Human Computer Interaction (Hindi mein)

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Data Requirement, Gathering, and Analysis: Lecture 6

Lec24

[Sangeet] Namaskar. Saptah chhah mein aapka swagat hai. Pichle adhyay mein humne padha tha kaise interface jo ki antar falak ya sampark bindu hota hai kisi bhi maanav kendrit system ko banane mein ek aham bhumika nibhata hai. Humne discuss kiya tha ki kaise conceptual modeling humein ek high level understanding description banane mein madad karta hai. Kisi bhi maanav kendrit system jo hum banana chahte hain. Humne uske alag-alag paripeksh ke baare mein bhi baat ki thi aur interface mein humne yeh bhi discuss kiya tha kaise alag-alag tarike ke jo interaction types hote hain chahe woh instruction based ho, nirdeshan based ho, chahe woh conversation based ho, samvaad based ho, chahe woh manipulation ya hastakshep based ho aur kaise aap anveshan ya exploring based ho aur usi tarike se humne alag-alag jo respond based ho, alag-alag tarike ke jo interaction types hain, kaise hum usko support karte hain alag-alag tarike ke a interface ke madhyam se. Humne baat ki thi kaise graphical user interface humein madad karta hai. Kaise? Command line interface madad karta hai. Kaise? Natural user interface madad karta hai. Kaise? Tangible user interface madad karta hai. Humne VR interface aur AR interface ke baare mein bhi baat ki thi. Toh ek tarah se jo alag-alag interface hain, alag-alag interaction type ko support karte hain aur kabhi-kabhi hum ek se zyada bhi interface ek se zyada interaction ko support karne ke liye uske combination mein uska use karte hain. Toh is saptah mein hum data ki zaroaratein unko ikattha kaise karna hai? Kaise neetigat aur fair tarikon se hum usko ikattha kar sakte hain. Uska anveshan kaise karna hai is baare mein charcha karenge aur kaise yeh ek maanav kendrit system banane ke liye aham bhumika nibhata nibhata hai. Is pe abhi hum baat karenge. Toh chaliye aage badhte hain. Toh jaisa ki humne baat kiya tha ki hum alag-alag interface aur interaction types ke baare mein humne baat ki thi. Humne conceptual modeling aspect of interface baat ki thi aur kaise cognitive aspect humein ek achha interface simple aur sahaj interface banane mein madad karta hai aur humne alag-alag tools ke madhyam se bhi iske baare mein seekhne ki koshish ki thi. Toh chaliye yeh is saptah ki rooprekha hai. Hum data zaroaratein ki baat baare mein baat karenge. Kis tarah ke data ki zaroaratein hain. Kis tarah ka data ikattha hota hai. Kis tarah ka data hum alag-alag stages mein use karte hain. Jab bhi hum design principles, design thinking, design process ki baat karte hain. Jab hum ek overall system banane ki baat karte hain, toh kis tarah ka data ikattha hota hai, kaise usko ikattha karte hain, us baare mein hum baat karenge. Data analysis jab ek baar data alag-alag tarike ka data alag-alag upyogkartaon ka data aapke samaksh hota hai toh kaise aap usko use karte hain kaise uska

analysis karte hain uske baad hum ek case study ke madhyam se iska adhyayan karenge aur ek tutorial mein hum data gathering aur uske analysis ke baare mein baat karenge aur kyunki jo bhi data aap collect karte hain ikattha karte hain un data ko ikattha karne ke liye alag-alag naitik paksh hote toh uske liye hum IRB Institution Review Board ke baare mein detail mein charcha bhi karenge aur finally hum assignment ke madhyam se aapko ismein madad karenge ki jo bhi cheezein aapne seekhi usko aap yahan pe apne aap ko mulyankan kariye. Toh chaliye start karte hain data ki mahatta kya hai HCI mein? Toh data ek tarah se fundamental hota hai apne alag-alag jo upyogkarta hai unki zarooraton ko samajhne mein aur jo designer hota hai unko batane mein ki kis tarah ka unko decision lena hai kis tarah ka interface lena hai kis tarah ka interaction type use karna hai waghera-waghera toh ek tarah se humein yeh madadgaar saabit hota hai kis tarah ka data chahiye kis tarah ke objective ko poorn karne ke liye toh alag-alag data ko collect karne ke liye alag-alag takneeki hi hongi. Toh alag-alag hum takneeki ki baat karenge alag-alag data ko ikattha karne ke liye aur ek baar jab data collect ho jayega alag-alag tarike ka toh ab hum alag-alag methods ke dwara alag-alag techniques ke dwara unse insight nikalne ki koshish karenge. Aur ismein ki concentration jaisa ki humne bola inki neetigat pehlu hai aur kahin yeh pakshpaat poorn toh nahi hai. Yeh kitna fairness hai? Ah kitna paaradarshi hai? Aur accountability kiski hai? Kitni hai? Kaun iske liye kiske upar iski accountability hai? Is baare mein baat karenge. Kyunki hum alag-alag data ikattha karenge. Alag-alag data ka use karenge. Toh aaj ke time par jab bhi upyogkarta alag-alag tarike se apne daily routine mein alag-alag tarike se jo huge amount of data generate karta hai toh yeh big data bhi ek tarah se alag-alag decisions lene mein alag-alag recommendation methods banane mein apne user ko samajhne mein unki zarooraton ko samajhne mein aur madad karta hai. Crowd sourcing ke madhyam se, real time data, diversity, vividhta aur field study ke madhyam se bhi hum alag-alag cheezon ko samjhenge. Toh Don Norman ne bola tha user research is a fuel for animation. Aur agar hum user research ki baat karein toh humne yeh bhi baat ki thi kaise user research humein apne upyogkartaon se sahanubhuti rakhne mein bhi madad karta hai. So driving design decision with real world insight. Ki kyunki ek tarah se real world jo data aapne collect kiya hai toh ek tarah se real world insight deta hai humein alag-alag ki decision ko lene mein kis tarah ki ah kis tarah ke alag-alag user hain aapke paas kis tarah ki unki zarooratein hain woh kaise use karte hain unka behavior kya hai yeh saari cheezein humein user research ke madhyam se pata chalti hain. Iska jo fayda hai woh accurate user insight nikalne mein hota hai. Jisse ki aap apne upyogkarta ko bahut achhe se samajh sakte hain. Unki taakatein kya hai? Unki zarooratein kya hai? Woh kis cheezon ko kis tarike se karne mein asamarth hain? Waghera-waghera improve design decision, design decision humein lene mein madad karta hai. Jaise kabhi-kabhi aapke paas dher saare aise option hote hain. Toh ek tarah se sahi decision aapke upyogkartaon ko dhyan mein rakhte hue unke drishtikon ko dhyan mein rakhte hue aap le sakte hain. Toh you can make informed choice during the design phase. Aur uske baad ah punravritti ke madhyam se aap usmein lagatar improvement karte rehte hain. Toh ability to refine design based on the real feedback. Kyunki ek hota hai simulation ya ek hota hai ki aap apne jaise hum pichle saptah mein dhaarnaon ki baat kar rahe the. Assumption ki baat kar rahe the. Uske basis pe aap apne user ke zarooraton ko

