

PhD Research Proposal Form

Please complete this form and upload it to your online application before submitting your application.

- Do not go over the stated word limits.
- Do not submit proposals in any other format unless this has been agreed with a member of staff
- Complete all sections

Surname	Jackson
First names	Christopher
Advert/Studentship Reference number	CDTAI25

1. Working Title – 15 words

This should be tightly focused on the research you are proposing to undertake

Empowering Chronically Ill Students to Shape the Future of AI Tools in Higher Education

2. Introduction and research significance/research motivation - 250 words

Why the topic is important to the design, development and evaluation of AI technologies and their impacts on society? What do we already know? What we don't know?

University is challenging, but chronic illness can cause additional complexity and barriers to success. The number of disabled students with a chronic illness at UK universities is increasing with a 34% increase from 2014 to 2019. These students are more likely to drop out and are less likely to achieve a first or upper second-class degree (Bolton and Hubble, 2021).

AI has been hailed as a revolutionary technology, that can innovate teaching, assessment and for intelligent student support systems (Zawacki-Richter et al., 2019). There is a lack of research into AI tools in higher education, and a need for research into user experience and perceptions (Michel-Villarreal et al., 2023). Research is needed which focuses on the use of AI tools and disability and the barriers and opportunities these tools represent. My research will reposition the focus on making AI tools accessible and effective for chronically ill students using their own personal experiences. Much of the current research points towards potential of these tools, or future goals for the tools. AI in education for disabled students is in its infancy and a lot remains unknown. What is clear is that disabled people need to be involved in the discourse and research, rather than being outsiders looking in.

Chronically ill students feel that they are less supported than students with other disabilities and research into chronic illness within the human computer interaction space has focused mainly on medical applications rather than accessibility (Hamilton et al., 2023, Mack et al., 2022).

3. Concise Critical Reflection on the Existing Literature – 500 words

What existing research is out there that is relevant to your proposed research? Why is it relevant? And how will your proposed research build on it/extend on it?

Chronic illness is unpredictable and variable, universities systems and processes are not designed for this and may not adequately support these students (Toller and Farrimond, 2021). Some students with chronic illness feel that staff do not take their illness as seriously as other disabilities or even class them as “real” (Hamilton et al., 2023)

Specific challenges for these students are pain, fatigue, cognitive dysfunction and stamina. These lead to missed deadlines, struggles to keep up and issues with exams and assessment. But they may also suffer from social issues like struggling with friendships (Toller and Farrimond, 2021, Hamilton et al., 2023).

Over 50% of UK university students use or have considered using Gen AI tools which shows how integral they are to the university experience (Johnston et al., 2024, Arowosegbe et al., 2024). All aspects of Artificial Intelligence are progressing at a fast pace which makes it difficult for research to keep up with the pace of innovation (Ahmed et al., 2023).

The rapid development of AI has led to a new area of AI in Education (AIED) which aims to develop intelligent tutors, partners and tutees (Hwang et al., 2020). These specialist tools are not yet advanced or widespread, the most used AI tool is Chat GPT from OpenAI (Johnston et al., 2024). Chat GPT is a generative AI tool that uses a large language model, other examples include; Gemini, Dall-e, and Midjourney. Elicit is aimed at researchers and students, it helps find and summarize research papers but it is limited to articles on Semantic Scholar (Kung, 2023). Quillbot and Grammarly are both AI powered writing tools designed to help with grammar, spelling and punctuation. AI tools are also increasingly being integrated into other software, such as Google, Microsoft Office, Facebook etc.

In recent discourse AI tools are being investigated and designed with disabilities in mind, these are still relatively new and further research is needed. It is proposed that large language model powered writing tools could assist with dyslexia, and Chat GPT-4 could be used to support autism (Goodman et al., 2022, Botchu et al., 2024). However, there is little research into AI tools for chronic illness.

AI in education may be a net barrier for disabled students rather than a benefit. Firstly, disabled students may not be able to use AI tools as effectively as they are designed for the general population (Martiniello et al., 2021). There is a lack of ethical consideration on AI uses effect on disabled students (Pierrès et al., 2024). For disabled people to make better use of AI technology, they need to be involved in the discourse, design of technologies (Smith and Smith, 2020, Shuford, 2023, El Morr et al., 2024).

Chronic illness has limited research in the design and accessibility space. One key design challenge for chronic illness is variability and the need to design adaptive and flexible technology and software. Chronic illness research within Human Computer Interaction is underrepresented and research has focused more on medical and diagnostics rather than accessibility (Mack et al., 2022, Mack et al., 2021).

4. What CCAI research theme(s) does your proposed research align to

Research themes can be found here: <https://www.northumbria.ac.uk/about-us/academic-departments/computer-and-information-sciences/citizen-centred-artificial-intelligence/>

Learning and Education

5. Research Questions Based on the Research significance/Research motivation & Literature Review - 200 words

What AI tools are currently being used by chronically ill students in higher education, and are these AI tools creating more of a barrier to success or enabling better outcomes?

What impact will the lived experiences of current chronically ill students have on the discourse within AI for education, and how will this impact further research?

Additionally, what impact can their experiences have more widely outside of academia, for example, sharing their stories with other students, other people with chronic illness, universities, governing bodies etc?

How can involving chronically ill students in the design of new specific AI tools benefit the accessibility, usability and effectiveness of those tools?

What training and support will chronically ill students need to be effective co-designers? And how will co-design workshops need to be adapted to support participants needs?

6. Research objectives – 100 words - Indicative three objectives

- Amplify chronically ill students' voices in the AIED discourse using semi-structured interviews and interpretative phenomenological analysis to identify the barriers and benefits of AI tools.
- Share those voices in creative ways to disseminate and represent these experiences to a wide audience.
- Co-design new AI tools that are tailored to chronic illness by collaborating with chronically ill students.

7a. Research Methods – 400 words

data collection methods/tools, sampling & data analysis approach

Research Methods

This study is broken down into two distinct aspects. Firstly, a lived experience study and secondly a series of co-design workshops.

Study One

Study one will use phenomenology and interpretive phenomenological analysis (IPA) to assess the students lived experience. Phenomenology can provide insights that other research methods wouldn't and is particularly good at making voices heard. (Lester, 1999) It aims to give a complete and in depth account of experiences that for this study will allow for a deeper understanding of the AI tools and their interaction with chronic illness (Pringle et al., 2011).

The method has been used to research illness and disability with disabled university students successfully in multiple studies (Moola, 2015, Carel, 2016, Griffiths, 2021, Dorado, 2024).

The students lived experience will be captured through long form sixty-to-ninety minute semi-structured interviews, and IPA will be used to assess these responses and to pull out key themes. The students will be taken from current Northumbria University students with a chronic illness, at both undergraduate and postgraduate level.

Due to me having a chronic illness and using AI tools to assist me with the completion of this PhD I will need to ensure that I don't allow my experiences to lead any participants or distort my analysis.

After the interviews, the experiences of these students should be shared in creative and interesting ways, examples include:

Podcasts and videos of the participants, shared openly as well as with organizations or charities. (Such as Action for ME, or MS Society)

Social media posts

Inviting the students to share their experiences at academic conferences, and events for university support staff and executives.

