Engaging Gentrification as a Social Justice Issue in HCI

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ABSTRACT

Gentrification—the spatial expression of economic inequality—is fundamentally a matter of social justice. Yet, even as work outside of HCI has begun to discuss how computing can enable or challenge gentrification, HCI's growing social justice agenda has not engaged with this issue. This omission creates an opportunity for HCI to develop a research and design agenda at the intersection of computing, social justice, and gentrification. We begin this work by outlining existing scholarship describing how the consumption side dynamics of gentrification are mediated by contemporary socio-technical systems. Subsequently, we build on the social justice framework introduced by Dombrowski, Harmon, and Fox to discuss how HCI may resist or counter such forces. We offer six modes of research that HCI scholars can pursue to engage gentrification.

CCS CONCEPTS

• Human-centered computing~HCI theory, concepts and models

KEYWORDS

Gentrification; Social Justice; Design

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1 INTRODUCTION

"*One by one, many of the working-class quarters have been invaded by the middle class—upper and lower.... Once this process of 'gentrification' starts in a district it goes on rapidly until all or most of the working-class occupiers are displaced and the whole social character of the district is changed…*" Ruth Glass 1964 [45].

In recent years researchers have identified an array of social justice issues that can be addressed by the field of human-computer interaction (HCI) including homelessness [26], sustainability [35], gender dualism [54], and colonialism [58]. Social justice research, which has been bolstered in subsequent years by case studies [21, 59, 62, 84], workshops [32, 39], and design strategies [12, 34], has established itself as a major agenda for HCI. Despite the range and depth of this social justice agenda, the issue of gentrification has been given scant attention.

There are several reasons why HCI research has not directly addressed gentrification. First, HCI scholars may lack general exposure to issues and impacts of gentrification. Given the average socio-economic and educational background of members of the HCI community [4], they are more likely to be "gentrifiers" rather than the "gentrified." Second, the connection between gentrification and technology is not straightforward. Gentrification takes hold through an accumulation of small, seemingly personal choices, which may seem insignificant on their own but cumulatively create devastating effects. For this reason, the exact causes of gentrification are rarely clear—scholarship on gentrification notes it as a "chaotic concept" lacking any one source or solution [68].

There are three inter-related factors that position gentrification within the purview of HCI's scholarship: (1) scholars outside of HCI have begun to discuss and identify how socio-technical systems mediate gentrification [85, 95, 99] which brings gentrification directly into the realm of HCI—whereas previously it might appear to be better left to urban studies, sociology, or economics; (2) several disparate studies within HCI have engaged with elements

of gentrification [6, 25, 41]—albeit in a piecemeal manner—often without directly engaging with gentrification scholarship; (3) outside of academia, there is growing interest in utilizing computing to resist and counter gentrification [46, 74, 94]. Moving forward we see an opportunity for HCI to explore these areas for suggestive models that can inspire research and design practice with gentrification.

This paper serves as a call to action for HCI on gentrification. Reflexively, both authors are new residents in areas that are experiencing gentrification in our home city of Atlanta, GA. Indeed, we do not consider ourselves outside of this ongoing gentrification; rather, we feel an obligation to contest how our own field might be affecting the city and the way we occupy it. Stemming from this personal perspective, our belief is HCI's engagement with gentrification should be orientated around a social justice perspective due to the negative consequences to the health and well-being of those impacted by it. Therefore, we ask the following question: *How should HCI's growing social justice agenda engage with the issue of gentrification?* To answer this question, we take the following steps, highlighting the individual contribution through each:

- We begin by reviewing scholarship in urban studies and sociology in order to **articulate gentrification as a matter of social justice** within HCI due to the forced class (and often race-based) displacement of existing residents that occurs as the end result of gentrification processes.
- Within this review we **focus HCI's attention towards the consumption side perspective of gentrification** (one of two primary perspectives of gentrification causality), which argues that gentrification is driven primarily by the accumulated practices of gentrifiers.
- Next, we connect scholarship on discourse, place, and technology in order to **describe how the consumption side perspective of gentrification can be understood within HCI.**
- We then present two existing cases studies on Yelp and Nextdoor, as well as introducing our own ongoing work on Zillow in order to **provide three distinct views of how consumption side gentrification can be mediated by socio-technical systems.**
- Finally, we end by building on Dombrowski, Harmon, and Fox's social justice framework— while also pointing out some specific limitations—to **develop six modes of research engagement HCI can pursue on gentrification moving forward**.

In all, this work charts a path forward on both how and why HCI's growing social justice agenda should engage the issue of gentrification.

2 GENTRIFICATION

Gentrification is a multi-faceted phenomenon that has been studied and defined by various academic fields, including anthropology, geography, sociology, political science, economics and urban planning. Outside of academia, it is a major concern for local and national governments, policy analysts, and urban planners, as well as civil and human rights activists. Given the wide array of disciplines and ways of knowing that are brought to bear on the topic, it is no surprise that the precise definition of gentrification is disputed (see the "Gentrification Debates" [17]). While it is beyond the scope of this article to engage these debates, for the purposes of our argument we provide the following synthesized definition [8, 17, 70, 89]: gentrification is a collective process of settlement by higher-income people in a low-income area, resulting in the forced class and race-based displacement of existing residents.

Displacement, especially when it is rapid or sudden, is perhaps the most significant impact of gentrification [89]. In addition to direct and involuntary displacement by increased rent or eviction, low-income residents may voluntarily vacate due to the changes in the cultural, social, and political fabric of the neighborhood. Unfortunately, displacement, and its well-documented ill effects on the health of displaced residents [89], can go unseen by incoming gentrifiers. This might explain why some writers naively argue that gentrification can represent a positive change [18]. Arguing against these claims, gentrification scholar Tom Slater asserts:

"*Gentrification is not, as one might be encouraged to think from reading recent scholarship, the saviour of our cities. The term was coined with critical intent to describe the disturbing effects of the middle classes arriving in working-class neighbourhoods and was researched in that critical spirit for many years. It has since been appropriated by those intent on finding and recommending quick-fix 'solutions' to complex urban problems, and in extreme cases depoliticized and called something else*" [89].