samajhte hain. Lekin woh zarooratein jo dhaarnayein agar galat hai toh dikkat hogi. Toh is wajah se usko validate karne ki zaroor koshish humein karni chahiye. Toh real feedback ke madhyam se hum un jo dhaarnayein hain unko validate kar paate hain ki haan hamari dhaarnayein sahi thi. Hamari dhaarnayein galat thi. Sahi hai toh matlab aap sahi raaste pe jaa rahe hain aur galat hai toh usko sahi karne ki zaroorat hai. Punravritt karne ki zaroorat hai. Jaisa ki humne bola tha refine your assumption. Toh stakeholder buy in toh data driven justification for right design decision. Toh ek tarah se aapne alag-alag jo aapke stakeholder hain unse unka data liya. Un unse jaankari li toh woh ek tarah se aapko madad karta hai data driven. Us data ke aadhaar pe aapne jo bhi aapne faisle liye hain design mein ya development mein woh justify karte hain. Toh what is data requirement? Toh ek tarah se identifying what information is necessary to inform decision and it focus on user needs task interaction context. Toh ek tarah se hum dekh sakte hain ki data is in HCI is about understanding people who they are, kaun hai woh, unki zarooratein kya hai aur woh kaise behave karenge, kaise interact karenge toh alag-alag keh sakte hain ki data ki zaroorat padti hai aapko user data ki zaroorat padti hai jahan pe demographic of preferences hum ek tarah se lete hain jaise example ke taur pe hum dekh sakte hain an e-commerce website like Amazon collect user data including demographics kahan pe rehte hain? Unki umra kya hai? Unke baare mein aur bhi details unki preferences kya hai ki unhone past mein kya cheezein search ki hain? Kya unki zarooratein ho sakti hai? Kis brand ki cheezein woh khareedte hain? Unki search history. Toh ek tarah se yeh jo personalize data hota hai, bahut hi zaroori data hota hai e-commerce jaisi companiyon ke liye, unke upyogkartaon ko samajhne ke liye. Kis jaise aap keh sakte hain ki jaise Delhi jaise sheher mein is tarah ki product ki zyada zarooratein hain. Grameen ilakon mein is tarah ki product ki zyada zarooratein hain. Jo student hain is tarah ke product ko zyada khareedte hain. Jo working class hai woh is tarah ke logon ko zyada khareedte hain. Ko alag-alag ek tarah se yeh jo preference hota hai unko ek achha decision lene mein insight unko milta hai aur uske madhyam se woh ek achhe seva ko pradaan karte hain aur achhe profit ko bana sakte hain in sab cheezon ko user data ko lete hue. Task data yeh zyada tar ek tarah se hum task ki jatilta aur kitna frequently alag-alag task ko use karte hain uske baare mein ek insight deta hai. Toh ab jaise banking app collect data on task like transferring funds checking balance paying bills. Toh ek tarah se jo jo alag tarike ka jo task woh kar raha hai, kuch saral hai, kuch aasan hai, kuch jatil hai. Toh, it analyzes the complexity of each task. Jaise in kaarya ko karne ke liye kitne aasani se woh kar pa raha hai. Kitna kitni baar aur kitni jaldi-jaldi kar pa raha hai. Toh jaise hum balance check karne ki baat karein toh shayad woh kam baar kare lekin baar-baar UPI ke through payment karna woh thoda frequently hota hai ki din mein aap chai peene gaye aap kuch saamaan khareedne gaye toh baar-baar UPI use kar rahe hain. Toh frequency sabki alag hai. Usi tarike se uski visibility alag honi chahiye. Uska placement alag hona chahiye. Usko saralta se aur kitne aap karne de sakte hain yeh saari cheezein honi chahiye. Toh is tarike se interface and reduces user effort kyunki ultimately humein user experience ko badhana hai aur uske anubhav ko badhane ke liye humein usko kam se kam effort daalne ki zaroorat hai. Chahe woh mental ho chahe woh physical ho. Toh aur contextual data ki zaroorat hai kyunki yeh is par bhi nirbhar karta hai ki kis environment mein aap data ko kis environment mein aap system ko use kar rahe

hain. Kis tarah kis tarike se use kar rahe hain. Jaise a fitness tracking app like Fitbit collect context data on whether the user is indoor or outdoor. Kyunki indoor aur outdoor ke madhyam se bhi aap kaafi jaankari le sakte hain ki woh app kaise kaarya karega. Jaise there location time of day. This information helps suggest exercise track outdoor activities waghera waghera system data jo ki ek tarah se ek tarah se metric hota hai mainly system ke liye ki kaise aapka system kaam kar raha hai kitni baar woh crash hua kitne achhe se kaarya kar raha hai waghera-waghera toh jaise par kitna tezi se kaam kar raha hai waghera toh jaise aap dekh sakte hain video conferencing tools like Zoom monitors system data including jaise call quality hai batchit karte samay kitni baar call drop hui ya aap signal kamzor hua ki aap agle vyakti ki baat nahi sun pa rahe hain. Connection stability hua, error occurrence hua. It helps identify bugs, optimize platform for different internet speeds, improve overall system and reliable. Kyunki jab tak aap ek reliable system nahi banayenge jo aapka upyog karta hai woh aapko aapke system ko use nahi karega. Toh isliye bahut zaroori hai ki hum jab bhi data ki baat karte hain toh ismein ek need finding jisko requirement gathering ke baare mein baat kar rahe the usko samajhne ki bahut zaroorat hai jo ki humein madad karta hai understanding the underlying needs kya-kya zarooratein hain kya-kya challenges hain kya jaise agar koi system already exist karta hai us tarah ka toh usko use karne mein usko kya-kya dikkato ka saamna karna pad raha hai kis tarike se behave kar raha hai of user for crucial gathering relevant data toh iska purpose ek tarah se dekhiye yahi hai. Identify what data is needed based on the research questions and the problem to be solved. Toh focus area hamara jo yahan pe hai user behavior hai, goal hai, pain point hai and the preferences hai aur real work constraint like time, budget and accessibility. Ek tarah se hum dekh sakte hain ki kaise data jo hai ek crucial crucial role play kar raha hai kisi bhi maanav kendrit system banane ke liye, human centered system banane ke liye aur example ke taur pe aap fitness app dekh sakte hain. Toh ismein alag-alag tarike ke data ki zaroorat ho sakti hai. Jaise yeh user activity level kis tarah ka exercise kar raha hai ya kya kar raha hai? Health metric jaise kitne step chala? Uski heart rate kya thi? Uska motivation exercise ke liye kya hai? Toh alag-alag ek tarah se data jo humein milta hai woh us usne kya lakshya banaya hua hai apne fitness app ke through waghera-waghera. Usi tarike se mobile health app mein jaise aap dekh sakte hain need finding would involve understanding the specific health challenges user face like tracking exercise diet stress. So this guide the data requirement such as the need for the health metric. Kyunki ek tarah se agar hum mobile health app bana rahe hain toh health se related jitne bhi zarooratmand data hongi usko aapko ikattha karne ki zaroorat hai. Jiske basis pe aap jo aapke upyogkarta hai usko bata paaye ki dekhiye aap is tarike se kar rahe hain. Aapka heart rate zyada badh raha hai. Aapka probably jo diet hai woh is tarike se nahi hai. Alag-alag jo ek tarah se activity logs hain aur feedback ke madhyam se aap jo app ki alag-alag functionality hai usko support kar sakte hain. Toh tools ek tarah se aap dekh sakte hain. User interviews survey for qualitative data, Google and analytics, app usage data for behavioral data. Is tarah se aap dekh sakte hain. Toh jaisa ki maine bataya ki khaastaur pe jo badi-badi companiyan hoti hain unke paas itna dher saara data hota hai jo ki unko ek alag-alag vividh prakaar ke jo aapke upyogkarta hain unke baare mein janne ki zaroorat padti hai. Janna aasan hota hai. Unki zarooraton ko janna