Study Two

Study two will use co-design methods to create new AI tools specifically for chronically ill students within Higher Education. Co-design aims to allow those effected by design to have a say in the design process (Busciantella-Ricci and Scataglini, 2024).

This proposal cannot say what tools will be created as that will be influenced by Study One and the co-designers.

For the students to be effective co-designers, they will need expertise, passion and creativity. To increase their expertise, they will need to be given some instruction on AI tools. CCAI such as Seymour Powell or Sunderland Software City would be approached to give training on designing digital products or technology.

Scaffolds or tools can be used to help boost creativity (Sanders and Stappers, 2008). The co-design workshops may need to be adapted to be accessible for the students (Labattaglia et al., 2023).

7b. Citizen-Centred Approach - 200 words

How will you work with citizens to ensure that the research is taking a Citizen-Centred approach to AI.

Please note that by Citizens we are referring to any human or non-human actor or organisation that is part of and/or contributes to society

The proposal focuses on amplifying the voices of chronically ill students in the discourse on AI in education. I believe these students should be directly involved in the research and provided an opportunity to share their lived experience and offer their own suggestions.

Study One will engage citizen participants to share detailed accounts of their experiences of using AI tools during their university journey. Eligible participants must have a chronic illness and can be undergraduate or postgraduate students. The study will include a diverse group representing different ages, backgrounds and genders.

Study Two will further integrate citizens into the research process by offering chronically ill students the opportunity to co-design bespoke AI tools. This collaborative approach will enable them to shape the tools based on their own experiences and share insights into how they have adapted tools previously to fit their specific needs.

8. Ethical Considerations - 150 words

Detail the ethical considerations you need to account for in the proposed research. This may include considerations throughout the research cycle (participant recruitment, data collection, data analysis, data sharing).

Please include any considerations for Equity, Diversity and Inclusion in this section.

Participant recruitment -

The study will aim to find participants from different ages, backgrounds, genders, sexualities and level of study to ensure that all views are considered equally.

Data Collection – The participants specific needs and disabilities will need to be considered, especially for the interviews and workshops. To ensure that participating is accessible, comfortable and that participation doesn't exacerbate any symptoms of their chronic illness

Data storage – the data will include details of students' chronic illness and therefore is a protected characteristic within GDPR as these are classified as a disability so strict data management and storage will be needed.

Sharing of participants stories – study one aims to share participants stories in creative ways, but there are ethical considerations in sharing students' stories of their chronic illness and experiences in an open way, for example on YouTube – i.e there could be negative comments or online bullying.

9. Research Plan/Timetable - 100 words

Please account for 1 year of training followed by 3 years to conduct your research and complete your PhD (i.e. total of 4 years)

Year 1	Months 1-12	- CCAI development modules and group projects - Project approval - Reading research papers and compiling literature for literature review
Year 2	Months 1-3	- Completing literature review - Compiling interview questions and procedure
	Months 4-6	- Apply for ethical approval - Write literature review
	Months 7-12	- Invite participants - Conduct in depth interviews - Prepare for Annual Progression 1
Year 3	Months 1-6	- IPA analysis on interviews - Conduct co-creation workshops
	Months 7-12	- Conduct co-creation workshops (continued) - Write up Interview analysis for publication - Prepare for Annual Progression 2
Year 4	Months 1-6	- Create final version of new AI tools - Write up thesis, including lived experience chapters
	Months 7-9	- Write the Thesis results and discussion chapters
	Months 9-12	- Final Write up of Thesis and submission for examination

10. How will your proposed research empower citizens to play a key role in AI-enabled futures? – 250 words

How does the proposed research reconcile AI's technical capabilities with citizen centric needs and concerns, by building capability and capacity to design AI products, systems and services that seamlessly connect people and their data to government, industry and organisations, in ways that foreground citizens' needs, rights, and aspirations? How does the proposed research contribute to a new framing of the relationship between citizens, AI and the state/organisations/services?

Please note that by Citizens we are referring to any human or non-human actor or organisation that is part of and/or contributes to society.

My proposed research focuses on the unique and diverse needs of citizens when utilizing AI tools. AI tools, especially the ubiquitous tools that are most used by students have not been specifically designed with disabilities in mind. My research will explore the experience of chronically ill students using these tools, uncovering both the challenges and benefits.

This will provide future researchers and designers with valuable lived experience data to inform the development of more inclusive and user-friendly AI tools, and highlight the different needs of chronically ill students to those of other disabilities.

As well as this the lived experiences will be shared in creative ways, such as podcasts and videos of the students sharing their own experiences in their own voice, which can be a powerful tool for change. These could be used to inspire other students, inspire changes to university processes or even government or national policies.

The second study will involve citizens throughout the design process and create new AI tools for chronically ill students by co-creating with them. As well as having new bespoke tools that can be used to improve the outcomes and experience of students with chronic illness. The participants themselves will gain knowledge and insight into the design process and it could inspire them to be change agents in the future.

12. References/Bibliography

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Surname	Owen
First names	Victoria
Advert/Studentship Reference number	CDTAI25

1. Working Title – 15 words

This should be tightly focused on the research you are proposing to undertake

Co-Designing an AI-Based Decision Support System for Informal Dementia Caregivers

2. Introduction and research significance/research motivation - 250 words

Why the topic is important to the design, development and evaluation of AI technologies and their impacts on society? What do we already know? What don't we know?

Dementia is a complex syndrome associated with progressive cognitive decline¹. There are several types of dementia and specific symptoms vary by individual². However, the condition generally affects one’s memory, thinking, reasoning, problem-solving, and communication³. More than 55 million people worldwide are currently living with dementia⁴. Around 980,000 of these people live in the United Kingdom (UK), a figure that is expected to reach 1.4 million by 2040⁵. Dementia also carries a growing economic burden. In 2024, the estimated economic impact of dementia in the UK was £42.5 billion⁶ with costs largely attributed to unpaid (informal) care and social care⁶. Informal (e.g. family) caregivers often struggle to navigate the post-diagnostic care pathway, forcing them to identify their own needs and available services³. Therefore, new solutions to support families caring for people with dementia are urgently needed.

Artificial Intelligence (AI) has recently shown to be a transformative tool in dementia care^{7,8,9} and research^{7,10}. AI-based technology is diagnosing earlier¹¹, improving drug delivery^{12,13}, and helping people maintain independence for longer¹⁴. For informal caregivers and people with dementia, an AI-based Decision Support System (DSS) has the potential to decrease cognitive overload⁸ and improve health outcomes by connecting people with the right services at the right time¹⁵. On a wider scale, support strategies (i.e. DSSs) have scope to bridge gaps in the fragmented dementia system¹⁶, minimise social care strain, lower economic costs, and raise the current standard of practices⁸. Leveraging AI, the proposed project could also pave the way for future AI-based care and support technologies.

3. Concise Critical Reflection on the Existing Literature – 500 words

What existing research is out there that is relevant to your proposed research? Why is it relevant? And how will your proposed research build on it/extend on it?

