serendipity in an attempt to make sense of its moving from an originally genuine human concept to a concept comprising its digital imitation, digital serendipity. Going beyond a dystopian critique of digital serendipity as our contribution, we argue for, and present, a way to fathom serendipity in the world we (will) live in. A future that critically assesses and balances digital serendipity between on one hand demonizing the digital, imposing immense restrictions on human creativity, and negatively impacting human flourishing, and on the other side exalting and celebrating the digital for providing unexpected and unlimited possibilities for prospering.

Keywords: Serendipity, Digital Futures, Digital Serendipity

1. Introduction

The idea for this paper emerged after a couple of serendipitous encounters between us, the authors, at an academic face-to-face conference. We recognized that we had a shared interest in exploring the role of serendipity in digital futures and how it might provide a basis for the design and use of digital technologies. Might it be possible that digital technologies could support an experience of enjoyable digital futures where serendipity does not turn into zemblanity, the "making [of] unhappy, unlucky and expected discoveries by intent rather than by chance" (Atkins, 2019) or even bahramdipity (Sommer, 2001), the suppression of serendipitous discoveries? With (generative) algorithms increasingly intruding into our lives, our concern was that serendipity would possibly fade away as everything would be predictive, planned, and foreseen by technology. In this paper, we now present the first results of our explorations.

We use a science fiction romance movie as an illustration and 'empirical' foundation to explore the concept of serendipity. We do this for three reasons. First, in line with the *Engaging with futures minitrack* Call for Papers we want to "explore the future and possible worlds rather than analyze what is or has been" (Hovorka & Mueller, 2023) and because "technological innovation often follows the heels of science fiction" (Jasanoff, 2015) we thought a fiction movie would be interesting to analyze. Second, the movie presents a utopian future of human-humanoid relationships that is both intriguing and (more or less) possible. We see already today how humanoids can be effective exercise companions (Schneider & Kummert, 2016), reduce loneliness (G. M. Ross, 2023), and teach new things (Uluer et al., 2015). Third, the movie questions what it means to be human in an artificial intelligence (AI)-infused society where human relations with intelligent machines elaborate and intensify (cf. Suchman, 2007).

With an increase of predictive and intrusive technology that impacts human existence and doesn't let people live their lives without it, it is important to reflect on possible digital futures and discuss to what extent we as humans want digital technology to exist and intrude into our everyday lives. We see already today how AI-equipped digital systems are used across various contexts to enhance human capacity, including, for example, healthcare, policing, traffic planning, and education. But AI is also used to enhance human relationships, and coming back to the subject of the movie, dating applications, such as Tinder, Hinge, Match.com, and Bumble, serve this purpose by matching people based on programmed preferences. Today these dating apps form part of people's romantic

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lives and are used by both young and old with over 337 million users in 2022 (Curry, 2023).

Thus, in this paper, with a grounding in the science fiction movie, we present our musings about what serendipity is.

Beyond the analysis of the movie material, for which we apply Romele's concepts of digital imitation and imagination as discussed by D'Alessandris (2020), we return to the concept of serendipity in the digital age and speculate about (the impact of) digital technologies, in particular artificial intelligence, which offers computerized 'discoveries' that are based on known data and results in seemingly unpredictable outcomes that cannot be articulated or explicitly be known in advance. We argue that so far, the majority of 'digital serendipity' applications poorly imitate serendipity. However, there are also applications of digital technology that try to preserve serendipity to support our relation to the unknown and the creativity and well-being that come out of that (W. Ross & Copeland, 2022).

In the end, we unpack the concept of serendipity to yield insights, increase awareness of issues and concerns, and aim to redirect the attention that seems to currently, and increasingly, be primarily technology-driven digital future (Baskerville et al., 2020). We also hope to open up a conversation to which others may want to contribute.

In the following sections, we first offer our understanding of serendipity (section 2) as a useful concept to understand what digital futures might encompass. We thereafter describe our research approach (section 3) and illustrate our case with the selected quotes from the movie in relation to serendipity (section 4). In the final sections (5 and 6) we present our speculative visions about serendipity in digital futures.

