

Human Computer Interaction (In English)

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Prototyping and Smart UI - Part 2

Hello, everyone. Welcome to the second part of lecture, Prototyping and Smart UI. In the first part, we have discussed primarily about prototyping. So let's go for the second part, that is Smart UI. So what is Smart UI? A Smart UI refers to an intelligent user interfaces that leverages AI, machine learning to adapt user behavior and optimize the user experience and provide some predictive insights. So these interfaces are designed to be intuitive, context aware and efficient, so that it enhancing both usability and accessibility.

So the key points, it includes AI integration, AI-driven personalization and adaptability to help different kind of users that you have based on their strengths and limitations. Context awareness, so real-time adjustment based on the user context. For example, the same user could be in different scenarios, in different situations, different environment, how they can perform the same task in different conditions. That is something you can help with.

Efficiency, so streamlines tasks through intelligent automation. So what are the benefits of smart UI? These are a couple of benefits, but not limited to that only. So the first and foremost important is efficiency. So it's streamlined workflow and reduces user effort. So if you can somehow help your users in improving the performance, probably taking less time to complete the task and probably even better way, I think the user is going to have very good user experience with the system that you have.

Consistency. So AI maintains design standard across the platforms. So often we have also seen that if you're going to build different UIs for the different pages, while reviewing the different government websites, we have seen that I mean the layout or probably the color scheme or probably the information flow is not consistent across different pages and which basically lead to the bad user experience. So AI basically help you in following those design standard across the platform and maintain it accordingly. So it helps you in real time adaptation.

So interface adjust, on the fly or based on the user needs you have. It enhances accessibility. So AI can automatically adjust to support users with different abilities. So for example, you are building some kind of learning app or probably a running app or

something. So how the different people with disabilities going to use it.

Basically your system can somehow support your interface can auto accordingly basically can support facilitating these kind of users. So some real world examples are Microsoft's adaptive UI in Office Suite, if you have tried that. So I just read one and tool based on the user behavior. So you might have also seen Duolingo language learning. So it did that lessons to the user's learning pace using AI.

So if you know about examination like TOEFL or probably many others, GRE and so on, in a way they also use some kind of adaptive examination based on the kind of answer that you are providing. So some real world example of smart UI, one of my favorite example is Tesla. As you can see that Tesla's autopilot, in this case the car's interface adapt to the road condition and the driver behavior and it works accordingly. Similarly, Spotify is another popular example you can see. So in Spotify music recommendation, it uses machine learning to curate personalized playlists like Discover Weekly and so on.

And more real-world example that you can see around your real-world life. So for example, many of you have seen that there are different payment terminals, just like probably this. used to be at different grocery store at different shop and so on because these days especially in the era of digital world nobody carries cash in that case people often prefer to pay through the cards Or other ways instead of giving cash; in this case, you can see one of the early payment terminals. You often see that, so it has keys; once you insert your card, it asks you to insert your PIN. So in this case, you can see that after you insert the pin, for example, 4613, after entering this four digit pin, you probably perform the transaction and you can see that.

But is there any issues with it? Somehow, the person sitting or standing beside you. They can somehow see the PIN that you have, and often it can be misused, leading to card cloning and probably many other types of fraud. So how can we avoid such scams or fraud? So that's where basically now the new payment terminal systems, They have often changed from key-based payment terminals to more digital payment methods. One of the major benefits is that at least you can see it here. Because the position of all the keys is fixed.

So, for example, based on your typing pattern and your clicking pattern, you would know if I click like this. So these are, for example, the numbers one, two, three, four, five, six, seven, eight, nine. So in that case, based on the position, you first place this, then this, then this. So it's very likely that some intruder can see what your PIN is because the key positions are fixed. So in order to solve this, so newer design while solving this

problem, they come up with the digital keys.

So where it doesn't follow the same key as this is unclear. So it might be the case that one is here, and then five is here. Then probably seven is here, then two is here, then probably nine is here, and then three, and so on. And at different times, these positions will be even more distinct. So that the imposter, or perhaps the person sitting beside you, I can't guess, just based on your finger positions, which button and which numbers you are pressing for your PIN.

So in a way, I mean this is an example of what you could say is a smart UI. So these payment terminals involve payments using the Paytm terminal with physical keys. Digital keys, and now we are more into the QR code things; you can simply. you can see one of the smart user interface rather than probably entering even the amount, the user basically, the vendor simply already You could probably even put the amount you simply have in the QR code. And it will automatically fetch the vendor payment details.

You can simply pay it, so the benefit is at the same time a drawback, as we discussed. It involves potential technical issues; it could also have a dependency on Internet connectivity. Acquiring these payment terminals also involves costs, and so on. At the same time, the benefits of payment terminals offer secure and convenient transactions. Increasing sales and efficiency now.