Current dementia-related technologies fail to use AI to its full potential and address wider, systematic issues associated with fragmented dementia care³. A significant body of research has utilised AI and Machine Learning (ML) technologies to predict¹⁷, detect¹⁸, and timely diagnose dementia^{11,19,20}. Other AI approaches have focused on drug development²¹ and tailored drug treatment plans²². Yet, when it comes to post-diagnostic care, few technologies use AI effectively, or at all²³. The vast majority of care-related technologies are patient-centric; developed to provide reminiscence therapy²⁴, manage behavioural challenges⁵, and help maintain independence²⁶. The lesser common, caregiver-centric technologies²⁴, include adaptable tools to monitor home environments and reassure caregivers, but these are not always effective, and prioritise management and security²⁷. Recognising this, organisations and researchers call for technological solutions that provide wider, post-diagnostic support to informal caregivers^{28,29}. This project will systematically approach and seek to address this challenge.

By and large, informal caregivers find the dementia care pathway difficult to navigate^{3,28,29}. Caregivers report receiving little direction at the point of diagnosis²⁸ and limited access to proactive, ongoing care and support²⁹. Further, research demonstrates that caregivers often lack knowledge of available services (e.g. day centres, home care), making it difficult to make informed decisions as dementia progresses²⁹⁻³¹. Despite recent strides with the implementation of Integrated Care Systems (ICS)³², it is clear that these perspectives remain unchanged for over a decade³³. Moving forward, organisations and researchers call for accessible information systems²⁹ and purposeful support that bridges actors across the system¹⁶. Future research should also explore supportive tools for decision-making³⁴, particularly those that account for geographical/cultural differences in health system delivery and reflect dementia's complex nature³⁵. These suggestions will help guide the proposed project.

When applied to informal dementia caregivers, AI-based DSSs are still in their infancy^{8,9}. In one instance, researchers evaluated ChatGPT's responses to complex questions posed by real-world caregivers on Reddit. ChatGPT was found to correctly interpret questions and produce high-quality responses with factual information, but missed certain subtleties and the dual meanings of words³⁶. The study was limited by sample bias, size, and reproducibility, but showed that AI has the potential to assist patient-caregiver information and education. Authors suggest future studies expand on these findings by assessing informal caregiver receptiveness to platforms like ChatGPT, and use them in tandem with information provided by healthcare professionals³⁶. These suggestions align with the only scoping review on the topic⁹ and will provide useful information to build upon.

In a more comprehensive approach, Dutch researchers co-designed, developed, and tested an AI-based DSS (dashboard) that provided actionable information for dementia caregivers. The dashboard involved various actors (i.e. stakeholders, nurses, council representatives), but largely drew from caregiver input, empowering them to be in control of the final product. The case study stressed responsible AI use, implemented a crucial co-design process, and highlighted ways a DSS could be expanded in future research, including to other contexts⁸. To date, it does not appear that a similar AI-based DSS has been replicated in the UK. The proposed project aims to address this gap.

4. What CCAI research theme(s) does your proposed research align to

Research themes can be found here: <https://www.northumbria.ac.uk/about-us/academic-departments/computer-and-information-sciences/citizen-centred-artificial-intelligence/>

1. Design and Co-creation
2. Health and Wellbeing
3. Communities, Democracy, and Society

5. Research Questions Based on the Research significance/Research motivation & Literature Review - 200 words

There are several questions that this project asks and will seek to answer through research. These questions are framed by the current body of literature, my own experience working with informal caregivers navigating the dementia care system, and my passion for making a difference in this field. I also understand that these questions are likely to evolve throughout the course of the project. I will adjust research questions as and when it is necessary, and with guidance from my supervisors.

The proposed project will ask:

1. To what extent do informal caregivers trust AI to help them navigate the dementia care pathway, and how receptive are they to using an AI-based DSS to help them make informed care decisions?
2. What do informal caregivers value regarding the functionality and usability of an AI-based DSS?
 - 2a. What are caregiver concerns regarding an AI-based DSS, and how can these concerns be navigated?
3. How can an AI-based DSS bridge gaps in the UK's current dementia care system to promote comprehensive post-diagnostic care and informal caregiver support?

6. Research objectives – 100 words - Indicative three objectives

1. Assess the level of trust that informal caregivers have in AI technologies for navigating the dementia care pathway and evaluate their receptiveness toward adopting an AI-based DSS.
2. Identify key features that informal caregivers value in an AI-based DSS, focusing on user experience.
 - 2a. Explore informal caregiver concerns about adopting an AI-based DSS and propose strategies to address these concerns effectively.
3. Investigate how an AI-based DSS can address gaps in the UK's current dementia care system, enhance post-diagnostic dementia care, and support informal caregivers.

7a. Research Methods – 400 words

data collection methods/tools, sampling & data analysis approach

The proposed project will adopt a multi-phase, predominantly qualitative approach to co-designing, developing, and testing an AI-based DSS for informal dementia caregivers.

Phase One: Literature Review

- 1.1. A comprehensive scoping literature review will identify studies on caregiver-focused AI-based DSSs and examine potential bias, gaps in knowledge, and areas for improvement. Given that there is currently little research on this topic, this review may include studies with different populations to provide a more robust review. Specific inclusion criteria will be developed at a later date.
- 1.1.1. This scoping literature review will also be used to create clear definitions and maintain consistent wording throughout the project.

Phase Two: AI Assessment

- 2.1. Semi-structured focus groups with informal caregivers will explore personal attitudes, concerns around AI, and informal caregiver receptivity towards an AI-based DSS. Semi-structured questions will give the focus groups flexibility, allowing for more in-depth exploration on previous user experiences, trust, and implications (negative and positive) of an AI-based DSS. Questions will be informed by phase one's scoping literature review and guided by supervisors. I also foresee participant recruitment involving some quantitative data and methods, but will seek appropriate guidance as it becomes more relevant.
- 2.1.1. Focus group discussions will be analysed using thematic analysis. Key themes will be extracted and shared with stakeholders.

Phase Three: Co-Design Process

- 3.1. Iteratively co-design DSS mock ups (e.g. a dashboard) with a small but diverse group of people with lived experience. The co-design process will gain key insights into user preferences, particularly how caregivers would like to use an AI-based DSS, and how it would function. Sessions may highlight potential barriers and inform barrier mitigation. This process will be done over multiple sessions to create a user friendly, caregiver-focused end-product.
- 3.2. Based on user feedback, a functioning dashboard will then be coded and created. I aim to create this dashboard from the hands-on experience and assistance that the CCAI training programme will provide.
- 3.3. This version of the DSS will be shared with stakeholders and any minor adjustments can be made.

Phase Four: Implement Final DSS

- 4.1. With the final DSS version, I aim to incorporate real-world user testing. Ideally, this process will be done with a larger participant group.
- 4.1.1. Upon completion of user testing, collect survey data to gauge usability, functionality, and overall user satisfaction.
- 4.2. Using survey results, create evidence-based recommendations for integrating an AI-based DSS in regional and nationwide dementia care.