aasan hota hai. Unke dikkato ko aaj janna aasan hota hai. Toh ek tarah se jo massive amount of user generated data available from the system and device woh unko madad karta hai ki kis tarah ka system kis tarah ke environment mein kis tarah ke user ke liye upyukt hai. Usi tarike se aap ek inform decision nikal laga sakte hain aur in sab insight ke madhyam se ek achhe system ka nirman kar sakte hain. Toh ek tarah se iska jo big data hai HCI mein keh sakte hain. Personalization mein aapki madadgaar saabit hoti hai. Jaise aap alag-alag useron ke data ke madhyam se aap soch sakte hain ki agar kisi aapki preferences yeh hai, aapki pasand yeh hai toh aapke pasand ke mutabik aapko is tarah ka content recommend kiya ja sakta hai. Toh this understand user behavior and provide personalize content. Chahe woh movie ho, chahe woh item ho, chahe woh alag-alag tarike ke experiences ho. Pattern recognition ke madhyam se jo dher saara data aapke paas pada hua hai woh aapko madadgaar saabit hota hai ki ab ka trend kya hai? Kyunki trend bhi samay ke saath badalte rehte hain. Jaise ki hum Instagram pe baat karein. Instagram par for example dher saare log alag-alag dress ke saath ya alag-alag tarike se alag-alag activities kar rahe hain. For example alag-alag fashion follow kar rahe hain. Toh kya us trend ke mutabik woh jo information hai aap jo unki e-commerce company hai ya aur bhi company hai unko is tarah ka data bech karke alag-alag insight unko de sakte hain. Toh jaisa ki hum sab jaante hain yeh saari jo badi-badi companiyan hain woh data bechti bhi hain alag-alag is tarah ki companiyon ko jaise chahe woh Google ho chahe Facebook ho chahe Amazon ho jo bhi user level par unke paas data hote hain woh uska use karke apne product ko aur achha banane ki koshish karte hain. Apne seva ko banane ki koshish karte hain aur baaki companies ko bhi is tarah ka data bechti hain aur uska fayda leti hain. Toh jaise ki aap dekh sakte hain ki pattern recognition ke madhyam se jo alag-alag trend hai unka pata karke usi hisaab se aap design decision le sakte hain. Real time decision making mein bhi aapko kaafi madad milti hai. To use big data to support real time decision and adapt interfaces directly based on the live user input. For example jaise Google search mein autocomplete ka suggestion hai, display hai, search hai. Woh trending queries ke hisaab se real time search data ko update karta hai aur aapko sahi prashn poochne mein madad karta hai. Toh, ismein jo key concept hai jaisa ki humne bataya ki ismein bias ka aapko dhyan dena hai ki jo bhi data aapne collect kiya kahin woh bias toh nahi hai. Kyunki agar aapne bias tarike se data collect kiya hai toh jaise hi aapke paas jo real settings mein environment mein doosre tarike ka data ya user milega woh turant fail ho jayega ya usko galat tarike ka galat tarike ka suggestions ya services suggest karega toh bias in data nahi hona chahiye aapne jo data collect kiya hai woh aapko ensure karna padega ki fair ho aur treat all the user equitably transparent hona chahiye paaradarshi hona chahiye so it clear clear explanation of how data is collected used and process. Toh un cheezon ka dhyan dena padega ki ek tarah se yeh pakshpaat poorn nahi hona chahiye. Fair hona chahiye aur paaradarshi hona chahiye. Jaise example ke taur par agar hum dekhein Amazon ne ek recruitment tool banaya tha jismein aap dekh sakte hain ki baad mein yeh paaya gaya ki woh jo mahilayein hoti hain unke prati pakshpaat poorn decision leti hain. Kyunki unka data hi aisa tha. Is wajah se unka jo model tha woh mahilaon ke prati pakshpaat dikha raha tha. Toh Amazon scraps secret AI recruiting tool that shows bias against women. Toh achhi baat hai ki kam se kam pata chalne ke baad unhone

usko scrap kar diya aur continue nahi kiya. Toh tool for fairness kaise hum alag-alag fair tarike se sahi tarike se hum cheezein kar sakte hain. Jaise exam conduct conduction ke liye aap dekh sakte hain Kairon pe madhyam se aap ek online fair examination kar sakte hain with proctoring jahan pe AI aur human ke madhyam se aap ek fair examination exam kar sakte hain. Real time data gathering jaise alag-alag data jo real time par aap collect karte hain to support dynamic and immediate decision making toh yeh real time data humein kaafi madadgaar saabit hota hai. Toh yeh humein personalize mein madad karta hai aur monitoring mein madad karta hai. Jaise dynamically adjusting interfaces or content based on the user action. Toh jis-jis tarike se aap jaise hum smart UI ki baat karein toh jaise alag-alag jaise aap system ke saath play kar rahe hain system ko use kar rahe hain toh uske anubhav ke hisaab se aapke experience ko aur badhane ke liye woh automatically ek tarah se interfaces ko adjust karta hai. Toh continuously observing user behavior to improve interaction in real time. Toh yeh sab cheezein hoti rehti hain. Aur example ke taur pe dekh sakte hain. Jaise Uber jo ek car taxi base company hai. Toh aap dekhte hain ki Uber use real time data to match riders and driver quickly. Kyunki alag-alag jo drivers hain woh alag-alag location pe hain. Usi tarike se alag-alag passenger alag-alag location pe hain. Toh inko optimize tarike se jo driver hai aur jo passenger unko connect karna hai ki jisse driver ko bhi kam chalna pade aur jo passenger hai usko bhi kam wait karna pade. Usi tarike se wearable and and and and and and and and app like Fitbit health app continuously track users for physical activity heart rate sleep pattern uske hisaab se batata hai ki haan aapke shareer ke andar sab kuch sahi chal raha hai. Kuch cheezon ko aapko dhyan dene ki zaroorat hai ya aap achhi nahi achhe se nahi so pa rahe hain raat mein jabki aap sone aapko dhang se pata nahi chalta hai. Heart rate waghera-waghera jo aap shayad normally observe nahi kar paate hain. In wearable devices ke madhyam se aap dekh sakte hain ki bhai sab kuch normal hai ya kuch abnormal ho raha hai. Systems like early warning network for natural device. Aaj ke time pe jo real time huge big data hai uske madhyam se ab hum pata kar paate hain ki kahin koi hurricane toh nahi aa raha hai. Kahin koi tsunami toh nahi aa raha hai aur hum achhe aur sahi samay se logon ke jeevan ko bacha pa rahe hain. Kyunki agar aap pehle logon se poochenge hazaron log aise mrityu ko praapt ho jaate the. Accident mein chale jaate the. Jab is tarah ka jo natural calamity humein samay se nahi pata chalta tha. Jabki ab earthquake, hurricane in sabke in sabko hum ek tarah se jo real time data hum ikattha kar rahe hain chaaron taraf se uske madhyam se hum kuch had tak pata kar pa rahe hain ki yeh hone waala hai. Abhi hum poorn 100% tarike se isko nahi kar pa rahe hain. Lekin phir bhi agar hum pehle ki sthiti se compare karein toh kaafi better tarike se hum pata laga pa rahe hain. Anuman laga pa rahe hain. Jaise mausam vibhag anuman lagata hai. Kal baarish hogi. Parson dhoop rahega. Andar so itne degree temperature rahega waghera waghera field study in HCI is observing kyunki dekhiye ek hota hai ki aap prototype ke madhyam se alag-alag tarike se madhyam se apne ya apni dhaarnaon ke madhyam se aap koi cheez banate hain. Lekin aap apne real user ko upyogkarta ko sahi tarike se tabhi jaan sakte hain jab uske natural setting mein aap unko bolein ki aap isko use kariye. Toh observing users in their natural environment gather real world insight. Toh ek tarah se woh aapko apne upyogkartaon ke baare mein aur bhi achhe se jaankari dega. Jisko aap achhe se utilize kar sakte hain aur apne system ko bana sakte