You see, I mean, if you're even driving on the road. You often see that the traffic police are now just holding this; earlier, it was. The challenge was in terms of cash. And that's where a lot of corruption was happening, but now there is a quite limited possibility. Having corruption, where you can basically pay the transport department directly using your card.

So there are more examples. So you can visualize it on Google Maps. Similarly, Tesla's in-car interface is. So I leave this as an activity for you to explore all the smart UIs they have. For example, Google Maps offers predictive route suggestions.

Real-time traffic updates and adaptive rerouting based on the user's location and traffic patterns. And the smart UI aspect it has is that the interface adapts based on previous searches. Commuting habits, current traffic conditions, and offering quick and relevant suggestions are important factors. So I would like you to explore and go through the examples of Tesla in car interfaces; you can also read about them. Apple Watch, Amazon Alexa, Duolingo, smart home lighting.

For example, Philips Hue, Google Photos, Slack, and others. So these are the smart UI

aspects that you can design. How you can incorporate something that is not fixed but can probably adapt to the situation. Adapt to the environment, adapt to the user, and facilitate their needs. In accomplishing the task so often, you might have seen that.

We are talking about the example of Google Maps, so when you are using Google Maps, you can use it. During the day, you can use it; at night, you can probably use it in some tunnel. And you might have noticed that the UI of Google Maps also changes over time. Similarly, UI, for example, is. You are going to one particular destination via one route, and you come to know that there is an accident happening.

Again, it may take input from some crowdsourcing, or probably not. Google can also find out, for example, through satellites and many other ways; you can probably get some real-time information. and accordingly it can suggest you rather than going probably from this route For example, it took longer to travel from Delhi to Mumbai earlier. Two days by car, but now it will be even longer, so it's probably better to go through this city rather than the other city. Similarly, Paytm, the RxA2 app, and all these applications have different smart UI features.

You can think about it; you can visualize it. So, some of them are probably listed here. And it's still the case that many of the features are present. Many of the interfaces that you interact with in these apps still do not use smart UI. So I would like you to think aloud about it and observe.

Which one can you basically make smarter? To again follow all the design principles and also make it more accessible. inclusive, easy to use, and so forth Similarly, I mean you can consider the case of Zomato. What are the smart UA aspects that it has to adapt to user behavior for personalized food recommendations? Trending restaurants and so on. Similarly, Ola is one of the popular car services like Uber. So you can also think of them as having other smart area aspects like real-time tracking.

Where the driver has come from, how far they are, and adapting to the traffic patterns are all necessary for an accurate estimated arrival time. It learns user preferences, such as ride type: auto, rickshaw, cab, bike, or whatever. It integrates local payment methods like UPI, cards, or other easier transactions. So, you can also think about Flipkart. You can also think about the Airtel Thanks app and many others in your real world.

and try to think about what kinds of interfaces they have, What kind of functionality do they have? How you can make them smarter, especially in the era of machine learning and large language models. How you can basically accomplish performing the task in a better, easier, more efficient, and more effective way. Improve the user experience for

your users while using the system, and so on. So, what is an AI-oriented UI? So, a user interface that uses AI to provide tailored content, predict user needs, and enhance interactivity is needed. So it involves techniques such as natural language processing, computer vision, speech processing, and recommendation algorithms.

So the key benefit is not just limited to these three. So personalization, customized access, and experiences based on the user preferences. predictive analysis so anticipate the user actions And suggest solutions that automate the process, reducing the users' cognitive load. Some real-world examples of AI-oriented UI that you can see. So, for example, in this case, you might have seen the queue of dragons' touchscreen interfaces that you have seen at SpaceX.

Shuttle, you can see that here, basically, the crew is interacting with these interfaces. By touching and interacting with them, there are different touch points. As you can see here, they can manage it. So in this case, you can see that the Crew Dragon spacecraft uses an AI-assisted touchscreen.

Instead of traditional control panels. The AI helps astronauts by automating routine tasks and providing real-time guidance, making operations smoother and safer. Similar thoughts can be made about the Google Maps traffic conditions. So I leave this to you as an activity to complete. So, what features does it have? Adaptive layout adjusts the UI based on the device, the user's behavior, patterns, and the environment. Similarly, recommendation system, so suggest relevant content or actions.

Voice and gesture control enable seamless hands-free interaction, which is more in line with how humans are accustomed to communicating, resembling the natural language conversations we have. And so, conversational interfaces use chatbots to enhance customer support. Because it may not be possible for you to provide real customer care support for, for example, the billions of users you have. You have millions of users on 24/7. so Netflix real world examples you can see that so Netflix have very popular recommendation system which uses AI to personalize movie show recommendations and so on Similarly, Apple's Face ID is a smart interface that uses computer vision to recognize faces.