Slater adopts this strong normative stance in order to push back against the loss of critical perspective on the social, economic and spatial injustice that once orientated gentrification scholarship. By taking this stance, Slater hopes to reemphasize the social justice implications of rent increases, landlord harassment and working-class displacement which was fundamental to gentrification scholarship ever since it was first identified in the 1960s by the urban sociologist Ruth Glass [45]. For this reason, Slater asserts that gentrification should be viewed as the spatial expression of economic inequality [89].

While both Glass and Slater locate the social justice implications of gentrification primarily through class, we would be remiss to not mention the ways in which race also factors into gentrification. Doing so is especially important as our focus in this article is on gentrification in the US—a country with a long and very problematic history with race and spatial injustice [16, 42, 63].

Confining Black Americans to impoverished, blighted spaces was fundamental in facilitating the institution of slavery [27] which continued in the era of Jim Crow's "separate but equal" places [96]. Even after the civil rights movement was supposed to make spaces equal for all, red-lining and discriminatory loan practices emerged to perpetuate spatialized discrimination [77]. The legacy of this history has calcified into the present day state of spatial economic injustice visible throughout the US [16, 83]. Present day gentrification leverages and extends this history as under resourced and physically degraded black spaces often become prime targets for gentrification [64].

In the end, rather than any single definition—it may be best to locate gentrification as an issue of social justice through its most troubling characteristics [7]:

- Displacement through rent/price increases with secondary psychological costs.
- Loss of affordable housing, resulting in unsustainable property price increases and homelessness
- Increased cost and changes to local services
- Loss of social diversity (from socially disparate to rich ghettos)

2.1 Production vs Consumption

Beyond understanding its defining characteristics, researchers in the HCI community should be aware of the lively debate about the various possible causes of gentrification. Generally, these debates fall into two theoretical camps: production and consumption [17].

Production side theories argue that gentrification is primarily the result of particular alignments of economic and political (national, state and local) factors, which create the market conditions for gentrification to occur. For instance, production studies might focus on how federal home loan policies or red-lining by banks can produce a market for gentrification. For production theorists, gentrification cannot be explained entirely by the activity of consumers, as "even the most apparently individual, personal decisions turn out to be bound up with larger social and collective processes" [27:55]. Gentrification, understood in this way, is the result of system level incentives, which then "shape the behavior of individuals, groups and institutions that have a stake in what happens on the urban frontier" [27:42].

In contrast, consumption side theories argue that gentrification is not a purely economic phenomenon. Rather, they argue that gentrification occurs as a result of the accumulated practices of actors: the gentrifiers. Put simply, "gentrification would not occur without gentrifiers who wish to participate in the process" [6:65]. These theories depart from production in that they argue markets for gentrification would not be produced without the consumption demand supplied by gentrifiers. Thus, consumption theorists focus on the culture or collective tastes of the gentrifiers—arguing that states and markets are responding to these actors. They might ask, what created a newfound desire for city life throughout the United States between the 1950s and 1970s? How did the "back to the city movement," develop and usher in "a switch from suburban to urban aspirations" [6:27]?

The key distinction between the two theories is that consumption side theories argue that "markets and states respond to consumer demand for gentrification rather than vice versa" [6:65]. We believe that both sides contribute limited perspectives. Production theories can be economically determinant and thus underplay the importance of the agency in individual choices. While consumption side theories sideline the role of the American capitalist system, as well as institutional, national, and regional actors. Ultimately, we suggest that researchers in HCI consider a combination of both production and consumption side causes. That being said, this paper will focus primarily on the consumption side by way of the case studies we draw from. We will explore the ways in which the practices of gentrifiers are either amplified or reinforced by social-technical systems. To do so, it is useful to revisit scholarship on place, discourse

and technology as these provide the theoretical backbone of our argument.

2.2 Space, Place, and Discourse

To understand how consumption side perspectives of gentrification can be mediated by socio-technical systems, we must first revisit the concepts of space and place. Space and place have been of great importance to geographers and sociologists who seek to understand how people, practices and cultures collide in the process of configuring and delineating "spaces" from "places" in the built environment. Spaces are geometrical arrangements that might structure, constrain, and enable certain forms of movement and interaction [23]. Space is abstract—detached from material form and cultural interpretation [44]. Space lacks meaning—space is raw, uninterpreted—devoid of memories or attachments. In contrast, places are spaces that people have made meaningful. Places have relationships with humans that are subjective and emotional—memories, meanings and history. Thus, the process of placemaking "denotes the ways in which settings acquire recognizable and persistent social meaning in the course of interaction" [36]. For this reason, "without naming, identification, or representation by ordinary people, a place is not a place" [44]. In short, space can be viewed as opportunity whereas place is understood reality [36].

Discourse plays an important role in placemaking—as discourse has the ability to not only describe places but also construct them. The philosopher and social theorist Michel Foucault popularized the study of discourse describing it as an "institutionalized way of speaking or writing about reality that defines what can be intelligibly thought and said about the world and what cannot" [38]. Discourse has long been an important concept in gentrification scholarship. For instance, as gentrification is generally considered a social ill, those who wish to mobilize the economic and legal mechanisms necessary to rationalize it at the policy level need to produce an alternate discursive framing for the process. Thus, terms like "urban renaissance," "urban regeneration," and "urban sustainability" are used instead [28]. These phrases can politely avoid or even cover up the violent nature of change forced on low-income people. Such forms of sanitized discourse seek to create alternate realties: shifting the focus of change from human displacement to physical renewal and regeneration.