hain. Jaise agar hum for example face recognition base koi system banana chahte hain toh humein alag-alag setting koshish karni padegi ki face recognition aisa nahi ki hamesha din mein hi kaam karega. Wahan pe raat bhi ho sakti hai, andhera bhi ho sakta hai, light kam ho sakti hai. CCTV ki baat karein toh CCTV ke lagane ka matlab hota hai ki aap chahte hain ki aap capture karein ki bhai kya-kya activity kaun aa raha hai, kaun ja raha hai waghera-waghera. Toh aisa toh hai nahi ki CCTV hamesha din mein chalega. Woh raat mein bhi chal sakta hai aur kohre ke ya fog in sab situation mein bhi ho sakta hai. Toh kitne achhe tarike se in sab cheezon ko aap solve kar sakte hain woh cheezon ko aapko dhyan dena hai. Toh real natural setting mein real world mein agar aap apne user ko apne system ko prayog karne denge toh aapko aur bhi achhi insight milegi apne user ke baare mein. Toh yeh real world data jo hai kaafi kaafi useful hota hai. Toh iske fayde dekhiye yahi hain. Provide the deeper understanding of user context and behavior. It identify challenges that may not emerge in lab setting. Obvious si baat hai yeh saari cheezein lab se mein nahi aati hain. Jaise lab setting mein hum bolte hain ki theek hai aapko isko aise-se use karna hai toh aap aise-aise use karte hain. Jabki real life mein aisa nahi hota. Real life mein agar hum koi education lab bana rahe hain toh class mein agar hum unko bolte hain ki aap padhiye ya teacher ke saamne padhiye toh bade achhe se dekhte hain padhte hain. Lekin agar hum jaise hi unko real setting bolein ki theek hai ghar jaake aapko padhna hai toh jaise hi aapne usko padhna start kiya phir lagta hai ki are yeh movie aayi isko dekh lete hain. Are idhar se phone aa gaya isko dekh lete hain. Are idhar se message aa raha hai isko dekh lete hain waghera-waghera. Toh ek tarah se kaafi distraction hote hain. Toh phir aap un sab cheezon ko kaise effective tarike se handle kar sakte hain woh cheezon ko dekhne ki zaroorat hai. Example ke taur pe Apple conducts field study to test the usability of new iPhone features in everyday settings. Bade achhe tarike se woh karta hai aur yahi wajah hai ki aaj iPhone one of the premier mobile phones hota hai jo ki kaafi log lena pasand karte hain aur uske liye koi bhi keemat dene ki ke liye ready hote hain. Ek cheez ka humein dhyan ki dene ki bahut zaroorat hai. Jab bhi hum dher saare data se ko handle karte hain, ikattha karte hain, unko use karte hain, analyze karte hain toh humein usmein vividhta ka dhyan dene ki bahut zaroorat hai. Kyunki agar woh diverse nahi hoga toh hamare har tarah ke jo vividh prakaar ke upyogkarta hai aur unki zarooratein hain usko handle nahi kar payega. Toh isliye diversity ka humein dhyan dene ki bahut zaroorat hai. Yeh ensure karta hai diverse representation. Vividh prakaar ke representation of alag-alag tarike ke jo user hain and avoid biased aur narrow city. Kyunki agar woh keval ek hi tarike ke users upyogkartaon ko adhyayan kiya hai, unse insight liya hai, unke baare mein jaana, unki zaroraton ko jaana hai. Toh jaise hi woh doosre prakaar ke doosre prakaar ke upbhogartaon ke paas jayega, doosre prakaar ke upyogkartaon ke paas jayega, woh fail ho jayega. Toh in cheezon ka humein humein bahut dhyan dene ki zaroorat hai. Kaise hum un cheezon ko apne system mein samavesh karte hain. Unki zaroraton ko samajhte hain. Toh yeh jab tak aap vividhta nahi layenge apne data mein un cheezon ko handle nahi kar sakte. Toh iski mahatta ek tarah se dekh sakte hain. Account for different user demographics, behaviors and experience in design. Example ke taur par Google ensures the search algorithms are tested across a wide range of culture demographic backgrounds. Toh ek tarah se jo vividh prakaar ke vividh alag-alag jagahon ke alag-alag padhai

ke level ke padhe likhe log thode kam padhe likhe log bachhe log working log kaise har tarah ki logon ko male female Africa ke log Asia ke log America ke log Europe ke log toh diversity metric and survey and the data analytics tools un cheezon ko dhyan mein rakhna hai toh chaliye ek tarah se humne data ke baare mein kaafi baat kar li ab isko ikattha kaise karna hai kyunki ki yeh data toh hai. Iski zaroorat kyun hai? Kaise is tarah se use hota hai? Toh chaliye usko ikattha karne ke baare mein sochte hain. Toh data gathering ke liye collection ke liye collecting data from user through various method to gain insight into their needs, preference and behavior. Toh woh date method kya ho sakta hai? Woh quantitative ho sakta hai. Woh qualitative ho sakta hai. Agar hum qualitative ki baat karein toh aap interview karte hain. Focus group karte hain. Jo maanavadi study hote hain. Ethnographic study kar sakte hain. Field study karte hain. Jahan pe jo natural setting hai, dear natural setting hai, usmein jo upyogkarta hai, kaise use kar raha hai, woh aap observe karte hain. Is tarike se alag-alag tarike ke qualitative data aap collect karte hain aur usko aap study karke alag-alag insight nikalte hain. Doosra jo ki ah ah doosra tarika jo hota hai woh quantitative hota hai. Quantitative data mein ek tarah se aap survey karte hain. User metric karte hain. Analytics karte hain. User logs se waghera ikattha karte hain. Toh ek tarah se jisko aap saankhyiki ke madhyam se ek tarah se se kuch-kuch data aap nikal sakte hain. Usse insight nikal sakte hain. Toh woh ek tarah se quantitative data ho gaye. Qualitative its more subjective data jahan pe aapko usko padh ke samajh ke apne vichaar ko lagane ke baad aap us pe koi decision lete hain koi insight nikalte hain toh alag-alag tools hain isko karne ke liye jaise Survey Monkey hai Google Form hai toh us tarike se aap survey kar sakte hain aur user testing Lookback.io remote user testing waghera alag-alag tarike hain. Jaise real world example ki baat hai. Spot basically kya karta hai? It uses crowd sourcing data to refined music recommendation based on user interaction. Usi tarike se mobile banking app jo hai woh track karta hai jaise server kitne der mein aapne user ne koi request ki toh aap kitne der mein bata pa rahe hain? Koi transaction error toh nahi ho rahi hai. Crash toh nahi ho raha hai. So this data helps the app developer identify and fix bottleneck and ensure a seamless and secure user experience. Toh alag-alag in takneek ke madhyam se aap data collect kar sakte hain. Humne jab data ki baat kar rahe the toh hum often big data bade level pe uchh star par dher saare data ki baat karte hain. Toh yeh sambhav nahi ho paata hai keval ek vyakti ke liye data collect karna. Toh us case mein humein bade global level par dher saare bade level par logon se logon ki madad leni padti hai. Toh crowd sourcing uska ek madhyam hai. Gathering data from a large number of people often online to gain insight from a diverse user base. Kyunki for example hum India mein koi app bana rahe hain jo ki baad mein poore vishwa ke logon ke dwara use kiya jayega. Toh ab hum hamare liye aasan nahi hai ki hum Bharat ke bahar jaake even Bharat ke alag-alag parts mein jaake ikattha karein. Toh crowd sourcing ke madhyam se aap ghar baithe-baithe us tarah ke represent diverse logon se bhi unka rai le sakte hain. Unke baare mein jaan sakte hain. Unka data ikattha kar sakte hain. Usi tarike se Amazon Mechanical Turk hai. Human protocol hai jo ki gather feedback on multiple interface design. Toh iska fayda humein scalability mein milta hai, diversity milta hai aur hum apne utpaad ko seva ko kuch seemit logon tak na seemit rakh ke ab hum dher saare logon tak pahunch sakte hain. Agar hum crowd source ke madhyam se diverse