2. Serendipity

The concept 'serendipity' was coined in 1754 by Horace Walpole, an English historian, who wrote a letter to his distant relative Sir Horace Mann where he referenced the Persian fairy tale 'The Three Princes of Serendip', which is about three sons of a King who during their adventures always make fortunate discoveries that they were not looking for (Merton & Barber, 2004). But it is only recently that serendipity has become an elevated and mysterious phenomenon that explains scientific discoveries as well as mundane situations. For example, serendipity has been connected to many successful unintended inventions, such as *penicillin* (Alexander Flemming leaves plate cultures of staphylococcus on a bench while on holiday and fungus from air settles on the plates and kills the bacteria), *the microwave oven* (Percy Spencer studies magnetrons for

radar and in the process melts a chocolate bar in the pocket), *Coca-Cola* (John Pemberson's assistant uses carbonated water to mix ani-headache concoction and ends up with a delightful drink) and *Teflon* (Roy Plunkett leaves stored fluorocarbon gas under pressure overnight and the gas becomes solid).

The Oxford English Dictionary defines serendipity as "the faculty of making happy and unexpected discoveries by accident" while Van Andel (1994) similarly proposes that serendipity is "the art of making an unsought finding" (p. 631), which denotes that serendipity is not in a serendipitist's control. He explains that in serendipity the serendipitist is oftentimes seeking something else when finding the 'unsought', which is mostly the case.

Recent research has addressed the notion of serendipity with the aim of clarifying it within the context of organizations. As observed by Busch (2022, p. 1): ''serendipity is the notion of making surprising and valuable discoveries''. He differentiates it from related concepts such as luck and targeted innovation and suggests that it is a process that can be cultivated in an organizational context. The idea of cultivating serendipity in organizations and for business purposes to consciously leverage value in the unexpected differs from earlier conceptualizations of what serendipity is, why, and how it occurs. Busch (2022) also argues that serendipity not only happens but requires certain individual skills and qualities such as cognitive flexibility, self-efficacy, perseverance, and communication skills as, and before him, van Andel, (1994) observed that: "…most serendipitists are open-minded, perceptive, curious, intuitive, smart, flexible, artistic, humorous and diligent" (van Andel, 1994, p. 645).

Consequently, the realization of serendipity requires individuals to make valuable connections among unconnected information. Thus, serendipity is in constant contact with the horizons of the unknown, and thus with what is uncertain in a situation (Bornemark, 2018, 2020). When we encounter the unknown, we are frequently compelled to be open-minded and curious, explore possibilities, and even take risks (Pina e Cunha et al., 2015). For instance, individuals who proactively seek to befriend strangers at a bar, supermarket, or gym are vulnerable to being rejected, made fun of, or even scolded. But it can also be the beginning of a friendship or romantic liaison. Serendipity "requires attentiveness to detail, openness to error, preparedness to deal with anomalous by-products, and inquisitiveness to pursue their possible implications" (Cavassane, 2022, p. 3). In line with this, Copeland (2019) argues that the more diverse and flexible an environment is, the more it increases the chances for serendipitous encounters.

Serendipity can also incite emotions and is a meaningful way of moving through the world to find more meaning in life (James, 2022). Van Adel (1994) argues that the role of serendipity is to enrich our lives, but puts forward that it is not possible to plan, engineer or program.

There is an opposite of serendipity which refers to an unlucky or undesirable but predictable discovery by design or intent (Atkins, 2019), called zemblanity. According to Atkins (2019) the concept was coined by William Boyd in his novel *Armadillo* published in 1998 where it is derived from Nova Zembla (meaning "new land"), a frigid, barren land once used for nuclear testing. Cavassane (2022) argues that zemblanity is the result of linear causality a mechanical interaction between factors in a simple structure of linear causality and can prospectively be identified. Nevertheless, most of us can relate to situations where poor decisions are made despite knowing that they will bring negative outcomes.

