**IN5480**
**Individual Assignment - module 2**
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## 1. Characteristics of AI-infused systems

*AI-infused systems are 'systems that have features harnessing AI capabilities that are directly exposed to the end user' (Amershi et al., 2019). Drawing on the first lecture of Module 2 and the four mandatory articles (Amershi et al. (2019), Kocielnik et al. (2019), Liao et al. (2020), Yang et al., (2020)). Identify and describe key characteristics of AI-infused systems. Identify one AI-infused system which you know well, that exemplifies some of the above key characteristics. Discuss the implications of these characteristics for the example system, in particular how users are affected by these characteristics.*

Amershi et al. (2019) describe three main key characteristics of AI-infused systems: inconsistency , uncertainty and behind the scenes personalisation. Inconsistency relates to the difficulty to predict behaviour and outcome. In addition to inconsistent user behaviour, AI is constantly changing due to deep learning processes that in general make it hard to predict behaviour on both sides. Lack of reliability can lead to poor user experience and in the worst cases lead to dangerous outcomes. Further, AI-infused systems can give false negative and false positive outcomes as they often perform under uncertainty. This uncertainty can again lead to errors. Finally, Amershi et al. discuss behind the scenes personalisation as a key characteristic of AI-infused systems relating to the for the user hidden activities going on in the background. These background activities often happen on behalf of the user. For instance, the authors discuss personalisation of content that can either match the user's preferences but when poorly aligned also hide for the user important content.

Kocielnik et al. (2019) argue that AI mechanisms such as natural language understanding and object recognition are probabilistic, however almost never completely accurate. Further, AI behaviour may pose transparency issues as most of the AI algorithms work below the surface, hidden for the user.

One example of an AI-infused system is the speech recognition system "Siri" of Apple. The slogan "Siri does more than ever. Even before you ask." gives the impression that AI is involved to recognise user intentions. Personally, I never use Siri so much except for when

driving the car. However, I get the strong feeling that Siri constantly listens and works in the background even though I am not aware. Sometimes, Siri accidentally turns on even though I was not intending to interact with Siri, leaving me confused. This is an example for the "behind the scenes" principle as Siri constantly works in the background without me being aware of what Siri is filtering and analysing. Further, this is also an example of that AI-infused systems are probabilistic in the way that Siri works quite well most of the time but sometimes turns on even though I was not intending to interact with Siri.

2. *Amershi et al. (2019) and Kocielnik et al. (2019) discuss interaction design for AI-infused systems. Summarize main take-aways from the two papers. Select two of the design guidelines in Amershi et al. (2019). Discuss how the AI-infused system you used as example in the previous task adheres to, or deviates from these two design guidelines. Briefly discuss whether/how these two design guidelines could inspire improvements in the example system.*

Kocielnik et al. (2019) examine the impact of the user's expectation towards the AI-infused system on user acceptance. Studies show that low expectations towards usability decrease user satisfaction and willingness to continue using the product. The authors argue that AI poses additional challenges impacting user satisfaction and acceptance as they almost never operate completely accurate. However most users expect error free user experience, leading to a conflict between the capabilities of AI-infused systems and the user's expectations. Therefore Kocielnik et al. argue that the end user's expectations should be shaped prior to use of AI-infused systems, aiming to minimise this gap. Further, the authors discuss how pre-use adjustment of user expectations can impact positively on transparency and improve trust. Most commonly, transparency techniques are used to explain why certain AI decisions have been made.

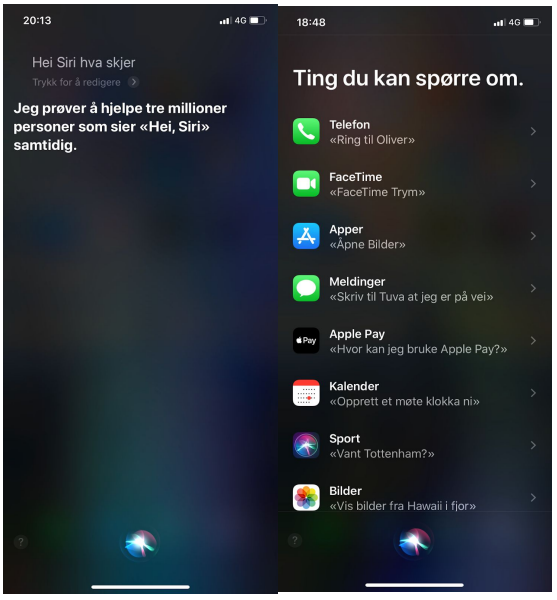
The main argument in Amershi et al. (2019) paper is that conventional guidelines and design principles are not applicable when designing AI-infused systems. This is due to the natural behaviour of AI mechanisms as described earlier. More specifically, unpredictability and inconsistency challenge use of conventional design principles. For instance, the design principle of error prevention cannot simply be applied to AI-infused systems as errors are common in AI algorithms due to unpredictable and inconsistent behaviour. Further, the authors argue that variability in AI designs due to different forms of interaction and capabilities challenge how to design intuitive and effective AI-infused systems. Thus, the