data ko ikattha karte hain. Toh real world example dekh sakte hain. Jaise Wikipedia is the largest crowd sourced encyclopedia where volunteers contribute and edit articles. Har tarah ke world ke alag-alag part se log ismein participate karte hain. Google Map relies on user contributed reviews, photos, location data to provide accurate local business information. Usi tarike se e-commerce vector site pe aap dekhte hain ki alag-alag product alag-alag hazaron lakhon karod log khareedte hain. Unmein se kuch fraction of log us pe apna reviews bhi dete hain. Toh uske madhyam se aap dekhte hain jab kisi product pe jaise is product ka jo rating hai 4.7 hai. Iska 3.2 hai. Itne hazar logon ne ya itne 100 logon ne apna vichaar rakha hai. Toh ek tarah se inform decision humein lene mein madad karta hai ki humein is product ko khareedna chahiye ki nahi khareedna chahiye. Iski itni value deni chahiye ki nahi deni chahiye waghera waghera toh Amazon Mechanical Turk and protocol Audino jo ki ek speech generation based platform hai CrowdFlower hai crowd sourcing task ke liye aap use kar sakte hain. Toh jab hum crowd source ke madhyam se data collect karte hain toh kabhi-kabhi humein alag-alag jo data collect kar rahe hain unko label ya annotation karne ki zaroorat padti hai. Toh woh hum kaise kar sakte hain? Toh humein quality control karne ki zaroorat hoti hai. Toh ensure high quality reliable and accurate label data for training AI and machine learning model. Kyunki khaastaur pe AI aur machine learning models ke liye ek annotated data ki zaroorat hoti hai jo ki humein models ko train karne mein madadgaar saabit hoti hai. Agar woh data achhe se ya sahi tarike se label nahi hai toh machine learning model jo hai woh galat cheezein seekh lega aur galat tarike se hi kaarya karega. Toh AI aur machine learning model ke baare mein bola jaata hai. Garbage in garbage out. Aap kooda kabaada denge toh kooda kabaada hi niklega. Toh uska decision bhi usi tarike se galat hoga. Toh isi wajah se humein quality control karne ki bahut zaroorat hai aur jisse ki jo error aur bias hota hai woh kam ho sakta hai and prediction and poor experience. So agar yeh cheezon ko aap dhyan nahi denge toh toh galti se galat prediction karega aur user experience bhi usi hisaab se kharab hoga. So it affects the performance and generalizability of the data driven system and crucial for user centered design. Toh ab hum ensure kaise karenge ki data ki quality sahi hai. Quality control hum kaise karenge? Toh uske bhi kai tarike hain. Toh sabse pehle aapko goal standard data banana hota hai. Toh goal standard data ek chhota sa subset hota hai jo ki pehle se label ya annotated hota hai aur wahan pe high quality ka bahut dhyan diya jaata hai. Usko bahut hi achhe se bahut dhyanpoorvak tarike se usmein label ya annotation ki jaati hai aur compare new level against the gold standard for accuracy. Toh ab hum kya karenge ki jab yeh gold standard humne bana liya tab hum is data ke liye jo bhi hum prediction karna chahte hain apne model ke through karenge. Dekhenge ki model ne uska output kya diya aur jab humne gold standard banaya tha benchmark banana tha toh actual level kya tha. Agar woh dono match karte hain toh yeh ek tarah se darshit karta hai ki aapke ne jo AI model machine learning model banaya hai woh sahi kaam kar raha hai aur agar nahi kar raha hai toh wahan pe usko sahi karne ki zaroorat hai woh galat hai toh aur aisa toh hai nahi ki ek aadmi saari cheezein kar sakta hai kyunki agar hum kisi ek vyakti ko hum bol denge ki aapko level karna hai toh wahan pe usse galti ho sakti hai. Toh ek tarah se upar ke level par uchh star ke level par agar humein pata karna hai ki overall quality kaisi hai toh hum kaafi time par same sample ko same data ko ek se zyada

logon ko dete hain label ya annotation ke liye aur unke madhya hum phir inter annotation agreement nikalte hain. Yeh inter annotation agreement ke madhyam se hum dikhate hain ki agar hum yeh jo data tha yeh sample tha. Agar humne person A ko diya toh usne kya response diya. Person B ko diya toh usne kya response diya. Agar dono ke beech mein consistency hai toh it means jo label kiya gaya hai data woh sahi hai. Agar unke beech mein consistency nahi hai zyada tar cases mein unconsistency hai toh matlab koi toh dikkat hai dono mein se koi ya dono jo annotator hain ya leveler hai woh achhe se apna kaarya nahi kar rahe hain ya task clear nahi hai. Kuch us tarah se humein data mein dikkato ka pata chalega jisse ki hum AI model banane se pehle pehle is data aur level ko fix karenge. Aur hum kya karte hain? Redundancy aur consensus daal dete hain. Kabhi kai aise task hote hain jahan pe ek vyakti ko uska uttar dena bada mushkil hota hai. Toh hum jaise normal time apne real life mein karte hain. Hum dekhte hain ki majority log kya bol rahe hain. Jaise Kaun Banega Crorepati mein aapne dekha hoga ki kabhi-kabhi kai prashn ke uttar jo banda uttar de raha hai usko nahi aa raha hai. Toh majority jo audience hai unse poochta hai ki aap logon ka kya mat hai is baare mein? Jis uttar ko zyada tar log select karte hain usko sahi hone ki sambhavna bahut zyada hoti hai. Toh aap toh same cheez technique hum yahan par lagate hain. Toh humne jaise kya kiya ki same sample humne teen logon ko de diya aur unko bola ki ismein se option select karte hain. Agar zyada tar logon ne for example teeno ne ya do ne ek particular response ko select kiya ya label kiya toh hum keh sakte hain ki iska uttar yeh hona chahiye ya yeh ek sahi level hai. Toh use majority weighting or weighted consensus to determine the final level of improving reliability. Active learning ki bhi zaroorat hai kyunki machine learning ke madhyam se aap kuch uncertain ya difficult cases hain usko pehle se pata kar sakte hain aur us pe zyada achhe se dhyan dekar usko sahi tarike se label kar sakte hain. Kar sakte hain. So this prioritizes these cases for manual review to ensure they are correctly labeled aur regular quality audit ki bahut zaroorat hai. Periodically sample label data to check for accuracy or consistency in regular quality audits mein hum randomly data ko select karte hain. Dekhte hain ki jo annotator ne usko kya label kiya. Toh yeh ek tarah se provide feedback and retraining retraining for annotator if quality feels below the threshold. Agar humein lag raha hai ki annotator baar-baar is tarah ki cheezon mein galti kar rahe hain ya is tarah ki cheezon mein galti kar rahe hain toh hum unko phir se training de sakte hain. Unko feedback de sakte hain aur unko bol sakte hain ki bhai aapko in cheezon pe zyada dhyan dene ki zaroorat hai apne annotation ke dauran. Automated aur quality check. Toh hum hum is tarah se algorithm bana sakte hain aur strong ek tarah se AI models bana sakte hain jo ki humein detect karega inconsistency ke liye, missing label ke liye ya outlier ke liye. Toh ek tarah se machine learning techniques flag potential error for manual review jisko aap manual tarike se check kar sakte hain. Toh alag-alag tools hain iske liye jaise Labelbox hai, ProG hai, Superwise.ly hai, Audino hai. Alag-alag kaaryon ke liye data annotation ke liye madadgaar hai. Jaise Audino humne bataya tha. Toh ek tarah se speech data annotation tool hai. Superwise.ly basically includes a review feedback system to ensure high quality labels aur alag-alag tarike se use hota hai. Toh real world example mein agar hum dekhein toh ab agar aapko bade level pe crowd source level pe data annotation karna hai toh maine jaise example bataya tha Amazon Mechanical Turk hai. Human

protocol hai, Google reCAPTCHA hai. Yeh global level pe aur ek tarah se diverse level pe aur keh sakte hain crowd source level pe data ikattha karte hain. Jaise yahan pe reCAPTCHA ke example hum de rahe hain toh kaafi had tak jo upyogkarta hote hain woh willingly ya unwillingly bhi data dete hain. Jaise example ke taur pe agar hum dekhein ki hum aap ek chitra dikhate hain aapke aapko authenticate karne ke liye ki aap sach mein human hai, robot hain. Aap often jo captcha mein image hota hai usko aap type karte hain. Toh ek tarah se aap bhi khud ek annotation kar rahe hain. Aur us tarike se agar hum dekhein toh quality data labeling is the backbone of any successfully AI project when you what you feed in is what you get out. Jaisa ki humne bola tha garbage doge toh garbage milega. Achha doge toh achha milega. Toh toh is tarah se humne dekha ki aap data collect kar sakte hain aur data collection ke baad even data collection ke pehle ek cheezon ka humein dhyan dena padega ki jo data aap collect kar rahe hain kya woh neeti sangat hai aapne kya uska ethical approval liya hai waghera waghera toh ek tarah se humein neetigat data collect karna chahiye aur woh ensure karta hai ki aapne gopniyata aur fairness ka paaradarshita ka dhyan diya hai in gathering and analyzing user data. Toh uske liye alag-alag organization mein ek tarah se jo committee hoti hai woh aap jisko hum keh sakte hain Institutional Review Board woh ek tarah se approval deta hai ya ek tarah se committee apna approval deta hai ki haan aapne in sab cheezon ka dhyan diya hai aur uske mutabik aap data collect kar sakte hain jismein aap alag-alag data poochte hain jaise aap poochte hain ki kya aap apni sehmati dete hain is data karne ke liye aur is tarike se aapka ka data use hoga waghera-waghera aapko unko jaankari deni padti hai aur Institutional Review Board ensures research follows ethical guidelines and protecting participants ki details. Toh jaise Facebook ka ethical review hai. Har organization ka alag-alag ethical review hai. Jo conduct ethical reviews of the expertise in involving user. Jahan pe user data hai, jahan par user interact karega, wahan par IRB ki zaroorat hoti hai. Toh isliye alag-alag regulations hain, guidelines hain jo ki humein ek tarah se inforce karti hai ki aap humein data ko kaise gopniya rakha jaaye. Toh jaise data privacy is a crucial aspect of designing any user system. Kyunki yeh jo gopniya information hai alag-alag user ke liye kabhi-kabhi yeh bahut khatarnaak hote hain aur yeh aur yeh information ek tarah se bias decision lene mein alag-alag companiyon ko madadgaar bhi saabit hote hain. Toh jaise agar koi e-commerce company hai, Amazon hai, for example ya Flipkart hai. Woh jaan liya ki main is tarah ke product ko use karta hoon. Is tarah ke product ko khareedna chahta hoon. Kal ko aapko search engine mein ya jo bhi aap koi product ko search karenge toh woh ek doosre tarah ke product ko dikhayega jahan pe usko profit zyada milta hai waghera-waghera us tarah se decision le sakta hai. Jaise aapne kisi diagnostic base company ko apna blood test ke liye diya, x-ray ke liye diya. Agar woh data woh insurance company ya kisi aur ko ya aapke jo aapke employer hai usko dene lage toh aapko naukri se nikaala ja sakta hai. Insurance company aapko insurance dene se mana kar sakti hai. Aapse zyada premium le sakti hai waghera waghera. Toh isliye data jo privacy hai uski gopniyata hai bahut zaroori hai aur aapko ensure karna padega ki woh achhe se surakshit tarike se rakha jaaye. So compliance with the data regulation privacy regulation toh alag-alag tarike se ek tarah se data regulation policies hain. Jaise khaastaur pe Europe mein agar hum dekhein toh GDPR in European Union jo ki batata hai General Data Protection Regulation