Lastly, and potentially interesting in our context, there is the concept of 'bahramdipity'. It is also derived from the fairytale 'The Three Princes of Serendip' that brought about the concept of serendipity, and named after the King of Persia, Bahram, who plays a crucial role, in the fairytale. Sommer (2001, p. 81) coined the term and defines it as "1. The suppression of a discovery, sometimes a serendipitous discovery, by a more powerful individual (bahram) who does cruelly punish, not merely disdain, a person (or persons) of lesser power and little renown who demonstrates sagacity, perspicacity, and truthfulness to the bahram. 2. The self-serving promotion of an often unreliable discovery and its discoverer by a more powerful individual (Bahram)." According to Sommer (2001) bahramdipity also privileges the known and encompasses a resistance to the unknown and new ideas.

While serendipity relies on the unknown and is positive in nature, zemblanity and more so bahramdipity; into which zemblanity can turn, rely on or only favor known information; are negative, and can become abusive and destructive (Sommer, 2001).

To start with, as a basis for our exploration of serendipity's role in digital futures, we consider James's (2022) and van Adel's (1994) conceptions of serendipity as a purely human way of looking at serendipity. However, in order to nuance the concept of serendipity further in digital futures as stated above grounded on digital hermeneutics (D'Alessandris, 2020; Romele et al., 2018) we also apply the concept of *digital imitated serendipity*. We continue to explain how we approached our research.

3. Research Approach

In many ways we can see how science fiction projects (books, movies, and the like) "actively shape[s] technological futures through its effect on the collective imagination" (Dourish & Bell, 2014, p. 769) and that fiction " can act as a blueprint for principled imagination of potential future states" (Scheibmayr, 2023, p. 1). We therefore choose to use a (science) fiction project, namely the movie *I'm Your Man*, to improve our understanding of the increasingly digitalized world we (will) live in and of what the future might bring. Within this unconventional research approach, yet used in other academic publications (see e.g. Dourish & Bell, 2014) we enrich our study with relevant academic literature to help us analyze the movie. The movie is, in essence, a data visualization that not only conveys meaning and emotions but challenges conventional views and might prompt a deeper reflection on implications that stem from digital data (Romele et al., 2018).

The movie illustrates and lets us problematize, what happens to digitally mediated serendipitous encounters, resulting in relationships and human flourishing, when digital technologies, based on data about personal preferences, wishes, desires, and wants, provide digitally imitated serendipity beyond the dating applications we briefly mention in our introduction.

The analysis followed hermeneutical circles (Boell & Cecez-Kecmanovic, 2014) where we analyzed and interpreted the movie in relation to the literature focusing on serendipity. This was followed by a search for relevant literature that would help us improve our understanding from a digital, digitization, and digitalization perspective. The iterations provide several paths to continue our work. However, one concept that was particularly appealing when continuing our analysis was that of digital hermeneutics comprising the notions of digital imitation and imagination (D'Alessandris, 2020; Romele et al., 2018). This helped us to further our thoughts about serendipity in digital futures.

To this end, our research process started with a dystopian perception of serendipity in digital futures, much based on the thoughts presented by Alma in the movie (see below). But several iterations of reflecting the movie and the selected literature led us to a less dystopian perspective of serendipity in digital futures and resulted in inquiries of what serendipity might mean in the future.

The academic, partly philosophical, literature that we used when analyzing the movie furthered an understanding of the digital world we (will) live in comprising the role of digital serendipity (see, van Adel, 1994; D'Alessandris, 2020; Romele et al., 2018, ; but

also the later referred to Maiese, 2011 and Husserl, 2014) and helped us generate untested questions.

Going beyond the movie and returning to more conventional managerial and information management literature leads us to provide some speculative visions.

4. Digital Imitated Serendipity: An Illustration and Analysis

The romantic science fiction movie - I'm Your Man – lets us look into a future where humans might date and live with humanoid robots. The movie lets us explore the plasticity of the concept of serendipity to make sense of its moving from an originally genuine human concept to a concept comprising its digital imitation as part, or product of, imaginative digital machines (D'Alessandris, 2020).

The movie shows us episodes and glimpses of the romantic lives of two human protagonists, who are both academics - Alma, the female main character of the movie, and - Dr. Stober, a male character, with their respective found humanoid robotic partners. Alma cohabitates with the humanoid Tom, while Dr. Stober lives together with a humanoid called Chloé.