7b. Citizen-Centred Approach - 200 words

How will you work with citizens to ensure that the research is taking a Citizen-Centred approach to AI.

Please note that by Citizens we are referring to any human or non-human actor or organisation that is part of and/or contributes to society

A citizen-centred AI approach is underpinned by the notion that, in research and practice, citizen satisfaction is the criteria for success. Research taking a citizen-centred approach should address a genuine need for the people involved and benefit the wider population. Further, I believe a citizen-centred approach heavily aligns with public health's core values of collaboration, equity, non-maleficence, and service.

Thus, to ensure this project takes a citizen-centred approach, I plan to:

- Engage a diverse group of caregivers and stakeholders early and continuously throughout the project. Early phases will help gather crucial insights into the values, concerns, and expectations of involved parties.
- Co-design the DSS with caregivers based on their post-diagnostic needs. Tools will be created by and for the end-user to make sure the product: a) addresses needs, concerns, and expectations; and b) fits user preferences.
- Ensure that there are accessible feedback channels to refine designs, improve project outcomes, and help participants feel like they are equal contributors to research.
- Continuously review ethics to ensure that participants (particularly those who are vulnerable) feel respected and empowered.

8. Ethical Considerations - 150 words

Detail the ethical considerations you need to account for in the proposed research. This may include considerations throughout the research cycle (participant recruitment, data collection, data analysis, data sharing).

Please include any considerations for Equity, Diversity and Inclusion in this section.

Maintaining a high level of respect, dignity, and sensitivity are paramount. Being a part of someone's care journey is a serious role that requires an immense amount of trust. There may naturally (and rightfully) be uncertainty, hesitancy, stigma, and concerns around data privacy. Data collection, sharing, and dissemination will prioritise the safety, security, and confidentiality of all individuals involved. Additionally, I will ensure that responsible AI, that considers positive and negative implications, is at the forefront of this project. This will enable participants to trust, and find value in, future AI-based care and support systems.

There is also no one-sized-fits-all approach to dementia care. Considering dementia's complexity, an AI-based DSS must account for health-related differences (e.g. types of dementia, other long-term conditions) and different social determinants of health. Therefore, I will actively engage with participants from diverse communities across Newcastle and Gateshead that experience health and social inequalities.

9. Research Plan/Timetable - 100 words

Please account for 1 year of training followed by 3 years to conduct your research and complete your PhD (i.e. total of 4 years)

Year 1: Undergo interdisciplinary skill training. Attend annual showcase and goal set. Begin building stakeholder relationships.

Year 2: Begin and complete phase one. Design phase two and secure research participants. Complete phase two and attend annual showcase. Compose relevant thesis chapters. Explore experiential learning and undertake any necessary Professional Development (PD).

Year 3: Co-design DSS mock ups. Adjust as needed and complete phase three. Attend annual showcase. Update thesis and write-up relevant chapters. Undertake any PD.

Year 4: Finalise DSS and perform real-world testing. Undergo further career development. Present/deliver to stakeholders at annual showcase. Compose relevant thesis chapters and submit.

10. How will your proposed research empower citizens to play a key role in AI-enabled futures? – 250 words

How does the proposed research reconcile AI's technical capabilities with citizen centric needs and concerns, by building capability and capacity to design AI products, systems and services that seamlessly connect people and their data to government, industry and organisations, in ways that foreground citizens' needs, rights, and aspirations? How does the proposed research contribute to a new framing of the relationship between citizens, AI and the state/organisations/services?

Please note that by Citizens we are referring to any human or non-human actor or organisation that is part of and/or contributes to society.

The proposed project is grounded by longstanding citizen-centric (caregiver) needs and is designed to address these needs by placing user values and concerns at the forefront of each research phase. The project's crucial co-design process and continuous stakeholder involvement will help create a valuable end-product that uses AI to bridge existing gaps, thus connecting caregivers with necessary post-diagnostic services/organisations. Furthermore, the project has scope to reframe *future* relationships between caregivers, post-diagnostic services/organisations, and AI. By actively involving caregivers in the design and operation of the DSS, and doing so in a way that supports and empowers them to be informed decision-makers, caregivers will be more likely to find value in future AI-based care and support systems.

The project's co-design process will also empower caregivers to experiment with AI systems more broadly. These systems include explainable AI (discloses AI features that provide relevant information) and generative AI (creates original content) that are becoming more common within and outside of health and social care. In doing so, the project will build citizens' AI literacy by helping them understand AI concepts, limitations, and implications. AI literacy may need to be tailored to meet different participants members' needs (i.e. geographical or cultural differences), but will ultimately foster the practical knowledge necessary for a more AI-enabled future.

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PhD Research Proposal Form

Please complete this form and upload it to your online application before submitting your application.

- Do not go over the stated word limits.
- Do not submit proposals in any other format unless this has been agreed with a member of staff
- Complete all sections

Surname	Imoukhuede
First names	William Promise Agbebakun
Advert/Studentship Reference number	CDTAI25

1. Working Title – 15 words

This should be tightly focused on the research you are proposing to undertake

Decolonising AI Design in Africa for greater cultural sensitivity and effectiveness

2. Introduction and research significance/research motivation - 250 words

Why the topic is important to the design, development and evaluation of AI technologies and their impacts on society? What do we already know? What we don't know?

Although AI adoption is on the rise globally (Statista, 2024), certain parts of the world are more involved than others in the development of these AI systems. This disparity has direct ties to the colonial history of resource extraction from Africa to the Global North that deprived nations of autonomy and the means to industrialise (Okolo, Aruleba and Obaido, 2023). Although colonialism is long gone, Africa has not caught up with subsequent industrial revolutions heralded by technology and it is evident in the social, economic, and digital disparities between the Global North and South (Bon and Akkermans, 2020).

AI systems developed without acknowledging how African perspectives and values differ from that of the Global North can lead to low adoption in African contexts. Also, the risk of neo-colonialism is increased if the Global North continues to own and control the datasets and processes that shape AI systems developed for Africa (Eke, Chintu and Wakunuma, 2023). If unchecked, this could exacerbate existing social inequalities, change socio-cultural dynamics, and negatively affect AI outcomes (Nelson, 2019; Weber, 2019).

However, achieving meaningful equity in AI worldwide will require more than diverse datasets. It will require a prioritising of voices by intentionally consulting and involving these communities in the development processes (Birhane, 2020). The fact AI is at its introductory stage in Africa offers the global AI design and governance landscape an opportunity to mitigate the discriminatory effects of AI in society by creating systematic diversity mechanisms.

3. Concise Critical Reflection on the Existing Literature – 500 words

What existing research is out there that is relevant to your proposed research? Why is it relevant? And how will your proposed research build on it/extend on it?

Biased AI systems deployed in the real world have consequences for real people. Faulty facial recognition software has led to wrongful accusations and arrests (Bloomberg, 2019; Boston Globe, 2019; ABC News, 2023), employment algorithms have led to gender discrimination (Reuters, 2018) and Automatic Speech Recognition (ASR) systems have struggled with accents and dialects among multilingual speakers and ethnic minorities (Mohyuddin and Kwak, 2023). When confronted with these failures, the response from technology companies has been ineffective and dismissive (Kayser-Bril, 2020). This highlights the pervasive Western-centric focus and absence of cultural considerations in the design and development of these systems.