Gentrification scholar Loretta Lees provides a compelling example of place discourse and gentrification in the practice of "Brownstoning" which describes the process of purchasing and restoring homes constructed of light brown bricks 'brownstone' in New York [68]. Brownstoning, an exemplar of consumption side gentrification theory, was a full-blown movement in New York during the 1960s fueled by young white middle-class families who purchased these homes in waves in the "tough parts" of the city often occupied by ethnic minorities [36]. Brownstoning was framed as an act of love and appreciation for the historic architecture of the buildings. One could take pride in Brownstoning without considering who might have been previously displaced from your brownstone. The Brownstoners were media-savvy as well as politically engaged. They created an entire magazine (the Brownstoner) which was widely circulated. They also leveraged local political players for zoning, permits and tax breaks to facilitate their endeavors. Together, these efforts of the Brownstoners allowed the practice of gentrification to be re-presented through discourse. But regardless of how gentrification is presented, the loss of place has "devastating implications for individual and collective identity, memory, and history-and for psychological well-being" of those being displaced [44]. One of the goals of this paper is to explore how consumption side practices like Brownstoning might be mediated by social-technical systems. Existing scholarship on the relationship between place and technology provides useful scaffolding for this goal.

2.3 Place and Technology

One early and influential work in HCI on the relationships of place and technology came from Harrision and Dourish who argued "the technologically mediated world does not stand apart from the physical world within which it is embedded; rather, it provides a new set of ways for that physical world to be understood and appropriated" [50]. By utilizing data on people's behaviors and locations—technology helps people exploit the meanings and relationships between attributes in place. In this way, rather than simply guiding navigation through space, technologies are engaged in making places by transforming the way people use and assign meaning to space [43]. These views on the relationship of place and technology push back against claims of place being irrelevant in the current age of networked societies [19].

If we accept these arguments on the relationship between place and technology, then we must ask: Whose place is reified? Whose place is replaced? Understanding the ways in which some actors are afforded more power than others in representing place is a key element of

consumption side theory of gentrification. In particular how "the social values of existing users—for example, working-class residents and small manufacturers—exert a weaker claim to the center than cultural values of potential gentrifiers" [33:193].

Taken together, this scholarship on place, discourse and technology provides the background for understanding how the consumption side perspective of gentrification can be mediated by socio-technical systems. We use this background to support our argument—calling for HCI to engage with gentrification. To illustrate how HCI might accomplish this, we present existing scholarship outside of HCI that has already begun to engage the intersection of gentrification and technology. We present two existing case studies of consumption side gentrification on Yelp and Nextdoor, as well as introducing our own ongoing work in Zillow. We choose Yelp and Nextdoor not because of any particular features or aspects of the platforms, but rather due to there being existing scholarship on how gentrification is mediated and influenced through them [85, 99]. Aside from the dearth of similar scholarship—this decision was expedient in our effort to scaffold how HCI might begin to engage gentrification. Therefore, the following case studies should be read as examples of how scholarship outside of HCI has engaged the intersection of technology and gentrification.

3 YELP: NARRATING NEIGHBORHOOD CHANGE

To illustrate how consumption side gentrification can be mediated by socio-technical systems, we turn to an established study of Yelp conducted by noted sociologist and gentrification scholar Sharon Zukin [99]. In our analysis of Zukin's work, we draw attention to how places are collectively represented in technology and the subsequent impact these representations can have on gentrification. Overall, Zukin's work shows how technology can empower (and disempower) differing claims to place through digital representations. This raises the question: whose place is being represented? How does technology (in this case Yelp) factor into the larger, structural power struggles between gentrifiers and gentrified? Zukin's work on Yelp provides a compelling case study to answer this question.

Zukin's study is a discourse analysis of restaurant reviews on Yelp in two communities in New York; both are currently experiencing gentrification, but one is historically African American and the other is Polish American. The focus of the discourse analysis is not on the quality of the food or service at these restaurants, but rather on how the surrounding communities are described. The reviews of restaurants in the African American community were almost three times as likely to mention the surrounding neighborhood in comparison to the Polish community. Moreover, when the neighborhoods were mentioned the reviewers tended to have a negative view of the African American neighborhood and thus tended to praise the ongoing gentrification as positive and needed change to the community. In contrast, the reviews in the Polish community that did mention the surrounding neighborhood had a negative perspective to the ongoing gentrification. Based on these findings, Zukin argued the racial identities of the neighborhoods factor significantly into how reviewers perceived and described neighborhoods. Zukin thus asserts that the reviewers are superimposing racialized ideologies onto places via Yelp's map. The map interface overlaid with the discursive investments of the reviews combine to have a powerful effect on gentrification, as Zukin describes:

"*Like media coverage of new art galleries and dive bars, favorable reviews not only boost the image of a specific restaurant but may also change the image of its neighborhood. This attracts more visitors, especially affluent, adventurous consumers, and, eventually, brings chain stores, higher rents, and real estate developers. What is special about Yelp reviewers is that they participate publicly and discursively, with no fi nancial reward, in the process of making place"* [99].

Zukin's focus on the power of Yelp's map parallels a similar argument made by Laura Kurgan on the power of representation in digital maps generally [67]. According to Kurgan, representational power is enacted in mapping technology by "imposing a quiet tyranny of orientation" [67]. This orientation is often achieved by omitting "invisible lines of people, place, and networks that create the most common spaces we live in today." These omissions give representations the appearance of neutrality: a "view from nowhere" [49]. As a result, these spatial representations tend to avoid political or moral inquiry—presenting "the reality" rather than "a reality" when in fact the use of any single representation is one of many possibilities. Th e work of the reviews performs a similar type of orientation Kurgan describes on the image of a neighborhood through promoting a particular representation informed by the ideological frame of the young white, affluent users that make up the majority of reviewers. Their particular representation is empowered

while the social values of existing residents end up exerting weaker claims to the center than the values of the gentrifiers.

In summation, this study on Yelp provides the first example of how consumption side gentrification can be mediated in socio-technical systems. Gentrification is a cooperative process that "persists as a collective effort to appropriate the center for elements of the new urban class" [6:37]. The importance of "collective efforts" is particularly important in a social media platform like Yelp where discourse is generated in a decentralized manner. Though the contributions are from individuals rather than organizations or government—gentrification as a process is the culmination of "small events and individual decisions [that] makes up a specific spatial process of gentrification" [34:187]. This process of gentrification is facilitated via Yelp Zukin argues as eventually what counts as "real" are the depictions of neighborhoods that amass in individual reviews "which continually redraw cognitive maps of consumer choice, which sets the stage for economic investment" [99]. Thus, representations have cumulative effects, in turn mobilizing the larger economic and cultural engines that drive gentrification. Of particular interest for the HCI community (and CSCW in particular) is in how this work is supported through social computing as collective work of geographically organized reviews by users.