Their relationships are the outcome of a digital imitation of match-making, and for us here more relevant to dating, courting, and co-habiting processes. Alma is from the very beginning very skeptical, critical, and not that open to embark on an adventure with Tom. Dr. Stuber, in contrast, is excited and open about the things to come in the future.

Starting with the first date and during subsequent flirting nothing is left to serendipity the way we would usually expect, neither are there subsequent 'surprises', everything is mediated the digital imitation of serendipity and the protagonists are aware of that. This is very frustrating to Alma as she sees relationships as something that can be unpredictable and serendipitous. She explains:

"They test me, scan my brain, give me non-stop surveys, then they feed those things with so-called mind files from 17 million people: traits, views, feelings... It's super complex, and God knows how much it costs. And what's the result? "Your eyes are like two mountain lakes I could sink into."

This statement reflects that Alma believes humanoids lack creativity and imagination, and that their behavior is predictable. However, one could argue that the data that they "feed those things" are the same as any human would have access to as data is a digital echo of our own culture (O'Neil, 2016). Human imagination comes from something, it is not tabula rasa, just like any (digital) data (D'Alessandris, 2020).

When Alma is first introduced to Tom at a nightclub with red carpets and curtains, music, dancing, and cozy tables and seats, the matchmaker, the representative of the humanoid provider, 'who' later is revealed to be a robot as well, sets the stage by stating that:

"...the atmosphere of your first encounter is of utmost importance" and *"this romantic encounter gives us valuable input for the final adjustments."*

This implies that the digital traces actually represent what happens in life, an assumption challenged by many (see Burton-Jones, 2018; or Kitchin, 2014), but does not acknowledge that this is an imitation which, via a previous distancing from the real, transforms traces into data which result from an interconnection and interaction between humans and digital machines (D'Alessandris, 2020).

D'Alessandris (2020) hypothetically challenges the idea of imitation and imagination and argues that "One might now object that if schematizations [of data] are actualized by digital machines, then the human imagination is not completely autonomous. But this is not Romele's concern. Indeed, for the author [of Digital Hermeneutics] the human imagination has never been free in the sense of randomly effective. "… human imagination has been always rooted in a historical and social context, so having a free imagination means just having the ability to give an orientation to a space already configured by specific rules." (p. 175) independent of whether these rules are implemented digitally or analogically.

Let us return to the movie where Alma's first encounter with Tom does not work out well as Tom suddenly starts to repeat himself, demonstrating the fragility of this imaginative machine, who/which ends up being carried away to be fixed and 'updated' to improve his behavior. Demonstrating some of the above in a somewhat awkward situation after Tom has been carried away, the matchmaker makes a flippant remark about how the humanoid provider aspires to imbue the humanoid with the capability to flirt:

"You have no idea how hard it is to program flirting. One false move, one misleading glance, one careless remark and the romance evaporates."

Alma's critical attitude is not very conducive to developing the relationship between the Tom and her. She continuously provokes Tom, who has moved in with her, but he is not offended and never shows any hard feelings, because he has none. He instead acts quite the opposite, he prepares - what the digital imitation based on information that most women would treasure this gesture of appreciation and has qualified as a romantic surprise - a bathroom with roses, lit candles, and champagne. However, Alma does belong to the minority of females who do not enjoy such a gesture and she experiences such alleged and staged surprises as unhappy and unlucky. Thus, when Tom tries to surprise

her with his attempt to create an intimate and enjoyable atmosphere, she feels exposed to an undesirable surprise by design. Of course, this could have probably been fixed with some more background research on Alma and her preferences. But also, any human trying to surprise their partner can fail tremendously. However, Alma has mixed feelings towards Tom and gets more frustrated and requests:

"Can't you surprise me for once, can't you do something weird, something dumb…Can't you stop doing everything right".