GPT models have been found to exhibit a cultural values bias towards countries in the Anglosphere and Protestant Europe and away from countries with African-Islamic values (Tao *et al.*, 2024). Research shows that culture shapes peoples' expectations/preference in their interactions with AI (Ge *et al.*, 2024). The way cultural values are intertwined with AI cannot be ignored. However, there is a noted lack of work done to understand how culture shapes design practices and reinforces cultural ideals in AI. There is also a lack of co-design studies that involve the communities in participatory design processes (Anuyah *et al.*, 2023) and these can aid the integration of cultural values into AI design by involving stakeholders in the architectural design process so that societal fears, expectations and concerns are taken into account (Ade-Ibijola and Okonkwo, 2023). This will enable the AI systems developed to serve and represent a broader range of the world population.

Additionally, there are ethical concerns related to the development of AI systems and although strides are being made globally to reach a consensus on what constitutes as Ethical AI, the African context has been excluded (Njoroge, 2024). Eleven (11) overarching ethical principles were identified from 84 guidelines on Ethical AI published worldwide and not even one of the guidelines reviewed was developed for African contexts (Jobin, Ienca and Vayena, 2019). This continued global discourse on Responsible AI without African perspectives is akin to epistemic injustice. For example, many of the ethical principles applied to AI currently are utilitarian meaning that solutions that centre on minorities are never sought (Birhane, 2020). This is unacceptable as AI and its ethical considerations should be compatible with the societal values within which they operate from (Gevaert *et al.*, 2021).

To achieve fair and ethical systems, designing for a world where many worlds fit is key. This is a pluralistic design approach recommended for the design of AI systems (Aal, Rüller and Wulf, 2024). It draws from participatory design and decentralization to address issues on power imbalances and cultural sensitivity which makes it suitable for decolonising design (Hirsch *et al.*, 2024). Decolonizing design can mean dismantling power relations, resisting biases, and considering the Western influence on current technology (Lazem *et al.*, 2022). This entails a process of reclaiming identity, agency, and sovereignty by the recognition of colonial tendencies and imperialist ideals in the AI lifecycle (Eke and Cruz, 2024).

This research programme aims to identify relevant values and principles to be embedded into AI systems by considering African ethical frameworks, belief systems, cultural practices and values so the technical design of these systems reflect societal values, needs and expectations.

4. What CCAI research theme(s) does your proposed research align to

Research themes can be found here: <https://www.northumbria.ac.uk/about-us/academic-departments/computer-and-information-sciences/citizen-centred-artificial-intelligence/>

Uncertainty Explainability Transparency and Bias in AI
AI, Design & Co-Creation

5. Research Questions Based on the Research significance/Research motivation & Literature Review - 200 words

To successfully complete this research, a few questions have been identified as key. They are:

- a. What relevant African values, needs, expectations and principles are currently underrepresented and should be embedded into AI systems?
- b. How can a pluralistic design approach systematically incorporate these identified values, ethical frameworks, and belief systems into the design and development of AI systems for the prioritisation of African perspectives?
- c. What lessons can the global AI community learn from integrating African perspectives into AI design to create systems that are equitable and contextually relevant worldwide and how might these approaches to AI ethics and design reshape global standards for ethical AI development?
- d. What metrics can be used to evaluate the cultural sensitivity and inclusivity of AI systems?

During the project, the questions are likely to vary in wording and scope but exploring cultural values and how they can be integrated into the design of AI systems will remain the focus. Africa is culturally diverse and so the questions will be explored in a **Nigerian** context, so the scoping is appropriate.

6. Research objectives – 100 words - Indicative three objectives

1. Explore, investigate, and identify what relevant African cultural values are underrepresented in AI systems.
2. Engage in a co-design, pluralistic design process with stakeholders (Digital Rights Organisations, End Users , and Decision Subjects of AI Systems) to incorporate local values and perspectives currently lacking into the design of AI systems.
3. Propose possible guidelines & metrics that could help gauge the cultural sensitivity of AI systems.

7a. Research Methods – 400 words

data collection methods/tools, sampling & data analysis approach

This research will utilise qualitative research methods including qualitative questionnaires, interviews and focus groups to understand stakeholders' perceptions on cultural sensitivity in current AI systems deployed. The aim of this would be to identify what African cultural values and ethical frameworks are underrepresented in these systems. Stakeholders in this context will include AI developers working on systems deployed in Africa, NGO's & businesses using AI on the continent, end users and decision subjects of these AI systems, Digital Rights organisations, as well as global organisations working on mitigating these biases. Relevant themes of interest will be generated from the collected data via thematic coding due to its versatility and rigor in interpreting qualitative data (Williams and Moser, 2019).

This research will adopt a Participatory Action Research (PAR) framework with a community of AI end users & decision subjects in Lagos, Nigeria to explore how the identified themes and values can be incorporated into the AI design process. PAR as a process fosters community involvement and promotes sustainable change by combining participation, social action, and knowledge generation (Greenwood, Whyte and Harkavy, 1993; Minkler, 2000). This will help empower citizens with the knowledge, skills and insight required to be an active part of the AI lifecycle. This PAR will draw from Human Computer Interaction (HCI) literature on participatory design practices in an African context (Irani *et al.*, 2010; Winschiers-Theophilus *et al.*, 2010) and maintaining an indigenous HCI perspective (Winschiers-Theophilus and Bidwell, 2013) to avoid parachute research.

Furthermore, co-design workshops will be conducted with stakeholders to design culturally sensitive AI prototypes and frameworks. These workshops have been identified to contribute to the creation of contextually and culturally relevant systems (Chopra and Chivukula, 2017; Reitmaier *et al.*, 2022). The prototype development will adopt a Value Sensitive Design (VSD) framework as it aligns with already developed Responsible AI toolkits and empowers researchers to incorporate human and ethical values into AI systems (Sadek *et al.*, 2024). These AI design strategies will prioritise local complexities and extensively engage stakeholders so the solutions are technically proficient and culturally sensitive (Anuyah *et al.*, 2023).

7b. Citizen-Centred Approach - 200 words

How will you work with citizens to ensure that the research is taking a Citizen-Centred approach to AI.

Please note that by Citizens we are referring to any human or non-human actor or organisation that is part of and/or contributes to society

The very nature of this research necessitates that its approach is citizen centred. A citizen in this context is anyone who participates in society. With AI systems being deployed in societies and having the potential to change the way those societies' function; the end users and decision subjects of those AI systems are conceptualised as citizens. Working with these individuals and centring their perspective will improve research outcomes. A true Citizen-Centred approach to AI will require more than just deliverables but will be a continuous process involving participants throughout. Citizens will be informed about exactly how their data will be used at every point in time. The co-design workshops will be run in a manner that educates participants on AI & its implications. This will equip and provide them with an input opportunity to co-design AI technologies in an informed manner that represent them and their culture. The requirements and needs of the participants will be respected and prioritised at every point and at the end of this research, any developed prototype will be shared with the participants as appropriate.