4 NEXTDOOR: REDEFINING THE "NEIGHBORHOOD"

Our second example is drawn from the Geographer Will Payne's article on Nextdoor which provides an insightful view of how seemingly technical mapping decisions can support the "everyday processes of gentrification" characterized by the gradual change of social character of place: "the sound of hammers and saws as workmen refurbish houses, the individuals seated a new coffee shop or bistro, campaign posters for a pro-gentrification mayoral candidate that color shops windows, or terse words between neighbors who come from distinct economic backgrounds" [6:14]. In contrast to the Yelp example, where the implications for gentrification occurred indirectly through representations created by Yelp reviewers, in this example the impact on gentrification occurs directly by way of particular affordances that mediate place between gentrifiers and the gentrified.

Payne's article, entitled "Welcome to the Polygon," draws attention to the unintended social consequences of the way neighborhoods are defined on many maps: "the discrete, non-overlapping, named polygons, composed of linear boundaries closing homogenous areas" [39]. The article traces the history of this style of neighborhood definition to the desires and interests of real-estate developers, politicians and affluent homeowners who all have vested interest in creating (and maintaining) "governable spaces." Technology can make space governable by creating data structures that sort every aspect of urban space into discrete, searchable, sortable variables. This allows one to "see the city like a data-base." It is a powerful and problematic strategy, Payne argues, as it "has the potential to cut off debate about the diverse character of urban space and presents a mostly unnoticed arrogation of authority" [39].

Payne takes this argument to Nextdoor, one of many placemaking technologies (Zillow, Yelp, Foursquare, etc) that relies on named, discrete polygons to represent urban space. However, Nextdoor is unusual in that the site allows users to define their own neighborhoods through a process of address verification via mail. These neighborhoods can be as small as a single condominium, an entire block, or even several blocks. The first user that registers a neighborhood serves as its administrator—moderating discussion boards, adding new members and controlling neighborhood boundaries. Other residents live within these arbitrarily defined extents in order to contribute to the shaping of the neighborhood on Nextdoor, which has been legitimized in recent years by local city officials who use the platform as a tool for community engagement [76]. Nextdoor's revenue model works primarily through selling advertisement space to businesses who wish to market to specific communities on the platform.

The named boundaries erected by Nextdoor users can produce a series of social effects. The first of these effects is spatial-economic fragmentation. Drawing from examples of neighborhoods created in the birthplace of Nextdoor, San Francisco, Payne shows how wealthier residents tend to self-segregate—creating fewer, smaller neighborhoods (in this case two single luxury condominiums) in otherwise mixed-income areas in the city. Nextdoor neighborhoods are private; people outside are not allowed to even view discussions that happen within. This results in a myriad of "elite enclaves" that insulate the newer, more affluent residents from existing, less affluent residents. Thus, digital neighborhoods become spatial-economic filter bubbles which further exacerbates the fragmentation of the larger community.

This spatial-economic fragmentation can create challenges for social equity in services and resources of communities. A by-product of fragmentation is how it can concentrate the social capital of wealthy, tech savvy users, many of which already tend to have greater influence over civic services and resources [76]. This concentrated capital is operationalized in Nextdoor in powerful ways as many municipal entities maintain a presence on the site—for instance law-enforcement and city council have access to neighborhoods within their jurisdictions. This gives Nextdoor members the ability to use their digitally concentrated social capital to commandeer resources. Payne described an instance of this with the Seattle Police Department's partnership with the site: "Seattle Mayor Ed Murray noted his frustration with how most complaints on Nextdoor are not from areas that have significant crime problems, which tend to be our communities in the south part of the city" [85].

Spatial-economic fragmentation points to the ways in which some actors are afforded more power than others in making the built environment amendable to their needs over others. Of course, this may or may not lead to displacement—but it does support the everyday process of gentrification: the slow, mundane changes to social character of place. To illustrate, consider the following scenario: in an effort to stay in business, a local corner store in the communities Payne described in his study may start to sell organic milk in order to cater to the tastes of affluent newcomers. Moreover, if the business eventually failed, a new business (a yoga studio or artisan cheese shop) also looking to cater to the newcomers might take its place. These changes are the everyday process of gentrification that "alienate or price-out long-time patrons, and even more pressingly, long-time residents who worked in the corner store lose their jobs and part of their social support network" [17].

In all, Payne's work provides another view on how consumption side gentrification can be mediated by socio-technical systems: the creation of spatial-economic boundaries. These boundaries work by "reinforce[ing] existing class and racial boundaries in increasingly divided cities, drawing lines between 'us' and 'them' and amplifying the voices of neighbors who want to use the site to profile people they consider outsiders, even those who may have lived the area for generations" [85]. Ultimately, whether Nextdoor is simply amplifying existing class and racial barriers or if the affordances of the platform are enabling entirely new divisions is unclear. However, it is clear, that the digitally defined neighborhoods on Nextdoor "do not stand apart from the physical world within which [they are] embedded" [50].

5 ZILLOW: SELLING THE NEIGHBORHOOD

In this section, we present some of our own ongoing research on Zillow in order to provide a third view on how consumption side gentrification can be mediated in socio-technical systems. For the past several years, we have been examining Zillow [71, 72], an online real estate marketplace that acts as a point of access to housing-related information for potential home buyers, sellers, and renters while providing real estate agents, lenders, and landlords access to these users as potential customers.