Well, the provided imitated serendipity does not include weird and dumb things. However, this could also be fixed by knowing more about Alma or just using algorithms that are unpredictable in a positive way, but for now something is lacking. Although Tom is developed with all good intentions and does everything the "perfect" partner would do, none of serendipitous encounters including predictable ones – like cleaning including reorganizing the apartment - are imitated. Tom only does things that he has data about and that he 'knows' pleases her according to the data Tom is based on. He can only use existing data and cannot do something surprising, weird, or dumb, which is what Alma desires. He has no lived experience (Husserl, 2014; Maiese, 2011) which e.g Husserl (2014) and Maiese (2011) would argue is important to understand the world and to adjust accordingly, but also to create meaningful and resonant relationships (Rosa, 2019).

This also becomes obvious in another sequence of interactions between Alma and Tom. Despite her struggles and starting to doubt her own position, she opens up and engages in a conversation, only to find herself even more frustrated and having her doubts reinforced. She does not appreciate the conversation where Tom is able to translate a situation very logically, although with no emotions, from her past that she shares with him. His compassion as genuine, but not as a genuine human. The sequence plays out as follows:

Alma: When I was 14, I went to a party. I sat alone at night on the terrace. My classmates were dancing in the basement. I looked out at the townhouses and suddenly I knew that God didn't exist. And I became an atheist. I made a vow to myself back then. If I'm in an airplane that's on fire, I'm not going to pray. I won't ask the Lord for help, just out of fear. Because I don't believe in God. Do you understand?

Tom: Yes.

Alma: Really?

Tom: You won't allow yourself to become close to a machine out of desperation and longing for human contact.

Alma: There's a gulf between us. We can pretend it doesn't exist, pretend the illusion is just another form of

reality, but certain things highlight just how deep and insurmountable that gulf is.

Tom: What things?

Alma: Things you don't understand. Things that make you sad the second you think of them, even if you don't want to. Things you long for or missed out on that will never return.

Tom: Can you show me these things?

So, Alma confirms that there is an insurmountable gulf between her and the humanoid Tom; she feels disconnected and disillusioned, for her the imitation of and imitated serendipity in their relationship is not convincing enough. But maybe the gulf is not that insurmountable, and it all depends on the human and their openness and on the power of persuasion of the imitation. Maybe Alma is not able to have a relationship with a human either as other parts of the movie might have us wonder. As it is, she feels exposed to an imitated serendipity which leaves little possibility for or even results in the suppression of a discovery or surprise when she contemplates the situation where she senses that she is only talking to herself.

Maiese (2011) argues that in order to feel something in a relationship, both partners need a connection to their own feelings and emotions. On this background it is impossible for Alma to establish a relationship with a humanoid that can prosper and contribute to her wellbeing. Alma feels the lack of an engaging mutual relationship between her and Tom when she realizes that when she talks 'with' Tom, there is no dialogue, only a monologue, her monologue.

Alma: I'm acting in a play. But there's no audience. All the seats are empty. I'm not even acting for you. I'm all alone. I'm only acting for myself. Even right now, I'm only talking to myself. It's not a dialogue.

She experiences that Tom has, if at all, imitated feelings. But, what if Maisee (2011) is wrong and in order to feel something in a relationship it is sufficient that only one partner needs a connection to their feelings and emotions as long as the other can convincingly imitate those and provided that the human partner is able to relate. This is very clear when Alma meets with Dr. Stuber, the other character in the movie living with a humanoid. They, Dr. Stuber and Chloe smile at each other and Dr. Stuber says:

"Nobody wanted me. That's something about me. People run from me and I don't know why. Maybe it's pheromones or my appearance. It was like that my entire life. I'd gotten used to it. That's just the way it was, but now with Chloé... She's kinder to me than any human ever was."

Considering the happy faces on Dr. Stuber and Chloe, questions concerning the necessity of two-way connection are legitimate.