8. Ethical Considerations - 150 words

Detail the ethical considerations you need to account for in the proposed research. This may include considerations throughout the research cycle (participant recruitment, data collection, data analysis, data sharing).

Please include any considerations for Equity, Diversity and Inclusion in this section.

The nature of AI makes it liable to exacerbate certain inequalities in a manner that might not be easy to spot. Therefore, extra care will need to be taken to make sure all ethical concerns and considerations are addressed. The safety, security and wellbeing of all participants will be protected by making sure participants are informed completely about relevant research activities before they consent to participate. All data collected will be anonymised to remove identifying information and promote confidentiality. Outcomes of the research and any technology developed with the community will also be shared with them where appropriate. This project will make contributions to global efforts to diversity AI via research and development with the active inclusion of the African perspective. This inclusion could also increase the ethical efficacy of AI systems in struggling areas leading to greater adoption.

9. Research Plan/Timetable - 100 words

Please account for 1 year of training followed by 3 years to conduct your research and complete your PhD (i.e. total of 4 years)

Year 1: Relevant training, securing of research participants, and comprehensive literature review.

Year 2: Interviews and focus groups to identify underrepresented cultural values. Running co-design workshops and design activities that actively involve stakeholders to incorporate identified values into AI prototypes

Year 3: Design, development, and testing of culturally sensitive AI prototypes with stakeholders.

Year 4: Identifying possible guidelines for the design of culturally sensitive AI systems. Writing up of thesis.

10. How will your proposed research empower citizens to play a key role in AI-enabled futures? – 250 words

How does the proposed research reconcile AI's technical capabilities with citizen centric needs and concerns, by building capability and capacity to design AI products, systems and services that seamlessly connect people and their data to government, industry and organisations, in ways that foreground citizens' needs, rights, and aspirations? How does the proposed research contribute to a new framing of the relationship between citizens, AI and the state/organisations/services?

Please note that by Citizens we are referring to any human or non-human actor or organisation that is part of and/or contributes to society.

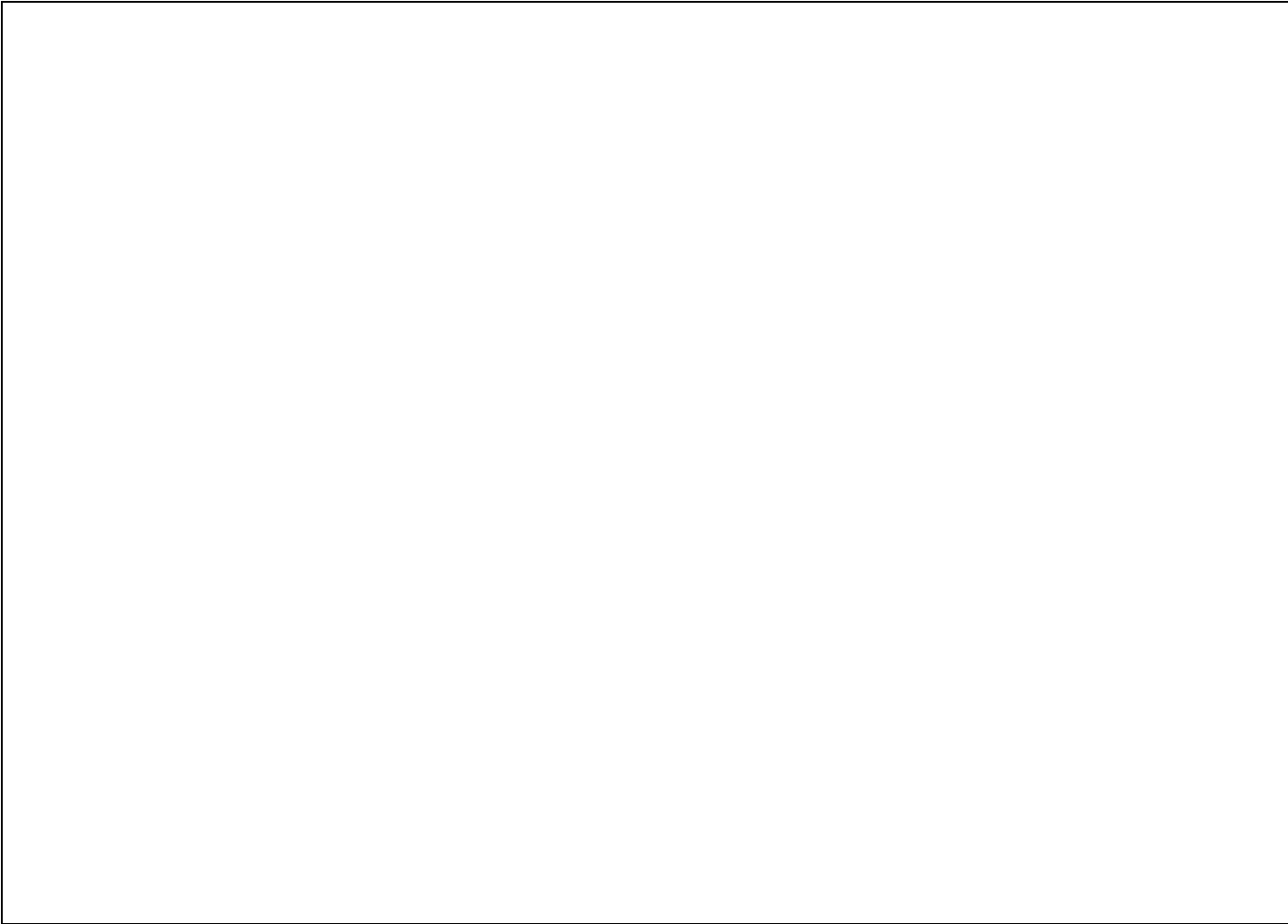
Digital civics aims to reconfigure power dynamics between citizens and the state by using digital technologies to centre citizens voices. The design of this research allows it to empower citizens by enabling them build capacity so that at the end of the research they can engage in AI design and governance activities. The co-creation of an AI system prototype with the citizens that has local ethics & rights embedded into it will possess various benefits for the future of their communities.

When citizens are involved with the design of AI systems, this frames them as more than data points and creates a move towards more digital sovereignty. This enables citizens to own & control their data whilst providing access to an AI system. This promotes community control and more decentralized AI models. It also cultivates a shared vision by promoting a narrative of AI being used as a tool for citizen empowerment, mutual benefit, and social equality instead of a tool for exploitation. Finally, this research proposes AI as a mediator of trust between citizens and the state/organisations.

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PhD Research Proposal Form

Please complete this form and upload it to your online application before submitting your application.

- Do not go over the stated word limits.
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- Complete all sections

Surname	Nie
First names	Xixiang
Advert/Studentship Reference number	CDTAI25

1. Working Title – 15 words

This should be tightly focused on the research you are proposing to undertake

Empowering Citizen-Centred Urban AI for Inclusive and Transparent Smart Cities

2. Introduction and research significance/research motivation - 250 words

Why the topic is important to the design, development and evaluation of AI technologies and their impacts on society? What do we already know? What we don't know?