The work of real-estate that Zillow mediates has a strong discursive element. As the creators of Zillow mentioned in their book "when it comes to real-estate listings, words matter" [86]. In the chapter "Magic Words and Dangerous Descriptors", they describe how words and texts used in real-estate listings are "loaded with hidden meanings." They report on experiments conducted on how word choices effect final sell prices of homes as well as how initial perceptions of homes are formed. While most of the discussion in the book is based on individual units of property—we were motivated by the Yelp study to consider how these discourses might also be applied to the surrounding neighborhoods of homes. This would raise similar questions that Zukin had regarding discourse and neighborhood changes mediated in Yelp reviews. Thus, our goal in this project is to determine if a "discourse of gentrification" exists within Zillow.

Our discourse analysis focuses on the language in Zillow home listings: descriptive text created by real estate professionals and independent home owners seeking to sell or rent properties on the market. We focused on two neighborhoods in our home city of Atlanta, GA: Reynoldstown and Cabbagetown. These neighborhoods have similar dynamics to Bedford-Stuyvesant and Greenpoint in the Yelp study. Additionally, Atlanta has a rich history of housing discrimination, red-lining, and other forms of housing justice related issues [63, 66]. Additionally, new large scale infrastructure developments are also introducing rapid gentrification to areas of the city [56, 57].

Our methods follow a similar approach to Zukin's Yelp study. We manually collected all of the listing from 2012-2015 resulting in a total of 492 listings (246 each from Reynoldstown and Cabbagetown). Of all the listings for Cabbagetown, 88 mentioned the neighborhood and 68 of those characterized the neighborhood in social terms

relating to discourses of gentrification. That is a 26% mention rate. Meanwhile, Reynoldstown listings mentioned the neighborhood 82 times, 65 of which characterized the neighborhood in specific terms. That is a 27% mention rate. However, the descriptors used in listings in these neighborhoods were not equivalent. Cabbagetown was described as "historic" in 17 separate listings. The same term showed up only two times for Reynoldstown. Meanwhile, terms such as "new" and "hot" were much more prevalent in Reynoldstown.

While these listings do not use the term gentrification, they gesture to related market patterns and use coded language to refer to gentrification. Some listings emphasize what sellers interpret as a newfound stability in a previously low-income neighborhood: "excellent location in *established neighborhood* but with all the *modern* conveniences and finishes of a new home" (emphasis added). Others sell the transformation: "This *authentic urban loft in hot Reynoldstown* boasts soaring ceilings, concrete floors, brick walls, skylights & amazing open space!" (emphasis added). Such language does not simply reflect market conditions; rather it is an active component of how gentrification can be encouraged through broadly circulated online representations. Actively celebrating or guarding against neighborhood change in online discourses is a well-studied strategy for dealing with gentrification [61]. This can have real consequences: welcoming more wealthy residents into the neighborhood; putting pressure on low-income residents to somehow conform to a new normal or leave; drawing attention from speculators, which can raise the home values in a neighborhood even further.

Our findings in this work thus far reinforce and add empirical evidence to communication scholar Joshua Hanan's critique of real estate culture in neo-capitalist society [48]. Hanan links the proliferation of online housing markets, such as Zillow, with the transformation of the home from being a "place of social and economic *reproduction*" to a "site of social and economic *production*" [48]. While this transformation has been long in the making, Zillow exemplifies and exacerbates the commodification fetish of the home through "the various tools designed to make real estate more ''assessable'' to the mapping software which represents the home in the form of a home/dollar sign. This "transforms housing from that of a private space of interiority to that of a public space of fixation that can be consumed, viewed, and expropriated by all" [48]. In this light, Zillow does not simply present existing home values; it contributes to the social production of value in real estate. In seeking to enable buyers, sellers and renters to participate in the housing market at an increased speed and scope, Zillow's interface, inadvertently, or not, can offer a platform for users to do the work of gentrification.

6 DISCUSSION

We end by discussing how the growing social justice agenda in HCI might engage gentrification. To do so, we propose learning from Dombrowski, Harmon, and Fox's social justice framework [34]. According to this framework the pursuit of social justice in HCI requires a commitment to conflict, participation and politics in order to address "the ways that individuals experience oppression, including how benefits, burdens, obligations, power, opportunity, and privilege have been (in)equitably distributed within society" [34]. Rather than a singular method or approach (such as participatory or value sensitive design), Dombrowski, Harmon, and Fox view social justice in HCI as an "constellation of modes and sensitivities" that can be brought to bear on design and research practice. The framework describes the following six dimensions of social justice: *recognition*, *reciprocity*, *enablement*, *accountability*, *distribution* and *transformation*. We explore the potential and the pitfalls in engaging gentrification along these six dimensions. In order to do so, we use examples from three areas of ongoing work: (1) established scholarship from outside of HCI on computing platforms that enable gentrification; (2) nascent work within HCI that could be made to engage gentrification more strongly; (3) efforts from outside of academia that utilize computing to resist or counter gentrification. We see these areas as highly suggestive for how HCI researchers and designers might further engage with gentrification as a social justice issue.

6.1 Recognition

We begin with recognition: the ways in which "unjust practices, policies, laws and other phenomena" can be recognized in the lives of those who are negatively impacted. In the case of gentrification those impacted are the gentrified. We suggest the following straight-forward form of engagement: ***Recognize the experiences of people undergoing gentrification***.

Recognition themed scholarship can extend research in HCI to illuminate the experiences of gentrified populations. In doing so, HCI can provide much needed empirical balance to gentrification scholarship which tends to focus largely on understanding gentrifiers. In fact, gentrification scholar Tom Slater once remarked, "there is

next to nothing published on the experiences of non-gentrifying groups living in the neighborhoods into which the much-researched cosmopolitan middle classes are arriving en masse" [89]. Unfortunately, our work in this paper (by way of the studies we discussed), perpetuates the empirical unbalance Slater describes, as we have only mentioned the gentrified in reference to their experience of gentrification. But it will be vital to give voice to these experiences, as doing so is perhaps the first step towards identifying what types of "counter-work" can push back against gentrification? What are the "everyday practices"– the strategies and tactics of the gentrified [20]?