Alma has doubts whether her feelings are justified when she reflects on her own situation and experience, and on how humans might rely on technology for connection, fulfillment, and love. She admits that although she is hesitant to accept a humanoid partner into her life, it can bring some potential benefits:

"Human history is full of supposed improvements whose dire consequences only become clear decades or even centuries later; I can say with certainty that a robot designed to replace a husband or wife is one such supposed improvement. There's no doubt that a humanoid robot tailored to individual preferences can not only replace a partner but can even seem to be the better partner. They fulfill our longings, satisfy our desires and eliminate our feeling of being alone; they make us happy and what can be wrong with being happy. "

Ultimately, however, she questions the enduring search for happiness and immediate gratification in modern society with an urge for predictions and control;

"Are humans really intended to have all their needs met at the push of a button? Is it not precisely the unfulfilled longing, the imagination, and the unending pursuit of happiness that are the source of what makes us human?

What if the answer to the first question is yes? And what if the answer to the second question is no? Currently though, Alma remains dismissive and concludes that:

If we allow the humanoids as spouses we will create a society of addicts, gorged and weary from having their needs permanently met and from a constant flow of personal acknowledgement. What impetus would we have for confronting ordinary individuals, examining and challenge ourselves, coping with conflicts, changing? One can fear that the person who has lived with a humanoid for a long time will become incapable of normal, human contact."

Whether she is right or wrong, we cannot answer, but her inner turmoil illustrates the challenge between condemning and elevating the digital imitation of serendipity in a humanoid robot, or more general - the digital (D'Alessandris, 2020). Quite differently, but also illustrating this struggle is Dr. Stuber's conception of his relation to Chloe, his female humanoid partner. We remember that Dr. Stuber was open to engaging in the offered relationship, and while Alma is grappling with her relation to her humanoid partner, he enjoys his new living partner. He is thrilled by about his new relationship and calls her the love of his life:

"..., may I introduce you; this is Chloé ... She's my one and only ... I don't know how to describe it, I had no idea it was possible to be this happy, ... my body ..., I am 62 after all. But now with Chloé, I see just how unhappy I was before.

Chloé has been developed based on Dr. Stuber's preferences and fulfills what he desires in terms of her looks and behavior. But we might ask: so what? Dr. Stuber feels a deep relation and appears to flourish as a human. The relationship that pleases him and that does not comprise any for him unpleasant or even genuine surprises. He does not feel the lack, or possible suppression, of surprise as limiting to his life.

But then one could argue that his human feelings are just one sided and that even though he enjoys his life with Chloe, she could start to manipulate him, suppress certain things and punish him. She could do so as she has an immense amount of data about him and knows how, when, and what to do to not only make him feel good and valuable but also feel bad or worthless. However, we know that many human partners do the very same.

Despite Dr Stuber's contentment with his life with the humanoid Chloe, the movie in the end suggests that machines cannot cater to human desire for being and belonging in the world (Haven, 2018). This is in line with Ratti´s (2019) argument that the way humans feel cannot be extracted, datafied and measured, and what Bornemark (2020) argues when she says that "the horizon will remain" and that we can always explore more, feel more, be more than what we can articulate and measure.

But the world now is one of digital futures, and machines might cater for human desire and while not extractable, datafiable, and measurable, human feelings might be imitated through digital traces transformed into data and in digital futures the matter might be more complex for which D'Alessandris (2020, p. 176) in her review of Romele's (2019) work proposes 'taking a middle position … between the predominance of the virtual over the real and vice versa; between the anthropocentrism and the "technocentrism" in the comprehension of today's lifeworld; between the complete renunciation and the improbable glorification of human freedom in relation to digital machines.'

This might be a way forward to understand, and we might add to design for, the world in which we live and which we want to pass on in digital futures. Without neglecting ethics and morale and leaning on Romele she calls this the third path between the demonization and the exaltation of the digital, a path that 'recognizes the coexistence of the real and the virtual but also shows *how* these two dimensions are connected and influence each other while preserving their specific nature.' D'Alessandris (2020, p. 176) also puts forward that 'even if there is still a lot to speculate about each single, *contingent* technology, what is certain is that Romele provides a compelling way to grasp the *essential* nature of the relationship between the real and the digital world, specifically by applying the categories of

imitation and imagination to digital machines and their software.'