kaise aapko data achhe se rakhna hai surakshit rakhna hai gopniya tarike se rakhna hai. Usi tarike se USA mein aap keh sakte hain CCPA California Consumer Privacy Act HIPAA hai US mein Health Insurance Portability and Accountability Act usi tarike se baaki alag-alag organization India mein bhi abhi probably is baare mein kaam chal raha hai toh ummeed hai ki wahan pe bhi ek achha data regulation policy hoga ah toh best practices for under data privacy regulation jis baaton ka humein zyada dhyan dene ki zaroorat hai woh woh paaradarshi hona chahiye. Clearly communicate data practices in simple language, clearly aasan bhasha mein. Kyunki agar abhi aap use karte hain dekhte hain jaise I agree with the policy terms condition. Itne bade se hazaron page ya saikdon pages ka chhote-chhote fonts mein detail jiske liye aapke liye impossible hota hai. Usko padhna samajhna. Toh aap thak haar ke bas simple haan ya accept accept karke aage badh jaate hain. Security measures to implement encryption and data anonymization techniques. In cheezon ka dhyan dena hai ki for example WhatsApp pe ya kisi anya platform pe agar main chat kar raha hoon apne mitra se toh woh cheezein mere uske beech mein hi honi chahiye. Kisi aur ko uske baare mein nahi pata chalna chahiye. User control toh provide user with tools to manage their data like privacy setting obtain opt out is tarah ki cheezein agar woh unko provide karna padega ki agar woh haan voluntarily aapke liye company ke liye data dena chahta hai toh theek hai otherwise woh nahi chahta ki uska data kisi bhi tarike se aap use karein toh ethical design prioritize privacy ethics and design process to build the trust toh is wajah se the in the world of design the best data is the data that is collected ethically and used responsibility responsibly. Toh agar hum in cheezon ko follow nahi karenge toh kabhi-kabhi aap jitne paise kama rahe hain usse zyada aapko dena pad sakta hai. Aap bade takleef mein ya pareshani ka saamna kar sakna pad sakta hai. Jaise ki kuch pichle saal yeh news aap dekh sakte hain. Russia fines Google more money than there in the entire world. Toh agar aap in sab compliance ka ka anupaalan nahi karenge toh aap badi dikkato mein phans sakte hain. Jaise Facebook faces GDPR penalties for not providing clear data usage information and lacking proper user consent mechanism leading to a major redesign of its privacy policy. Usi tarike se agar hum India mein dekhein toh jitne bhi financial company hoti hain toh wahan par RBI ka guideline hota hai ki aap user ke data ko kaise use karenge, kahan use karenge, kis tarike se use karenge, kaise usko secure rakhenge, woh saari cheezon ka dhyan dene ki zaroorat hai. Jaise Paytm ke ke upar penalty lagayi gayi thi. Kyunki RBI ne paaya shayad is jo aapke upyogkartaon ke data hai woh achhi tarike se nahi save kiye gaye ya woh baaki organization jo ki China mein hai unke saath share kiya gaya. Toh in sab aaropon ke upar ek tarah se un pe penalty lagayi gayi aur unke kai utpaadon ko band bhi karna padega. Jaise Paytm Payment Bank ko band karna. So tools for ensuring data privacy OneTrust, TrustArc, GDPR compliance and data privacy management platforms data anonymization tools like Aircloak and ARX use consent management tool like Cookiebot Osano for managing user content ek tarah se alag-alag tools hai jo ki data privacy ko maintain karne mein ensure karne mein madadgaar saabit hoti hai. Toh yeh cheezein aap dekh sakte hain. Toh ek tarah se pehle humein samajhne ki koshish zaroorat padi data ki zaroorat kyun hai? Kis tarah ke data ki zaroorat hai aur usse humein kya fayda ho sakta hai? Uske baad humne baat ki ki humein data collect kaise karna hai? Alag-alag sources se, alag-alag use logon se kaise

hum vividh tarike se diversity wahan par ek bahut important factor play karta hai. Real setting mein ya real natural environment mein hum data collect karein toh bahut hi laabhdayak hota hai aur aapke upyogkartaon ko janne mein madad karta hai. Jab ek baar data ikattha ho gaya toh aap analysis kar sakte hain. Vishleshan kar sakte hain aur uske basis pe aap alag-alag insight nikal sakte hain apne upyogkartaon ke liye baare mein. Toh chaliye jaante hain iske baare mein. Toh data analysis process of interpreting the data to derive actionable insight. Toh yeh actionable insight kaise nikal sakte hain? Aap pattern dhoondh sakte hain, trend dhoondh sakte hain aur insight and other insight from collected data. Toh ek tarah se jo raw data aapne collect kiya usse aap actionable design improvement kar sakte hain. Naye feature daal sakte hain. Kuch cheezon ko change kar sakte hain. Based on the law ki jo aapke upyogkarta hai. Yeh is button ko unko dhoondne mein dikkat ho rahi hai. Is option ko dhoondne mein dikkat ho rahi hai. Isko karne pe wahan pe galtiyan zyada ho rahi hain. Toh yeh actionable insight ek tarah se aapko madad karti hain. Kaise aap apne system ko aur bhi achha bana sakte hain. Toh alag-alag again iski technique hai. Jaisa ki humne pehle bataya ki aapke paas alag-alag tarike ke data hai. Aapke paas quantitative data hai. Aapke paas qualitative hai toh usi ke hisaab se aap us tarah ki technique use karke unse insight nikal sakte hain. Jaise quantitative analysis ke liye statistical data analysis kar sakte hain. Jaise regression analysis t-test and ANOVA kar sakte hain. Data visualization for representing trends and pattern yeh saari cheezein kar sakte hain. Aur qualitative analysis ke liye affinity mapping kar sakte hain. Thematic coding kar sakte hain. Interview data, content analysis to identify themes and user conversation and reviews. Is tarike se aap alag-alag quantitative aur qualitative data se alag-alag tarike ke insight nikal ke apne maanav kendrit system ko aur achha bana sakte hain. Example ke taur pe agar hum dekhein jaise Google search mein analyze user queries to improve search result relevance. Toh jo bhi usne prashn poocha jis tarah ke aapne uttar diye kitna satisfied toh nahi tha waghera-waghera toh ek tarah se SPSS tab is yeh jo saare tools hain for different qualitative and quantitative data aap uska fayda utha sakte hain. Toh alag-alag steps kya hone chahiye data analysis ke liye? Toh sabse pehle toh aapko data ko organize karna padega. Short categorize padega, categorize karna padega. Uske baad aap alag-alag pattern ko dhoondne ki koshish karenge. So look for the trend in the feedback. Uske baad synthesize finding karenge. Develop the theme and insight. Uske baad aap usko prioritize karenge. Saari cheezon ko ek saath toh kar nahi sakte. Toh focus on the most critical user problem pehle. Uske baad aap jo kam upyogi hai us pe zyada dhyan dijiye. Uske baad translate to design. So use findings to inform design solution jo uske baare mein hai us pe aap dhyan denge. Toh data analysis in HCI is about turning information into actionable insights that improve the overall user experience. Toh is tarike se aap data analysis ke madhyam se kaise actionable insight nikal sakte hain. Toh agar hum baat karein jaise hum affinity diagram ki baat kar rahe the toh improving the mobile app for food delivery ke liye agar aapko karna hai toh data gathered through the surveys and user interviews. Kis tarah ka agar food delivery se related agar aapko app banana hai toh kaun-kaun ke log kaun aur kis tarah ke log usko use karenge? Kis tarah ke unki zaroaratein hongi? Yeh saari cheezein jaise kuch case mein keh sakte hain ki payment turant karenge. Kuch log payment on receival receive karne pe karenge. Kuch log keval vegetarian karenge. Kuch log