One key challenge recognition themed scholarship will need to contend with is identifying the displaced—a notoriously difficult task as "it is difficult to find people who have been displaced, particularly if those people are poor… By definition, displaced residents have disappeared from the very places where researchers and census-takers go to look for them" [79]. This is why the eminent gentrification scholar Roland Atkinson once likened measuring the displaced to "measuring the invisible" [8]. This presents a challenge for HCI methods in terms of locating and revealing the displaced but also an opportunity to explore the design of inventive methods that can operate in the constraints of research with the displaced [73].

The anti-eviction mapping project [74] provides a compelling example of HCI might pursue recognition research moving forward. This project utilizes a series of data-visualizations and storytelling to recognize the experiences of gentrifying communities. A key aspect of this work is the collection of oral histories of the gentrified. By collecting these histories—documenting both the dispossession and resistance of the gentrified—the project recognizes and amplifies the experiences of the gentrified across various communities.

Drawing from these challenges and opportunities for recognition we ask: *How can HCI design improve mediation of the lived experiences of the gentrified? How can we design new forms of storytelling utilizing digital media to evoke the public conscious towards empathy and action?*

6.2 Reciprocity

Following recognition, reciprocity describes changes that need to occur in the relationships between those who are owed justice and the means of enabling those changes. Reciprocity is predicated on there being some form of agreement (implicit or explicit) between those who have suffered injustice and those who might be responsible. This dimension suggests the following engagement with gentrification in HCI moving forward: ***Identify and reconfigure relationships in gentrifying spaces towards reciprocity***.

The first challenge reciprocity themed scholarship will need to address will be identifying the relevant relationships. By working from within the consumption side perspective of gentrification, this paper only focuses on one particular set of relationships: gentrifiers and gentrified. However, if we were to consider the production side perspective, several other sets of relationships are revealed. For instance, one of the most popular production side theories of gentrification is Neil Smith's rent-gap hypothesis [90] which argues that gentrification starts when a large enough divergence in current rent earned by landlords (with current land use) and the maximum possible rent that could be earned (based on different land uses i.e. changing to lofts or high-end retail to attract higher income tents). Gentrification is *produced* once this gap becomes high enough. Moreover, this production side perspective can be extended to socio-technical systems. To illustrate, recent scholarship has identified how Airbnb exacerbates rent-gap gentrification by facilitating rapid transformation of affordable long-term rental units into the more lucrative short-term rentals for Airbnb renters [95].

In this light, which set of relationships require reconfiguration towards reciprocity? Is it the relationships with those who move into these new units (the would be gentrifiers) or the relationships with landlords? Or is it the relationship between Airbnb and the communities being transformed into de facto tourist districts? On the latter, what does it mean to have a relationship with a socio-technical system [61, 80, 88]? What does it mean to form an agreement about injustice perpetuated by, for instance, Yelp's discursive map or Zillow's proprietary algorithm, the "Zestimate," when these support indifference to, if not an amplification of the effects of a rising market on low-income residents?

The end goal of reciprocity themed scholarship is to reconfigure relationships towards reciprocity such that injustice is reduced or eliminated. One possible approach to reconfiguration is one which the lead author has been involved with through working with a social innovation incubator located in Atlanta, "Goodie Nation" [46]. Goodie Nation is currently attempting to "hack" gentrification by providing resources to local entrepreneurs in efforts to connect people in gentrifying areas to economic opportunities introduced by gentrification. Their approach

is interesting (and somewhat problematic) in that rather than trying to combat gentrification by opposing it, they instead focus on using technical innovation to create viable businesses that would leverage the influx of capital created by gentrification in ways that would benefit those being gentrified. In this way, Goodie Nation believes it can achieve reconfiguration of the relationships in gentrifying spaces such that the gentrified can benefit from ongoing gentrification. On the whole, Goodie Nation's approach maybe a capitulation in terms of achieving social justice but nonetheless it is worth noting and documenting. Outside of this particular instance, the overall approach from the standpoint of the researcher is that of action—participating as both volunteer and researcher directly. This approach reflects the traditions of activist, interventionist style research popular in existing social justice oriented work in HCI [5, 40, 51].

Drawing from the challenges and opportunities for reciprocity we ask: *How can HCI design systems or research interventions that reconfigure relationships between the gentrified and those responsible (directly or indirectly)? How can HCI action style research participate in the work of reconfiguration towards reciprocity?*

6.3 Enablement

Enablement focuses on "fostering human capacity or helping people take advantage of opportunities by creating platforms for participation and self-determination" [34]. This dimension suggests the following engagement with gentrification in HCI moving forward: ***Enable the gentrified to benefit from the socio-technical forces at play in gentrification processes.***

While not specifically focusing on gentrification, HCI has several examples of scholarship that has engaged issues of enabling participation in placemaking [24, 25, 65]. For instance, Crivellaro et al [25] showed how residents of a public housing complex (who were in danger of being displaced) used histories of place to develop social capital and engage with change processes underway. Crivellaro's team designed a briefcase fitted with audio recording and playback mechanisms. This briefcase was passed around the community, from resident to resident, in order to accumulate stories of place. This design intervention enables resident agency in placemaking "by amassing a heterogeneous collection of stories tied to specific times and places on the estate." In this way, the design intervention performed a similar kind work as the collections of discourses on Yelp or Zillow. The challenge for design interventions like Crivellaro's in the context of gentrification is in the sustainability of experimental and often temporary research engagements. What happens to those in danger of being gentrified when a research project ends [93]?

Perhaps even more problematic for enablement is how we have shown throughout the examples of Yelp, Nextdoor, and Zillow that gentrification is operationalized through the collective actions of some users mobilizing the larger economic and cultural engines that drive gentrification. For instance, in Yelp this was how the cultural capital of some users (young, affluent, white according to Zukin) enhances the flow of visitors and developers to neighborhoods. In Zillow, this was in how the economic capital of some users (real estate agents and home owners) are able drive up local housing markets. Both of these examples point back to consumption side theories of gentrification: markets respond to the cultural and economic capital of these users. Comparing these users to those in Crivellaro's study (who do not possess the cultural or economic capital) raises the question of how research practice aimed at enablement can succeed given the unequal starting point of socio-economic status. This challenge was illustrated in Erete and Burrell's recent ethnographic work on how socioeconomic class impacts a community's ability to engage with their local government [37]. They found that neither technical ability nor access to technology increases political efficacy necessary to enact meaningful transformation of systemic issues facing the community [37]. Erete's work exemplifies the limitations of design interventions to overcome the larger, structural challenges underserved communities face. HCI is growing more cognizant of the challenges facing enablement Erete has raised given recent work [30–33], yet solutions to this challenge remain an ongoing question.