common accepted design guidelines and principles cannot be transferred to AI-infused systems. However, shared understanding and standards for design are important in order to achieve reliable and consistent AI technologies. The main challenge is therefore to develop reusable guidelines and design principles that yield all different types of AI-infused systems in order to improve user experience and build trust among users when interacting with AI-infused systems.

Guideline G1 “Make clear what the system can do. Help the user understand what the AI system is capable of doing.” (Amershi et al., 2019) relates to letting the user understand what the system he or is interacting with can or cannot do. The authors discuss displaying all metrics of an activity tracker app in order to help the user understand what the app measures and how.

Guideline G5 “Match relevant social norms. Ensure the experience is delivered in a way that users would expect, given their social and cultural context.” (Amershi et al., 2019). The example being discussed by the authors relates to using semi formal voice in voice assistants that spells out “okay” rather than for example “k”.

Drawing back on Siri as an example of an AI-infused system, I would say guideline G1 is met by viewing an overview of what the user can ask or do with help of Siri. The system also gives examples on how to interact with the system in order to fulfill a certain task. Noticeably, the overview does not show what Siri cannot do. Guideline G5 is not as easy to identify as G1. I asked “What’s up?” to see how Siri handles casual, informal smalltalk. Interestingly, Siri answers in a neutral, quite formal tone while at the same time being funny and informal.




3. *Chatbots are one type of AI-infused systems. Based on the lectures, and the mandatory articles, discuss key challenges in the design of chatbots / conversational user interfaces. Revisit Guidelines G1 and G2 in Amershi et al. (2019). Discuss how adherence to these could possibly resolve some of the challenges in current chatbots / conversational user interfaces.*

*Optionally, you may read Følstad & Brandtzaeg (2017), Luger & Sellen (2016), and Hall (2018) from the optional literature to complement your basis for answering.*

Chatbots are used for different purposes such as in customer service, for assistance or for social matters. Different purposes pose different context of use and thus need for different types of chatbots. For instance, a chatbot assisting older people to send or receive messages is most likely to be designed differently than a chatbot for customer service. Agreeing on standards and general accepted design principles is challenging as the users and use contexts differ. Luger and Sellen (2016) discuss the challenge of supporting the ongoing user engagement. Ideally, a conversation should result in a "binding hypnotic effect" that keeps the user wanting to continue interacting with the system. Currently, AI-infused conversational agents are far from this goal. Personally, I often stop interacting with chatbots before achieving my goal because I experience the chatbot to be too cumbersome. Other challenges in the design of chatbots are discussed by Yang et al. (2020). The authors discuss the unpredictability of errors that impair user experience or even can lead to dangerous outcomes. For example, an AI-infused navigation system, used while driving could lead to a car accident if the user gets confused and stressed. Errors in navigation such as giving wrong hints about speed limits could have devastating consequences. The authors further discuss two main challenges to design: uncertainty surrounding AI's capability and AI's output complexity, spanning from simple to adaptive complex. Uncertainty exists around what the system can do or how well it performs. Capabilities of an AI-infused system may change depending throughout the design process. During the earlier design phases, capabilities may be more limited by the algorithms the system was designed for, during the later phases however, the capabilities may expand as the system is learning from user behaviour. Output complexity relates to the outputs the system might generate and affects how designers conceptualise the system's behaviour in order to plan and design interaction.

Drawing back on the guidelines G1 and G2 in Amershi et al. (2019), I think both guidelines should generally be followed no matter what the context of use. It is always important for the user to know what the limitations of the system is. Revisiting Kocielvik et al. argument, it seems legit to know of the AI-infused system's limitations prior to use. Considering an AI-infused navigation system, I would rather know what the system is capable of before starting to drive than having to find out that the system is not capable of certain actions during driving as this might confuse me while driving. Similarly, it is important to know

about the navigation system's error rate before driving. For instance, the car driver should be aware that he or her cannot fully trust the parking assistant if there are chances for error. Again, the user should be informed about the error rate prior to use in order to align the user's expectation towards the system and the system's capabilities.

## 4. References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