As artificial intelligence (AI) is applied in cities, it drives the emergence of Urban AI, the systems that process urban data through algorithms to benefit the city's social and spatial dynamics. [1]. Urban mainly refers to the city centre. Although, as the Digital Newcastle Programme Manager claimed, Newcastle improves smart city operational efficiency by developing AI models for parking and provides better service to enhance user experience [2], existing literature shows that future Urban Intelligent Technology Systems (UITS) may eventually exacerbate the evolution towards autonomous cities due to the top-down development [3,4,]. This autonomy may increase the barriers to citizens' understanding and engagement with Urban AI, limiting their data agency and leaving them with minimal influence over urban governance decisions [4,5,6]. The citizen mainly refers to general public interacting with non-human agents within urban AI (e.g., self-driving cars). So, where is the voice of citizens? The Senseable City concept encourages dialogue between different citizens that make up the urban and promotes fair decisions about their environment by making technology transparent [7]. However, there are still research gaps in design and human-computer interaction (HCI): **whether enhancing citizens' data agency could address the societal challenges of autonomous smart city, and whether making citizens' interaction with urban AI more visible will promote citizen participation in designing technology** [8]. The proposed research will leverage Newcastle's status as a leading smart city in the UK [9] and collaborate with citizens to explore how to promote citizen involvement in urban governance and responsible urban AI practices.

3. Concise Critical Reflection on the Existing Literature – 500 words

What existing research is out there that is relevant to your proposed research? Why is it relevant? And how will your proposed research build on it/extend on it?

Most current urban AI research either focuses on top-down case studies of AI implementation in smart cities or technical research on AI algorithms [1,10], yet lacks Human-AI Interaction research that explores the impact of Urban AI on the public and society from a bottom-up perspective. However, as future urban intelligent technology systems embedded with urban AI harness AI's powerful ability to simulate human self-learning, cities will increasingly take on roles traditionally conducted by humans. They will operate independently and make decisions without external human input, and cities will gradually become autonomous [3]. Autonomous is used here to highlight the presence of urban AI, which leads to independent thinking and management without human intervention [3], and technology vendors and government officials believe that removing human involvement in urban governance can enhance efficiency [11,12]. Due to the autonomous city systems' lack of transparency and accessibility, the citizens cannot participate in or respond to algorithmic decision-making [13], which weakens their data agency [14,15]. Data agency is "an individual's capacity to shape action around the data they create" [15]. We understand data agency as the key capacity for citizens to avoid becoming passive data resources within autonomous city. One study investigates that explainable AI (XAI) can be beneficial in restoring data agency [14]. However, XAI focuses on technological transparency [16] and lacks provide citizens with socially contextual understanding [17]. Explanations and transparency should be situated in the daily social context of Citizen-Urban AI interactions [17,18,19]. There are currently no empirical studies on this research intersection. The first potential contribution will validate how improving contextual understanding of Urban AI could enhance citizens' data agency to address the societal challenges of autonomous city.

The concept of Senseable City helps facilitate the transformation of autonomous smart cities into more citizen-centric urban environments, because it emphasises the integration of public participation and citizens' data agency at the core of urban systems [7]. The Atlas of the Senseable City mentions "focus[es] less on the technology and more on human agency" [20]. It emphasises social participation and fair decision-making, replacing traditional top-down engineering solutions led by technology vendors [20]. Senseable City also advocates for receiving, visualising, and making real-time information publicly accessible [21]. Citizens will become "distributed intelligent agents" by actively making decisions and taking action. Urban governance will no longer rely solely on algorithmic technologies and automated infrastructures but will be influenced by the citizens' partnership and competition with Urban AI. This interaction makes urban operations more visible and flexible and will support the citizen-in-the-loop for urban AI. One possible design chance is designing the city interface to make the interaction between the public, their data, and urban infrastructure more visible [8]. However, this research explores designing interfaces for citizens in the context of IoT technology. Existing studies rarely discuss the effectiveness of city interfaces for Urban AI. Therefore, the second potential contribution will validate how to design actionable and visible city interfaces as interventions to enhance the transparency of Urban AI, promoting citizens' participation in urban decision-making.

4. What CCAI research theme(s) does your proposed research align to

Research themes can be found here: <https://www.northumbria.ac.uk/about-us/academic-departments/computer-and-information-sciences/citizen-centred-artificial-intelligence/>

- (1) AI, Design & Co-Creation
- (2) Uncertainty Explainability Transparency and Bias in AI

5. Research Questions Based on the Research significance/Research motivation & Literature Review - 200 words

RQ1: How can we improve citizens' contextual understanding of Urban AI to enhance citizens' data agency?

RQ2: How might we shape citizens' data agency to address the societal challenges of autonomous smart city and strengthen the Citizen-Urban AI partnership?

RQ3: Which interaction forms can be employed to design actionable and visible city interfaces that enhance the visibility of Urban AI systems and promote citizens' participation in urban governance?

6. Research objectives – 100 words - Indicative three objectives

As Figure 1 outlines the research's potential impacts and corresponding transformations across three aspects of society.

- Explore methods to improve citizens' contextual understanding of Urban AI, enabling them to shift from passive data resources to active co-decision-makers.
- Investigate how enhancing contextual understanding fosters citizens' data agency to address the challenges of technology-centred Urban AI.
- Design and evaluate interaction forms and interfaces that enhance the visibility and transparency of Urban AI systems, facilitating the transition from a data-driven city to a citizen data agency-driven city and achieving inclusive urban governance.

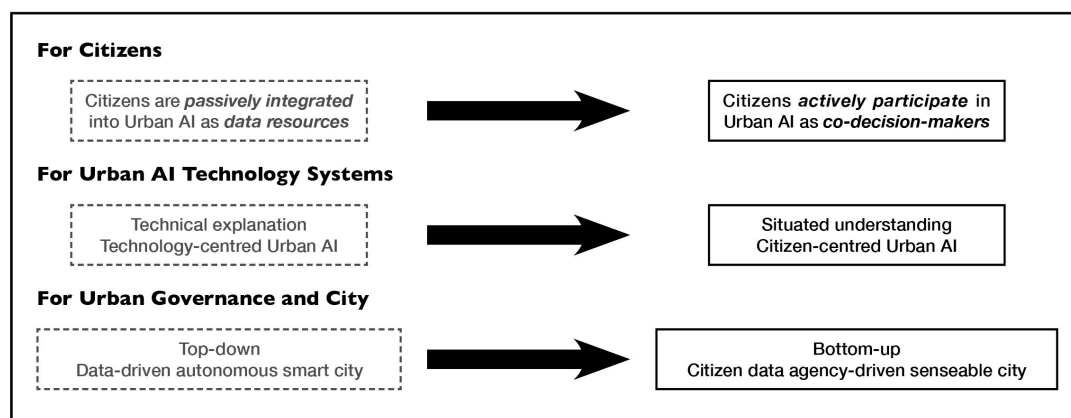


Figure.1. A diagram of the expected changes in this PhD research's impacts on different aspects of society

7a. Research Methods – 400 words

data collection methods/tools, sampling & data analysis approach

This research will adopt the Research through Design approach for empirical studies [22], mainly following qualitative methods. Since this cross-disciplinary field lacks established methodologies, it will draw on methodologies such as Participatory speculative design [23], Experiential AI [17], and Tangible and Playful Urban AI Interface [11,24] to establish a responsible Urban AI framework for Citizen-Urban AI interaction.

