Title
Who's Smart City

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ABSTRACT

This study examines how smart city developments impact marginalized communities, applying Standpoint Theory to analyze digital divides, surveillance concerns, and accessibility disparities. Findings emphasize the necessity of inclusive policies for equitable advancements.

INTRODUCTION

Smart cities integrate technology and data to enhance urban efficiency and quality of life. Examples include AI-driven traffic systems in Singapore, IoT-enabled waste management in Barcelona, and energy-saving smart escalators in South Korea. While these innovations promise sustainability, critical questions arise about accessibility and equity. Concerns persist regarding whether benefits disproportionately favor wealthier populations, exacerbating existing societal divides. This work explores the equity implications of smart city technologies, focusing on marginalized communities' access to digital infrastructure, privacy risks, and affordability barriers. By applying Standpoint Theory, we center underrepresented voices in evaluating these developments.

"This work is in partial fulfillment of the ENGR184 course using the blueprint curriculum in Refs. [1,2] and captured in a collection [3]."

METHODS

Standpoint theory argues that knowledge is often socially situated which means that individuals' perspectives are shaped by their unique experiences within the power structure. Furthermore, this theory asserts that marginalized groups, because of their experiences with systemic oppression, have the ability to critique dominant narratives while also bringing light to issues that may otherwise go unnoticed. While smart cities are often presented as universally beneficial, concerns arise regarding accessibility, digital exclusion, and systemic bias in urban development. By centering the perspectives of marginalized communities, Standpoint Theory allows for a critical evaluation of whether smart city initiatives reinforce existing inequalities or work toward creating more inclusive and equitable urban environments.

A study we will be taking a look at to support our observations comes from the UN Habitat, which examines how smart city initiatives contribute or try mitigating digital inequality.

Furthermore, this study highlights how basic needs such as internet access, digital literacy rates, and even affordability for these resources vary across socioeconomic groups. Unsurprisingly, results have shown that even in highly developed urban communities, low income communities are often ignored due to both economic barriers and infrastructural neglect.

To gather this information, UN Habitat employed a mixed method approach to garner information on this particular topic. There were multiple methods used here including: large scale surveys and census data, Broadband Coverage mapping, Internet Service Provider (ISP) data, and government policy reports. Large-scale surveys and census data were used to assess digital literacy rates as well as the affordability of smart city tech across different locations. Broadband coverage helped researchers see the geographic disparities in connectivity. ISP Data was used to understand the pricing structures, service availability, and quality of service across different incomes.It is important to note that Standpoint Theory principles also shaped our critique of facial recognition datasets which represented a majority ethnic groups.

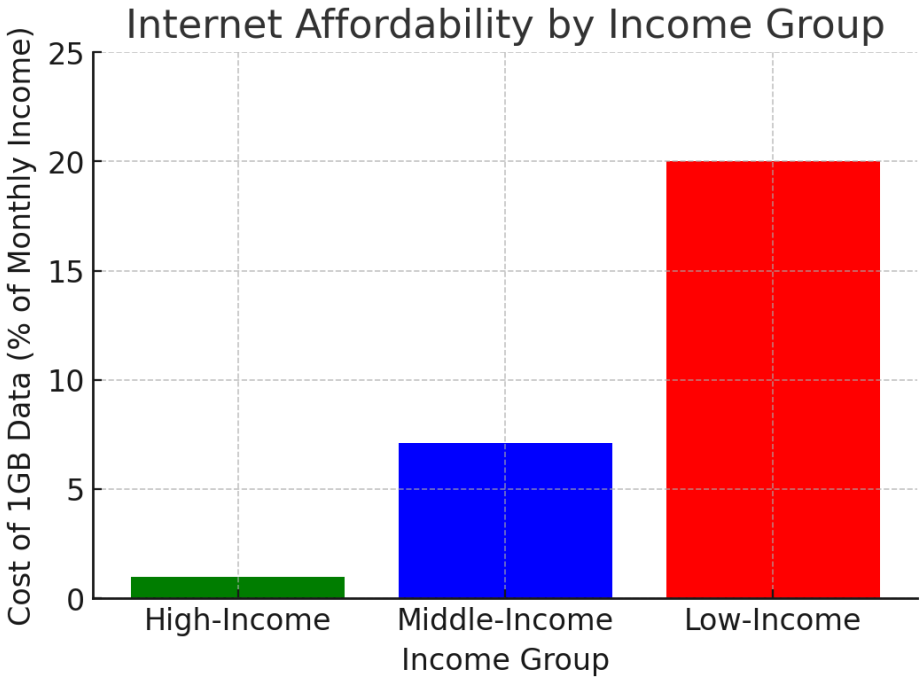

Fig. 1. *Percentage of monthly income required to afford* ***1 GB of mobile data*** *across different income groups. Low-income individuals pay a disproportionately higher percentage, limiting their digital access (Ref. [1], Table 3).*

Table 1. Percentage of monthly income required to afford **1GB of mobile data** across different income groups. Data sourced from **UN-Habitat's Addressing the Digital Divide Report (2021).**

Income Group	Cost of 1 GB Data
High-Income	1%

Middle-Income	7.12%
Low-Income	20%

Source: UN-Habitat, Addressing the Digital Divide Report, 2021 (Ref. [1], Table 3).