Drawing from these challenges and opportunities for enablement we ask: *How can HCI design sustainable socio-technical systems that enable participation in placemaking? How can we design from within the constraints of socio-economic status?*

6.4 Accountability

Accountability describes the ways in which we might hold responsible those "who foster or unduly benefit from the oppression of others" [34]. In their original paper, Dombroski, Harmon, and Fox acknowledge that HCI has limited capacity for leveling sanctions, penalties and punishments on those responsible for social injustices. But

can the field help focus attention and scrutiny on oppressive groups and systems? This dimension suggests the following engagement with gentrification in HCI moving forward: ***Participate in efforts to reveal the layer and levels of accountability in gentrification processes.***

Because of the complex factors underlying gentrification—introduced earlier in the paper—accountability is difficult to prove. Gentrification scholar Robert Beauregard once wrote, "no one or even two factors are determinant. Conversely, the absence of anyone factor does not mean that gentrification will not occur" [13]. Moreover, gentrification has inconsistent effects and many, such as displacement, are not directly perceptible. These effects might be thought of as what John Dewey calls *indirect consequences;* they are "*felt* rather than *perceived*" [28]. This is particularly true of the spatial-economic fracturing created by Nextdoor. Its user designated "neighborhoods" are imperceptible by anyone not within their network. In this light, accountability is only possible when the indirect consequences of gentrification are made perceptible and susceptible to criticism.

As of this writing, there are few examples from the work of HCI which address accountability for gentrification and those that do are modest. We would like to highlight one such effort, developed by the second author in collaboration with a local, resident-led housing rights organization, the Housing Justice League [52]. These efforts have focused on illuminating the social and economic effects of the Atlanta BeltLine Project, one of the most visible ongoing works of urban redevelopment in Atlanta [2]. The Atlanta BeltLine Project is currently under construction along a loop of disused railroad tracks that circumvent the city, stitching together some of Atlanta's most historic neighborhoods and bringing with it new facilities for recreation, transportation, and housing greatly needed by a population on the rise [47]. But the BeltLine is also transforming existing communities along its path. In response to concerns about these changes from members of the Housing Justice League, the second author has led the development of an online interactive map that explores indicators of gentrification along the current and proposed path of the Atlanta BeltLine Project [1].

The online interactive map allows audiences to investigate affected neighborhoods in terms of three demographic factors selected by a team of residents and researchers working together: percent change in median income, percent change in college educated residents, and percent change in "white share" of the population. The final indicator tells us, inversely, the percentage of people of color who have left the area. These data show changes over a six-year period, from 2010-2015, and were attained from the American Community Survey. The neighborhoods depicted are defined by census tracts.

Although scholars have already shown the influence of the Atlanta BeltLine Project on rising property values within a half mile of it's line of development [57], those findings only hint at the possibility of displacement and other ill effects, which we consider direct evidence of gentrification. Moreover, in order to support accountability, such research needs to be embraced by local residents—those who are subject to oppressive changes in the city. The Housing Justice League's report [14], of which the interactive visualization is a just one part, connects existing quantitative scholarship to qualitative accounts of fear and anxiety —the felt effects of indirect consequences—in low-income neighborhoods along the path of the BeltLine's development. The report was delivered to local media and civic leaders in a press conference on the steps of city hall.

It is difficult to say what effects, if any, the report has had as a whole. However, it was part of a wave of scrutiny which did turn the tide in public opinion about the Atlanta BeltLine Project [10]. In subsequent years, amid widespread criticism, the leadership of the BeltLine has stepped down [9]. That change was certainly not a direct result of the Housing Justice League's report. However, the project demonstrated the potential for accountability in HCI; it helped residents to focus their discussions about how to make gentrification visible. We believe that such efforts can be important components of larger and more far reaching organizing efforts necessary to bring accountability to the forces behind gentrification.

Drawing from this example, we prompt HCI to ask: *How can HCI make the consequences of gentrification perceptible? How can we raise questions about accountability by illuminating the patterns in gentrification?*

6.5 Distribution

Distribution focuses on how equity can be achieved in distributing both benefits and burdens throughout society. This dimension suggests the following engagement with gentrification in HCI moving forward: ***Design socio-technical systems that equitably distribute placemaking***.

Within HCI, Le Dantec and Fox's community historians project [41] provides an excellent example of distribution. The project utilized a series of participatory design encounters within an underserved community in order to facilitate the creation of shared identity of place. While not explicitly about gentrification, the community historians project did take place in the backdrop of inequities being perpetuated by large scale sport stadiums being developed in the area [29]. Distribution of placemaking in the community historians project was achieved through participatorily designed sensing technologies which were used by community members to explore how they might further goals, communicate values, and utilize social capital in resisting the forces of gentrification. A series of public presentations after the project allowed the design activities to be projected out towards the larger community in order to further distribute the conversations about ongoing displacement and loss of community identify. One important characteristic of the project is the longevity and community ownership it achieves by existing as an ongoing collaboration to explore socio-technical engagements with placemaking as partnership between university and community organizations [22]. It also engages with discourse—as one of the objectives of the project was to enable the community to construct their own counter-narratives of place. This focus on counter-narrative is key—as the forces of gentrification acting upon the community have quite often done so under the guise of "revitalization" [29].

Outside of HCI, counter-mapping is another good example to draw inspiration for pursuing distribution themed scholarship. Originating from critical cartography, counter-mapping describes how oppressed populations appropriate mapping techniques of those in power in order to represent oppositional claims to place [87]. While initially counter-mapping was popularized based on historical studies of indigenous populations using analogue maps, counter-mapping has also been explored extensively in digital maps of modern, urban settings [3].