I will use Data Walking as a preliminary data collection tool. Participants will observe the surrounding city environment, combining observation and critical reflection during a relaxed walk [25]. I will provide a toolkit (project brief, data walking map with prompts, and pens). Participants will mark locations or infrastructure where they believe Urban AI might currently or potentially be used. This approach enhances participants' experiences to inspire qualitative data generation in the following focus group discussion.

After the Data Walking, I will invite participants to a focus group discussion to construct new scenarios collaboratively. Focus groups can reveal directional insights through social interactions [26]. I will provide a focus group guide with questions to discuss their impressions during the Data Walking (e.g., *which locations might involve hidden AI, whether they found AI difficult to understand, and how they wish to engage with AI*). This will contribute to the third step of scenario co-speculation.

Based on the explored scenarios, participants will be encouraged to reflect on city interfaces that might be suitable, what kinds of data should be more visible, and which interactions could promote willingness to participate. They can sketch or generate visual prototypes through storyboard, bodystorming [27], or AI-assisted tools (MidJourney).

Thematic analysis [28] will identify themes of citizens' preferences using the research data from the first three steps (data walking maps, focus group transcripts, and provocative visual prototypes). Then, I will compare themes with the locations marked on maps and visual prototypes, selecting the most discussed scenarios and prototype forms.

Since thematic analysis will reference prior theories and methodologies, I will improve the prototypes they created. For instance, tangible and experiential interfaces can enhance citizens' understanding of urban AI [17,24], and playful forms benefit public participation and interaction [11]. I will prototype and conduct initial user testing through the Wizard of Oz method. I will also conduct workshops outside, where citizens and stakeholders will test the prototypes realistically. We will ask whether they feel a stronger sense of agency over AI and would like to participate, thereby validating our research questions.

7b. Citizen-Centred Approach - 200 words

How will you work with citizens to ensure that the research is taking a Citizen-Centred approach to AI.

Please note that by Citizens we are referring to any human or non-human actor or organisation that is part of and/or contributes to society

This research adopts a citizen-centred approach, considering the involvement of both human and non-human actors to ensure that the design and development of urban artificial intelligence (AI) systems meet societal needs. Inspired by the principles of more-than-human design, this approach transcends the focus on ordinary citizens to view the broader urban ecosystem—including infrastructures, AI systems, and data flows—as indispensable components of urban governance and interaction. For example, the renowned *Anatomy of an AI System* examines Amazon Alexa's data ethics issues [29], extending beyond the device itself to encompass a wider range of stakeholders, including technology companies and other infrastructures.

Collaboration with relevant companies is therefore essential. In line with this, my project will seek partnerships with organizations such as Newcastle City Council and Newcastle-based technology companies specializing in public transportation and surveillance technologies. These collaborators can provide diverse perspectives and expertise, bridging the gap between citizens' needs and institutional goals. This research not only highlights citizens' rights and aspirations but also ensures alignment with urban or national strategies, contributing to the design of systems that seamlessly connect people and their data with governments and industries.

8. Ethical Considerations - 150 words

Detail the ethical considerations you need to account for in the proposed research. This may include considerations throughout the research cycle (participant recruitment, data collection, data analysis, data sharing).

Please include any considerations for Equity, Diversity and Inclusion in this section.

This research will account for ethical considerations and research integrity. Before participation, informed consent will be obtained from participants per the university's ethics and research integrity policies.

Anonymized data will be securely stored and shared only with collaborators such as Newcastle City Council or relevant technology companies. Additionally, workshops will be conducted with these stakeholders, ensuring that the research outcomes do not inadvertently disadvantage any industrial organizations.

I will pay attention to will be paid to ensuring that interpretations reflect diverse perspectives, especially those from underrepresented groups such as ethnic minorities, individuals with disabilities, older adults, and children.

Since this project involves interactions with AI in urban or outdoor environments, I will pay attention to the privacy of user-generated data displayed in public spaces. Determining whether participants consent to having their data or interaction outcomes displayed in urban environments is crucial to prevent secondary data privacy issues.

9. Research Plan/Timetable - 100 words

Please account for 1 year of training followed by 3 years to conduct your research and complete your PhD (i.e. total of 4 years)

Year 1:

- Write a literature review to identify the main research questions and define what urban and citizens (human and non-human) mean to identify research participants.
- In addition to core courses, audit any university AI technology courses.

Year 2:

- Conduct user research through HCI methods mentioned in the research methods and complete data coding and analysis to determine the design direction.
- Attend various seminars to deepen my understanding of the evolving field of AI.

Year 3:

- Prototype and iterate designs and test usability
- Publish ACM CHI/DIS academic papers

Year 4:

- Prepare PhD thesis

10. How will your proposed research empower citizens to play a key role in AI-enabled futures? – 250 words

How does the proposed research reconcile AI's technical capabilities with citizen centric needs and concerns, by building capability and capacity to design AI products, systems and services that seamlessly connect people and their data to government, industry and organisations, in ways that foreground citizens' needs, rights, and aspirations? How does the proposed research contribute to a new framing of the relationship between citizens, AI and the state/organisations/services?

Please note that by Citizens we are referring to any human or non-human actor or organisation that is part of and/or contributes to society.

The proposed research could benefit Newcastle as a leading smart city by establishing a responsible and citizen-centred Urban AI framework. This framework could help transform Newcastle into a more inclusive, dynamic, and engaging city, addressing the needs of citizens, organizations, and governments.

For citizens, the research has the potential to promote inclusivity by ensuring Urban AI systems meet the diverse needs of marginalized groups such as older adults and individuals with disabilities. For example, AI-integrated systems like public transport or traffic signals could adapt in real-time to provide on-demand services, such as optimized routes or extended crossing times, making the city more accessible and user-friendly. By empowering citizens with data agency, the research will foster a sense of ownership and partnership in urban governance.

The research will offer government departments tools to build stronger relationships with citizens by making Urban AI systems more transparent, fostering mutual understanding, and addressing concerns around fairness and inclusivity. With citizen input integrated into Urban AI decision-making processes, the government can better understand public needs,

For industry and local businesses, actionable Urban AI interfaces can drive innovation in urban mobility, tourism, and event planning. By making the city's data systems more interactive and engaging, tourism companies can use Urban AI to enhance Newcastle's attractiveness as a tourist destination, turning the city into a playground for exploration.

This research demonstrates how a smart city can become more citizen-focused, inclusive, and engaging, benefiting all aspects of its urban ecosystem.

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