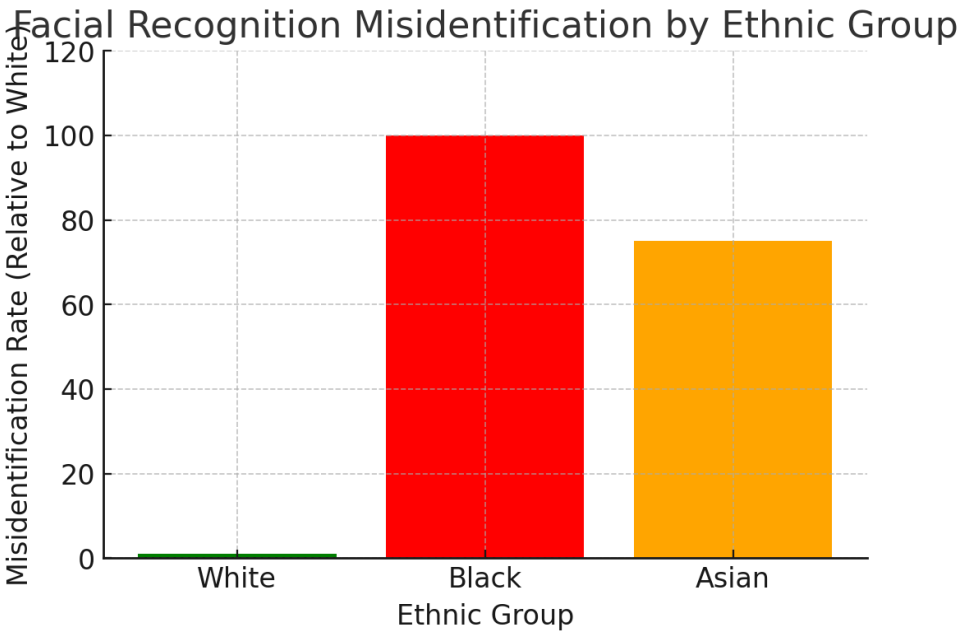

Fig. 2. *AI-driven facial recognition misidentification rates across different ethnic groups. Black and Asian individuals experience significantly higher error rates compared to White individuals, raising concerns about algorithmic bias (Ref. [2], Fig. 4).*

AI-driven facial recognition misidentification rates across different ethnic groups, showing significantly higher error rates for Black and Asian individuals, raising concerns about algorithmic bias. Data sourced from **Buolamwini & Gebru (2018) Gender Shades Study.**

Ethnic Group	Misidentification
White	0.8%
Black	34.7%
Asian	20-30% varies

Source: Buolamwini, J., & Gebru, T. (2018). Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification (Ref. [2], Table 5).

RESULTS AND INTERPRETATION

We see the results of Internet affordability between different income groups in Figure 1. This chart shows us what percentage of their monthly income does each income group use on 1 GB of data. We see a bit of a jump between the high and middle class however, between the middle and low income class we see a big jump. This difference highlights significant barriers faced by low-income communities, directly impacting their access to resources that might be essential to participate in this "smart city". Using Standpoint Theory as our framework of thinking, we can recognize this disparity not as market error but as a structural exclusion - systemic barriers and inequalities within the social structure preventing marginalized groups from reaching this luxury. On Figure 2, we see discrepancies in misidentification between different ethnic groups. There is a clear trend of certain ethnic groups being misidentified more frequently than others. Before we even consider creating these multi billion smart cities, making sure that our surveillance technology does not have any misidentification issues is critical before officially using it in public.The neglect in technology development perhaps indicates a societal bias that comes from the many marginalized voices that were never heard. However, how exactly do these graphs illustrate that smart city initiatives inherently tend to exclude or disadvantage low-income communities?

The concept of smart cities while on paper sounds like a very good idea, comes at a heavy cost. An article on the potential costs of smart cities was published by the National Science Foundation, there is a good quote that shows what smart cities will come to: "Unfortunately, significant costs are incurred when deploying sensors equipped with 5G or WiFi connectivity due to data subscription fees." (DeHart, Baker, & Grant, 2020, p. 30) Already we see mentions of data subscription fees, if low income families are struggling to afford their own internet bills, how will they afford any additional subscription fees that may come with living in a smart city. Yet this isn't uncommon, America has always had perks for those who can afford it. Take something as simple as Netflix, the cheapest plan comes with ads, with more expensive plans coming with more perks. Yet, this system has never been questioned because of the concept of the American Dream. The reason for it was because America has always been a land of opportunities, immigrants travel with the belief they will be able to accomplish the American Dream. Hence, when these marginalized communities are not paid attention, America assumes that they haven't worked hard enough to be in a position to afford those luxuries. Similarly, we can look at Figure 2 to see the discrepancies between ethnicities when it comes to misidentification. The issue with this case is the fact that even when an ethnicity group other than white is able to make enough money to become a part of these exclusive smart cities, they might still be treated with discrimination all due to technical errors within the surveillance system. Overall, there are a lot of factors to be considered before we can consider smart cities fully inclusive.

CONCLUSION

The study reveals that smart city initiatives, while at first glance may seem promising, often create systemic inequalities through three key mechanisms. Affordability barriers (this was shown in Figure 1, low-income families spending 20% of their income on 1 GB), biased surveillance technologies (Figure 2: Facial recognition misidentifying ethnic groups at 2-3 higher rates), and infrastructural neglect. Applying Standpoint Theory confirms the theory that these inequalities are not random occurrences but rather issues that are rooted in systemic bias. To truly create an inclusive environment, it is crucial that we make sure marginalized communities are placed at the forefront as they have the right to address and critique these issues and biases they face on a daily basis.

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