To unlock devices securely, many of you use different smartphones in the same way you unlock your phone with a fingerprint. You can probably make the eyes with the face either more complex or simpler. You can think of the role of AI, or probably the smart UI, there. to probably make it more fun or to probably make it more robust One of the areas in biometrics that causes continuous user authentication is. Because you might have seen that your friend was asleep.

And probably you unlock his phone by just putting your finger on it. And you can do a number of tasks with that, or you could probably misuse it. So that's where the necessity of continuous authentication comes in, which again you can handle through a smart user interface and smart functionality in your system. So, what is automatic UI evaluation? How do you evaluate them? So, the use of AI tools to automatically evaluate and assess usability is important. The aesthetics and effectiveness of the user interface are important.

So it helped designers identify issues, improve accessibility, and optimize layouts without manual testing. Because sometimes manual testing is not feasible. Given the scale, the environment, and so on, the key points include automated usability testing, performance metrics, and aesthetic analysis. So, where automated usability testing is concerned, it is about UI tools.

That simulates user behavior to find potential issues. So what if, for example, you are in a particular situation? how you are going to behave it similarly that's where basically a lot of simulation studies are happening to doing all those testing Performance metrics track interaction metrics such as click rates, completion times, and engagement. To provide more information about the performance and similarly analyze aesthetics to check for visual harmony, color schemes, and readability. So, some real-world examples you can see are Google's Lighthouse tool. So it automatically assesses the website's performance. Accessibility and SEO (search engine optimization) use Adobe Sensei, which employs AI for image editing and design assistance, ensuring layout balance.

So there are several challenges and considerations in smart UIs. So, privacy concerns, data collection, and uses for AI-driven personalization: how it is going to be useful. So that's where we discuss the example of the guidelines regarding ethical concerns, IRB, and many other topics. Bias in algorithms can cause AI models to reinforce bias if they are not properly managed. And that's where we see many examples of existing AI systems being biased.

So, for example, in a resume, there is a short listing. We have discussed one example in earlier lectures about Amazon's AI-based recruitment tool, which is biased against women. Similarly, there is an overreliance on automation. So excessive automation can reduce user control, which can eventually lead to poor user experience. So that is advanced AI feature that may lead to steep learning curve for some users.

Examples of Facebook's algorithm bias are so. Instance of AI suggesting inappropriate content. that we have seen that it's not only on Facebook but also on many e-commerce websites and so so Google's privacy control so that regular updates to update AI features

With user privacy, there are several popular tools being used, such as Adobe XD plus plugins, for creating smart and interactive prototypes. Figma's AI-powered collaborative features with real-time feedback. Sketch design system management with plugins for automation: Google Analytics, Hotjar. Track user interaction and behavior analytics for the XRPE Prototype with advanced interactivity and automation features.

Examples include: Adobe's XD is auto-animate. So create smart animations for prototypes with minimal effort. Or just a heat map, which is a visual tool to see where users click and scroll on the website. And that's where you can basically understand user behavior. does the user is doing the, uh task the way you want to the weather the some for example on e-commerce website You have placed a sale notice somewhere.

Thus, it attracts user attention. So that is something you can focus on; there are several emerging trends related to AR/VR, as we discussed. And that is more for integration with the MRC UIs. So, voice-first interfaces prioritize voice commands. So, Alexa and Google Assistant, that is something we have discussed. So, emotion recognition means UIs that respond to user emotions using facial recognition.

So, zero UI interface reduces visible UI elements in favor of natural interactions. So Apple's design is something like this. Tesla's design is something like that. So that's where they're also gaining quite a bit of traction.

So, for some real-world examples, you can see Google Lens. So, an AI-powered camera that can identify objects and translate text in real time. So you might be aware that Meta has also come up with a similar glass. With the collaboration with Rand Bay, they can again do something similar, probably in an even better way, which Google Lens was not able to do. So BMWs use AR navigation, where augmented reality projects navigation instructions onto the windshield of the car. So, to summarize, smart UI leverages artificial intelligence to create adaptive, efficient, and personalized user experiences.

So the use of AI in automatic UI evaluation saves time and offers unbiased insights. As technology advances, smart UIs will continue to evolve, making user experiences more seamless and intuitive. For example, Samsung's One UI. An interface that adapts to the user's hand grip for one. So, those who may be using a Samsung phone, when you start or restart your phone, will see that one UI optimization is happening.

So that is something that is happening there. So AI will redefine the future of UI design by making interfaces smarter rather than fixed, and not just prettier. That's what Chris told me, and I agree with him. So, going forward, these are additional materials that are part of this lecture. So we are going to have a tutorial on prototyping by our amazing TA,

Hrithik Bamba. Going forward, we are going to have a discussion on prototyping by our wonderful students, Shlok, Sanjana, and Hardy, and releasing the assignment for that.

So these are the further reading materials, and I encourage you to go through them for more details. Thank you. With this, we stop here. Looking forward to seeing you in the next lecture.