non-vegetarian karenge. Kuch log frequently karenge. Kuch log kabhi kadaar karenge. Toh ek tarah se alag-alag yeh jo aapko data ikattha ho raha hai unke hisaab se aap decision le sakte hain. Affinity mapping used to identify pain points like confusing navigation. Persona aap create kar sakte hain. Jaisa ki humne pehle discuss kiya tha. Toh develop to represent different types of user jaise abhi hum baat kar rahe the busy professional ho sakta hai, student ho sakta hai. Aur design changes implemented to simplify the menu and improve search functionality. Toh ek tarah se in design changes ko implement karke hum overall ek tarah se interface hai, menu hai aur jo functionality hai usko aur achha bana sakte hain. Toh agar hum conversation samvaad aur discourse ki baat karein toh analyzing user conversation or interaction with interfaces to understand the communication pattern kyunki humein yeh dekhne ki bahut zaroorat hai ki jo aapka upyog karta hai woh kis tarike se samvaad karta hai. Toh discourse analysis mein aap dekh sakte hain yeh ismein pragmatics ki zaroorat hai. Ethnography of speaking ki zaroorat hai. Genre analysis, conversational analysis, multimodal discourse analysis, critical analysis aur uske hisaab se mediated discourse analysis. Toh ismein methods ki baat karein toh conversational analysis examining user dialogue to improve voice interface and the chatbots. Aur discourse ke case mein its more about meaning. Toh, wahan par understanding how the language and communication shape user interaction. Toh woh us pe zyada dhyan deta hai. Example ke taur pe aap dekh sakte hain jaise Alexa analyzing voice command to improve natural language understanding communication tools like Slack Microsoft team that facilitate team communication through channel direct message and and so on. Toh alag-alag iske tools hai jaise speech analytics software for voice data LIWC jo ki bahut hi common text base discourse analysis based data hai usko aap use kar sakte hain. Toh LIWC ke baare mein aap yahan pe aur bhi jaankari le sakte hain. Toh data visualization in HCI toh data visualization humein ek tarah se visual insight pradaan karta hai ki kya ho raha hai, kaise ho raha hai. Toh graphical representation of data to identify trends, patterns and the insight. Iski mahatta dekh sakte hain aap. Yeh designer ko madad karta hai samajhne mein. Jo large amount of data aapne collect kiya hai make in uske basis pe jo bhi inform decision aapko lena hai woh kar sakte hain. Jaise kal ko aapne koi changes kiya aap toh aap convince kar sakte hain ki dekhiye itne logon ko zaroorat thi. Is tarah ke log yahan pareshani kar rahe the. Yeh jo hamara UI tha kaafi intuitive nahi tha. Toh isliye hum isko change kiye. Toh Google Analytics ek tarah se visualizes the website traffic pattern to improve user experience. Toh Tableau Power BI Google Data Studio ek tarah se iske alag-alag tools hain jo ki log use karte hain. Statistical data analysis in HCI toh alag-alag statistical data analysis tools hain. Aap unko use kar sakte hain aur alag-alag techniques hai jaise regression hai, ANOVA hai, t-test hai. Yeh saari cheezein aap kar sakte hain to identify the relation between variables. Toh alag-alag software hai jaise SPSS aur baaki cheezein hain. Aap isko use kar sakte hain. Jaise R, SPSS, Python aur statistical computing example ke taur pe dekh sakte hain. Jaise Facebook use statistical analysis to measure the effectiveness of the changes in the new speed algorithm. Toh chaliye ab hum ek case study ke baare mein iske baare mein aur dekhne ki koshish karte hain. Toh case study enabling independent learning for BVI. Toh agar hum jo ek tarah se blind and visually impaired students hain. Unko kya-kya challenges ka saamna karna padta hai

independent learning ke liye. Toh they face significant challenges in education due to the absence of visual stimuli. Unko dekh nahi sakte which impact their ability to perceive, focus, retain and process information effectively. Kaise hum prabhavshali tarike se unko madad kar sakte hain woh dekhne ki zaroorat hai. Jo traditional educational approaches hote hain woh primarily jo Braille hota hai us aur audio based hota hai us pe based hota hai aur mukhya woh jo alag diverse tarike ke learning needs hote hain students ke woh usko fulfill nahi kar paate. Toh is wajah se the study seeks to explore the learning preferences of BVI. Hum yeh janna chahte hain kis tarah ki unki learning preference hai preferences hai jo BVI student hai kis tarah ka ek tarah se kis modality ko zyada prefer karte hain kya modality unko seekhne mein zyada madadgaar ka saabit hoti hai toh jaise is case mein comparing audio and Braille modality aisa unhone compare karke dekha hai kaun zyada useful hota hai and evaluate the effectiveness and engagement potential of multimodal approach agar hum multimodal tarike se isko use karte hain toh uski kushalta aur prabhavsheelta kya hai woh hum theek karenge. Allowing user to switch modality between their preferences. Toh ek tarah se yeh humein enable karega ki aisa nahi ki aap ek modality se seekh rahe hain toh wahi seekhte reh. Kuch cheezein aap ek modality se zyada achhe se seekh sakte hain. Kuch cheezein aap modality change karke karte hain. Jaise for example jo simple cheezein hain keval sun ke aap samajh sakte hain. Aur kuch jo complex word hai sunne mein nahi clear ho raha hai. Toh aap switch kariye Braille pe aur usko padhiye aur bataiye usse uski meaning ko samjhiye aur aage badhiye. Toh ek tarah se multimodal system ek tarah se unki learning preferences ko seekhne mein madad karega aur hum unko aur prabhavshali tarike se seekhne mein madad kar sakte hain. Toh limitation with the traditional approach dekhiye jo hai limited availability of accessible educational material nahi hai hamare paas, restricted reach of assistive technology hum bhi abhi kaafi peeche hain wahan pe, heavy reliance on the human assistance abhi jo manushya ke upar uski reliance hai jo ek tarah se un pe dependency hai woh bahut zyada hai toh BVI student face challenges in challenges with inaccessible visual content cognitive difficulties and the high cost on impractical impracticality of the Braille materials making inclusive education harder to achieve agar is baare mein thoda sa aur dekhna chahte hain toh aapne ek movie aayi thi Srikanth jo ki real life pe based thi. Kaise kis tarah ka dikkato ka usko saamna karna padta hai. Kaise visually impaired student hai jo science aur usse related cheezon ko nahi padh sakte the. Pehle usko court mein jaana padta hai. Kaise justify karna padta hai? Toh woh cheezein aap dekh sakte hain. Toh a multimodal approach can offer effective way to address the limitation of single modality based education approach. Toh kaise hum single modality se multiple modality pe ja sakte hain. Overall jo BVI based student hai unke education ko aur prabhavshali banane ke liye. So as proposed by the dual code theory integrating verbal and nonverbal tactile system can establish multiple pathway for memory storage and retrieval. Toh dual code theory ke madhyam se aap dekh sakte hain kaise woh unki madad kar sakte hain. So this can help in reducing sensory overload and facilitate deeper understanding of the material. Toh alag-alag tarike ki data ki zaroorat padegi. Agar hum is particular use case ki baat karein toh humein time se related zaroorat padegi. Jaise pre-test mein kitna samay laga, learning activity mein kitna samay laga aur seekhne ke baad jo humne post-test kara hai usmein kitna samay laga.