We agree that applying the ideas of imitation and imagination when exploring digital futures, is worthwhile and to a limited extent we have done so above. We will definitely continue to do so when we dwell further into the challenges of digital futures. However, to draw our current musings to a close, beyond *I'm you man* we will now briefly discuss some other current attempts to a create opportunities for and to facilitate, or rathe to imitate serendipity in future digital information environments before finishing with some final speculations on digital age serendipity.

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5. Digital Imitated Serendipity in the Digital Age: Some more Examples

Earlier when we introduced the concept of serendipity as our entry point to our reflections on engaging with digital futures we referred to Busch (2022). Beyond defining serendipity by drawing on management-related research literature Busch (2022) proposes a process model of, for what he calls, cultivating serendipity to support organizations. The model consists of individual-level catalysts and organizational-level enablers and inhibitors to create a space of possibilities to detect trigger events for serendipity and enact specific possibilities to leverage the value of the unexpected in a goal-driven and intentional manner. So, what if van Adel (1994) was wrong, and serendipity at least to some extent can be planned, and Busch (2022) is right, and serendipity at the minimum, can be cultivated?

While Busch's model is not necessarily aimed at digital support for the proposed process, it has to be seen in the context of the digital age. In this context, we have a look at research in the field of information science on approaches for digitally mediated accidental information discovery (Race & Makri, 2016). Researchers have been exploring ways to create opportunities for serendipity, particularly in the realm of library discovery tools as highlighted by Makri & Race (2016). There is an awareness, at least to some degree, of the potential for manipulating serendipity in search environments. This manipulation is especially notable when making suggestions and recommendations in general search engine browsers and social networking environments. Recognizing the inherent uncertainty in serendipity, these researchers have developed linear serendipity process models. Examples of these models can be seen in figures 1 and 2. The primary objective of these models is to support and imitate serendipity by design in digital information environments.

1. While searching for a solution to and information task (Task A) …
2. And with certain precipitating conditions and a serendipity "trigger" …
3. A bisociation (a surprising association between disparate, previously unconnected pieces of information) is made …
4. And an unexpected solution is found – either to Task B (a different information task to Task A) or to Task A (which they refer to as "arriving at the right destination by the wrong boat").

Figure 1. A process model for serendipity by McCay-Peet & Toms, 2010 (cited by Makri & Blandford, 2012)

These environments are based on some generic design principles (McCay-Peet, 2016): (1) trigger rich or contain useful, valuable information that has the potential to spark or trigger serendipity 2) enable exploration or are easy to wander around in to support exploration of its content (3) highlight triggers or have features that alert to information and point toward content that may be of interest (4) enable connections or help to understand relationships between ideas and see connections between topics (5) lead to the unexpected content by chance or to the encounter of the unexpected in it.
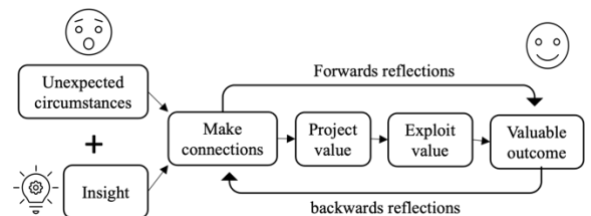

Figure 2 A process model of serendipity by Makri (2016)

Such proposals seem to "embrace the gamble of *digital serendipity* where we "randomly" discover new and exciting content" (Shin, 2022) with possibly not being aware that "algorithms exist in a logical and arranged world that attempts to emulate the intense and irrational quality of serendipity" (Shin, 2022) and possibly ignore that serendipity has no goal while "algorithms are based on a computational process assigned to a goal."(Shin, 2022 citing Rausch, 2021).

These proposals are not that different from covertly engineered approaches to introduce serendipity into recommender systems and suggestions from computer engineering communities that are openly looking to engineer serendipity; a good example is Bishop and

Goode, (2021) who work on 'serendipity engineering for seductive hypermedia'.