The values of counter-mapping are being taken up in interdisciplinary projects known as "Map Rooms" in two large US cities: St Louis [92] and Atlanta [11]. These map rooms operate as open design spaces for communities to reinterpret space and place within their cities. Much like the discursive maps of Yelp—these projects realize the representational power of maps. They confront the "view from nowhere" objectivity of existing orientations of city space by facilitating design practice around alternative ways of seeing and knowing the city. While neither of these are explicitly about gentrification—the Atlanta Map Room in particular has been initiated under a sense of urgency as the identity of the city is in flux due to rapid development. Acknowledging these stakes, the Atlanta map room hopes to position itself as a design space to enable critical discourse on the future of the built environment.

To further build upon these existing examples of distribution, HCI will need to consider how to evaluate the efficacy of these attempts at placemaking. In particular, how do these interact (and potentially conflict) with institutional placemaking as it exists in official planning and development efforts? What happens when these alternate modes of placemaking afforded by map rooms clash with city planning or private developers?

Drawing from these challenges and opportunities for distribution we ask: *How can HCI design interventions for equitable placemaking that confront and resist gentrification directly? How can HCI research develop methods to evaluate the efficacy of participatory placemaking?*

6.6 Transformation

Transformation requires a significant change in the focus of HCI: from short-term opportunities for innovation to the long-term consequences of structural conditions (i.e. the cultural milieu, education systems, and regulation). Reforming structural inequalities that perpetuate social injustice demands the most intense form of engagement. Engaging spatialized inequalities through the mechanism of "transformation" suggests the following: ***Challenging long-standing institutions and conventions that create the conditions for gentrification.***

Efforts to bring about such transformation in HCI might take one of two paths: The first path focuses on influencing policy, following the guidelines set out by Jackson et al [60]. Policy, argue Jackson et al, often precedes and prefigures design interventions. In following, they advocate viewing the ties between research, design and policy figuratively as a "knot" in order to convey how all three of these elements are inherently tied "as strands woven together," necessitating an integrated approach. A "knotted approach" to gentrification might mean supporting the development of rent-controls [55], creating incentives for affordable housing development [57] or encouraging anti-displacement legislation [75]; all of which strike at the structural root of gentrification. Several of the projects mentioned earlier, such as the Anti-

Eviction Mapping Project, aspire towards such changes in regulatory structures.

The second path is more reflexive. It requires that we take a hard look at how the successes of HCI—a field situated within the larger high-technology movement—creates the conditions for gentrification by consolidating wealth in high-tech centers and therefore increase property values in those areas [82]. This is not only a problem in Silicon Valley [78], where media coverage has focused its attention, but in many other cities in the United States and around the world [81]. Indeed, the success of HCI has indirectly contributed to the demographic transformation of centers for innovation, by creating markets for housing that are now inaccessible for a broad spectrum of the population [53]. For HCI to engage transformation at the deepest level, it must contend with its own good fortune and consider how that fortune might be fairly redistributed.

In either case, engaging transformation in HCI will require adopting a long-term perspective. Even in its more rapid manifestations, gentrification can take several years to unfold [56]. During that time gentrification processes can adapt to changes in the market and culture [98], they can evolve (see "super gentrification" [69]), and they can become stubbornly durable [91]. A typical PhD research project which lasts one or two years can scarcely gain perspective on such slow-moving processes. Moreover, by the time the indicators of gentrification become visible (displacement, loss of affordable housing and social diversity) it is often too late for meaningful intervention [57].

Facing down these daunting challenges requires asking: *How might HCI confront the underlying political and economic systems that produce the conditions for gentrification, particularly when the field indirectly benefits from those conditions?*

7 CONCLUSION

In this paper we posed the following question: *How should HCI's growing social justice agenda engage with the issue of gentrification?* To answer this question, we first articulated why gentrification is an issue of social justice and focused in particular on the consumption side of the debate. From within the consumption side, we discussed the role of discourse in gentrification. We tied discourse to the shaping of space and place as well as how place is acted on through technology. Then we provided three distinct examples of how consumption side gentrification can be mediated in socio-technical systems by discussing existing scholarship on Yelp and Nextdoor as well as presenting our own ongoing work in Zillow. Overall, our work is less about evincing a direct causal link between these platforms and gentrification. In fact, much of the existing social justice agenda is not predicated on the causality of technology in perpetuating social justice issues. Rather, more often it is about discovering the ways in which HCI research could (and should) engage with an issue. To this end, we have provided six modes of research engagement that HCI can pursue on gentrification moving forward.

Let us now acknowledge the limitations of this work. There is the trade-off in our case-study selections and methods. We took a narrow, deep dive into three platforms covered by two papers and our own work; rather than a more expansive, wide-ranging review of scholarship on gentrification and computing platforms. Moreover, these three platforms highlight only consumption side theories (tastes, behaviors and actions of gentrifiers). Future research on the connections between HCI and gentrification need not be limited to studies of cultural consumption or the kind of qualitative interpretive analysis we model here. Indeed quantitative, statistical analysis might yet support a better understanding of production side causes of gentrification. This could in fact lead to a whole other set of engagements for HCI with gentrification.

Indeed, we believe there is much more to learn about what engaging gentrification in HCI could bring. Most important is the need for more research on what (if any) is the essential nature of digitally mediated gentrification? Recall that the consumption side practice of Brownstoning discussed earlier in this paper occurred in the 1960s, predating the digital media platforms we reviewed. Yet, even in the 60s brownstoner's utilized non-digital media (they created an entire magazine 'The Brownstoner'). This raises the question of whether gentrification is changing along with new media [15]?

In summary, we believe that the HCI community—a community of socially conscious technologists—bears responsibility for engaging with gentrification as it intersects with a range of contemporary computing platforms. As HCI designers and researchers, we have the ability to publicly challenge and perhaps transform the spatial expression of economic inequality that surrounds us [89].

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