Toh again yahan pe aap dekh sakte hain alag-alag instrument ke madhyam se alag-alag unit ke madhyam se aap us tarah ka data lenge. Aap heart rate data bhi collect karna chahte hain during pre-test post-test and learning activity alag-alag jaise yahan pe smartwatch ke madhyam se inhone ikattha kiya hai toh woh dekh sakte hain different physiological parameter inhone ikattha kiya learning and response improvement kuch improvement hua bhi ki nahi hua kaise hum data ke madhyam se karenge toh ek tarah se learning improvement toh test scores record as a mark measured in second for kitna time laga toh woh saari cheezein hum ek tarah se alag-alag unit mein alag-alag instrument ke madhyam se ikattha kar sakte hain. Toh aisa toh hai nahi ki aapne seedhe data collect kiya. Ki yahan pe user involved hai toh aapko IRB approval lena padega. Toh ek tarah se aapko IRB ke madhyam se Institution Review Board ke madhyam se jaana padega. An IRB application typically include the following component aur yeh information ke madhyam se aapko batana padta hai ki aapka study kya hai? Title abstract purpose objective background of research kya hai? Kaun log involve honge? Information about the principal investigation and the team member. Study design and methodology kya hogi? So details of research design methodology and timeline kab se kab tak aap data ikattha karenge? Kaise karenge? Participant detail kaun log ismein participate karenge? Unki eligibility criteria kya hogi? Unki recruitment method kya hoga? Sample kya size kya hoga? Compensation hai toh kya hoga? Unka inclusion criteria kya hoga? Unka exclusion criteria kya hoga? Inform consent matlab unko bata sehmati lene ki zaroorat hai. Consent form and the process of obtaining consent from the participant. Agar participant minor hai toh unke parents se guardian se aapko permission lene ki zaroorat hai. Risk and benefit kya hai? Potential risk mitigating strategies and benefit per participant kya hai? Kahin aisa toh nahi ki is is study mein participate karte samay aap apne aap ko nuksaan pahuncha dein. Participant ko nuksaan pahuncha dein. Toh woh saari cheezon ka bhi aapko dhyanpoorvak dene ki zaroorat hai. Toh toh ek tarah se data management kya hoga? Data collection method kya hoga? Kaise aap store karoge? Confidentiality kaise maintain karoge? Kaun-kaun sa analysis karoge? Aap gopniyata aur ko kaise maintain karoge? The participant privacy and the data security. Ethical consider kahin aisa toh nahi hai. Aap unethical tarike se kuch unse poochein. Ah jaise compliance with ethical guideline and handling with the vulnerable population. Kuch log kaafi vulnerable hote hain ki kahin aap aisa toh nahi unko ab nuksaan pahuncha de. Withdrawal process aisa bhi hona chahiye. Kuch logon ne theek hai. Us samay aapko data de diya. But agar woh baad mein chahte hain ki woh par poore system mein ya poore study mein woh nahi chahte ki unke data ko use kiya jaaye. Toh woh ek tarah se withdrawal process bhi hona chahiye. Funding and conflict of interest. Source of funding and any potential comfort ka bhi aapko dhyan dene ki zaroorat hai. Supporting document jo chahiye hota hai jaise survey kya hoga? Recruitment material kya hoga? Interview guides kya ho gaya? And finally signature and assurance from PI and other relevant institution authority to ensure. Theek hai? Ab aapko approval mil gaya hai. Ab aap naitik tarike se data ikattha kar sakte hain. Usko analyze kar sakte hain aur apne kaarya mein prayog kar sakte hain. Toh ek tarah se ek dekhiye simple IRB application hai. Alag-alag institution ka alag-alag tarike se hota hai. Toh aap ek tarah se dekh sakte hain. Toh case study jaise hum jo BVI case study kar rahe ab usmein dekhiye kis tarah se

data collect karte hain. Toh in tarah ke devices ka aap unhone use kiya hai. Is yeh ek tarah se headphone sunne ke liye hai. Yeh jo smartwatch unhone use kiya usse heart rate ke liye hai. Braille ek tarah se typing ke liye keyboard hai aur laptop hai. Is tarah se aap dekhenge ki alag-alag modality unhone ki. Kaise unhone pehle pre-test kiya. Learning activity ki. Phir post-test kiya aur kaise unhone alag-alag group ke madhyam se alag-alag modality ko dekha ki unki learning preferences kya hai. Camera set kiya waghera-waghera yahan pe ek tarah se dekha jo ki aapko batana padta hai aur alag-alag setup mein dekh sakte hain. Multimodal setup mein aise hoga audio modality setup mein aise hoga aur Braille modality setup mein aise. Is tarah se aapne thodi si jaankari di. Toh ab jab data humne ikattha kar liya toh alag-alag analysis karke aap insight nikalne ki koshish karte hain. Toh jaise yahan par agar aap dekhein toh audio multimodal comparison mein jaise is case mein aapne improve dekha ki kahin learning improve ho rahi hai ki nahi ho rahi hai. Toh ek tarah se unhone t-test t-test perform kiya aur dikhaya ki multimodal perform slightly better ah slightly better than compare to audio modality. Usi tarike se unhone doosra comparison kiya Braille aur multimodal mein toh unhone dekha ki Braille relatively thoda better perform kiya multimodal comparison mein jabki multimodal better perform kiya audio ke comparison mein toh improvement ke hisaab se toh yeh hai but agar samay ke hisaab se dekhein toh time improvement ke hisaab se dekhein toh multimodal mein sabse zyada time improvement tha as compare to Braille as compare to audio. Toh again alag-alag tarike ke aap test karke statistical test karke aap correlation nikal sakte hain. Aap insight nikal sakte hain. Similarly aap dekh rahe hain heart rate analysis ke liye aapne alag-alag jo data collect kiya ki pre-test ke time pe kaisa tha? After pre-test kaisa tha? Before learning activity kaisa tha? After learning activity kaisa tha? Before pre-test kaisa tha? And after pre-test kaisa tha? Ek tarah se aapko alag-alag jo aapke upyogkarta hai, alag-alag log hain, unke baare mein unke baare mein aapko ek alag-alag bahut useful information provide karta hai. Toh heart rate variation ke baare mein again aap alag-alag cheezein dekh sakte hain. Kaise across stage hua, across modality hua, woh sab cheezon ka adhyayan kar sakte hain. Aur in sab data aur insight ke madhyam se aap apna ek Braille typing device bana sakte hain. Kuch bhi kar sakte hain jo ki aap kaise effective tarike se aap unki madad kar sakte hain. Toh summary ek tarah se dekhein toh data is a backbone of user centered design. So proper data collection, analysis and ethical practices are foundational to user centered design. Data driven design create more intuitive and satisfying user experience. Effectively gather and analyze data to better interfaces. Balancing the need for big data, real time data, feedback, fairness ensures equitable, transparent and system design. Diversity and ethical principles are the key to developing inclusive and trustworthy HCI system. Iterative data collection refine and product continuously. Toh good data lead to good design. Additional material mein hum dekhenge data gathering analysis ke upar. Tutorial hai aur IRB ke upar hum ek panel discussion karenge aur assignment denge aur for further study ke liye data requirement gathering aur analysis ke liye aap alag-alag yeh dher saare bahutere study material hai. Aap inse laabh le sakte hain. Jaise ki interview mein users measuring the user experience the UX book understanding your user waghera-waghera aap ek tarah se dekh sakte hain. Yahan pe bahut dher saare bahut useful information de rakhe hain in sab resources mein. Aap inko padh ke inka achhe

se laabh utha sakte hain. Aur isi ke saath is saptah mein main aapse vida leta hoon aur agle saptah hum punah prastut honge naye topic ke saath. Thank you so much.