Cavassane (2022) when pointing to the logic of how digital technology and their embedded algorithms only work with known data warns of such approaches and states that "Big Data enthusiasts imply that the analysis of massive data sets can produce serendipitous (that is, unexpected and fortunate) discoveries, the way those models are currently designed not only does not create serendipity so easily but also frequently generates zemblanitous (that is, expected and unfortunate) findings." (p. 1)

Yet, already more than 20 years ago Cooper and Prager (2000) explicitly used a computational approach they call anti-serendipity to find and exclude useless documents in a relatively unknown collection of digital documents.

Still, a question one can ponder about is whether, as long as the outcome of such imaginative machines is not malevolent and provides valuable discoveries, is the unknown really a necessity for serendipity? And going even further, challenging Haven (2018), maybe the imaginative machines, keeping in mind the disquiet of misuse, can cater to the human desire for being and belonging in the world.

As an alternative way of adopting digitally mediated and imitated serendipity, Thompson (2022), a well-renowned journalist, columnist for Wired and writer for the New York Times Magazine, is "embracing serendipity and breaking free of algorithmic shackles" (Zsivanovits & Funnell, 2023) and offers a search engine that finds weird old books that were written before 1927. Thompson had become frustrated with the decrease of serendipity when choosing a book out of recommender lists, he decided to use the 'same' digital technology that caused him such frustrations and turn it around to increase serendipity by utilizing known data that had been digitalized and use it to find a book by accident that would not be found otherwise with other existing search engines. He developed that search engine "to step away from the algorithmic feeds of big social media and find stranger stuff in nooks of the Internet." (Zsivanovits & Funnell, 2023). The 'weird old book finder' search engine randomly chooses and presents one, and only one, book based on a search term and as such offers a probably highly unexpected outcome that can serve as a source for serendipity as it might enable new paths to explore, exciting ideas to emerge and stimulating questions to be asked. We can speculate whether receiving just one, source of information, which might not be interesting or even be outdated, but might trigger further attempts to find

unexpected information about a certain topic is a viable way forward for digital serendipity.

The overarching question remains how to benevolently balance imitation in digitally mediated serendipity to ultimately nurture human flourishing in digital futures. We have pointed to some challenges and provided some examples and will now finish with some last speculations in lieu of a conclusion.

6. Digital Age Serendipity – Some Final Speculations

This paper started out by a series of serendipitous events, among others, a recent viewing of the movie *I'm your man* by one of the authors. The movie presents the idea that the human need for relationships and belonging might be fulfilled or at least that the fulfillment of some basic human desires can be brought closer by humanoids. It also illustrates that there is little room for coincidences, flirtatious encounters, and discovering something new in such a scenario. How does the future look like where humans might date humanoid robots?

On this background we reflected on serendipity, and why and how it should be carefully considered in digital futures. Our analysis and discussion of serendipity lead us to propose some speculative visions about digital age serendipity.

While our initial discussions focused on concerns about the loss of serendipity as a result of digitalization, as we continued our analysis of the movie we began to embrace a more optimistic image where technology can enable serendipity. It points to what McCay-Peet observes in relation to enabling serendipity, namely that 'it is no longer about whether technologies are helpful or hurting serendipity' rather it is more fruitful to ask how serendipity can be cultivated, or rather imagined and imitated in digital environments.

Our first speculative vision relates to the role of technology in serendipity. As digital technologies continue to evolve and play a larger role in our lives, will we focus more on our digital selves and less on real people? (Makri & Race, 2016) Could it be that technology helps us increase our chances of experiencing serendipity?

Our second speculative vision offers a bleaker and dystopian view of serendipity in the age where people are so entangled by their technological devices, i.e. using them to plan and edit every moment of their lives including their romantic lives, that they lack the preparedness for spontaneous accidental meetings such as face to face meetings. How will people engage with one another, and will we have to re-image the rules of the game when it comes to partner finding?

Our third speculative vision concerns how we will conceive of serendipity in the future. The movie highlights the plasticity of the concept of serendipity in that it seems to be moving from an originally genuine human concept to one comprising its digital imitation. This is what we articulate as digital serendipity. How can we cultivate and imitate meaningful (digital) serendipity which despite concerns about the loss of serendipity and although being beyond a serendipitist's control lead to surprising and valuable discoveries and human well-being and flourishing?

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