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The Intersection of Big Data and Anthropology

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SUBJECT: Literature Review: The Intersection of Big Data and Anthropology

Abstract:

The intersection of big data and anthropology is important for both academics and private sector leaders in both fields to understand due to the joint applications and capabilities created. Through the inter-disciplinary intersection, both big data and anthropology could be mutually and greatly impacted, but due to the widespread perception that the fields function aversely, seemingly few people are investigating. The intersection has already illuminated fascinating research and practical applications that could revolutionize how data is interpreted and is utilized both in academia and the private sector. The literature review will seek to showcase these applications through a number of both academic and nonacademic sources which relate anthropology and big data.

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The Intersection of Big Data and Anthropology

Introduction

Due to data gathering and processing advancements, big data stands to heavily impact the increasingly data-informed field of anthropology. Big data, though still limited by the type of data it can analyze, could heavily impact the understanding of patterned human and cultural behavior through the mass analysis of travel, behavioral, and psychological data [1] [2]. Though big data and anthropology may seem to function antagonistically superficially, at a deeper analysis, quantitative studies of massive volumes and varieties of data complements the mixed-methodological and holistic study of humans. Further, qualitative data can provide invaluable insights for data that cannot be feasibly or accurately quantified. From better understanding the section of big data and anthropology, the focus, means, and methods of anthropological inquiry and utility of big data could be greatly sharpened, redirected, or justified.

This literature review seeks to review a number of relevant sources detailing the current intersection of big data and anthropology to better understand the mutual impact the two fields are and likely will have on one another. Due to the increasing prevalence of anthropologists in data analytics and consulting, anthropologists need to be better equipped to serve in private sector positions through analytical and ethnographic skillsets [3] [4]. Similarly, those in data analytics and big data, with awareness of the shortcomings of purely empirical studies, have become increasingly interested in those with ethnographic and anthropological skillsets to provide context and actionable insights for data-using companies [4] [5]. In the past month, I spoke with a friend of mine who is an executive for a major oil and gas company. In our short exchange, he mentioned how he was trying to learn ethnographic skills and was looking to hire anthropologically trained consultants to help train his team. The interaction further solidified statements found in my research about the increasing importance of anthropological skillsets in the private sector. Similarly, university anthropology departments have started to offer data-centric anthropology classes to meet the expected demand of anthropologists in data-related roles [6].

With greater knowledge of the increasing joint applicability of qualitative and quantitative data forms in industry and academia, courses could be tailored to better prepare students for their futures. Further, by establishing credibility and methods for applying joint empirical and non-empirical information, contextual and blind spot-based errors can be avoided [7] [8]. In this context of the growing intersection of anthropology and big data, greater study is necessary to understand the breadth of applications and potential drawbacks.

Background

In order to understand the application of this paper, and ensure its joint utility for both humanities and technical readers, it is important to define the major terminology and ideas utilized in this paper, namely big data and anthropology.

Big Data and Data Analytics:

Big data often refers to data that is increasing in the '3 Vs': volume, velocity, and variety [9], [10]. In this, the data being collected is received in far higher volumes, at a far faster rate, and in a number of new forms that historical or traditional data sources were incapable of. In short, "big data is data that cannot fit into an excel spreadsheet" [1]. Following these ideas, for this project, big data refers to massive data sets that through complex computational analysis can reveal patterns or associations that would be difficult or impossible to find otherwise. Currently, big data is seen as being useful in applications for product development, predictive maintenance, customer experience, fraud detection, machine learning, and operational efficiency [9].

Sociocultural Anthropology:

For this paper, the word anthropology primarily refers to the cultural, sociocultural, and applied subfields. For those outside of the field, it is important to understand both the lateral and vertical scope of anthropology. Generally, anthropology has been defined as the study of all humans, in all places, at all times. Cultural anthropology, the type of anthropology this paper focuses on, often utilizes more contemporary sources, relying on ethnography and social theory for research. Similarly, the applied subfield works to apply anthropological knowledge to a

variety of pressing issues including environmental change and medical care as well as providing qualitative solutions to business problems. Often with big data, there is a large focus on the anthropology of business due to applications discussed later in this paper. Though there were some sources found that related to biological or archeological anthropology, due to the focus on cultural anthropology, these sources were not included.

Methods

The approach for this literature review, I utilized a mix of traditional database searches and internet searches. In utilizing K-State Libraries database search tool, I utilized the search string “Big Data” or “Data Analytics” and “Anthropology”. This initially returned 3,285 articles with filters specifying English language and articles written in the past 20 years. In this initial return, several which were redundant. From these articles, I sorted by Topic, selecting “Anthropology”, “Big Data”, “Sociology”, “Ethnography”, and “Business”. This reduced the number of articles to below 2,000. From this number of 2,000 I selected the 260 most relevant articles based on search returns and selected my articles from the smaller pool. From the 260 articles, I then extracted the 45 articles most relevant to the search. From here the number was reduced to 23 due to a small number of repeated articles and lack of relevancy after more targeted scrutiny.

Source Type and Relation to Material

These 23 articles provide a high level of background and academic knowledge about the subject, however, due to the high business and applied interests in this topic, I decided it would be useful to also utilize nonacademic sources to highlight possible differences in opinion from the private sector compared to the academy. Ten articles were selected along with four other types of resources including a university course posting [6], a job posting [11], and a podcast [4]. Utilizing these nontraditional resources is important in this study to identify if there are gaps in opinion or goals between the two sectors. Also, these articles allow for us to better understand perceptions that the private sector has about the academy and vice versa.

In total, Academic sources account for about 62% of the sources utilized in this paper, while articles account for about 27% and other sources account for 11% as shown in Figure 1. By Utilizing different perspectives and sources, we can have a more holistic sense of how those in the intersection of big data and anthropology perceive the location.

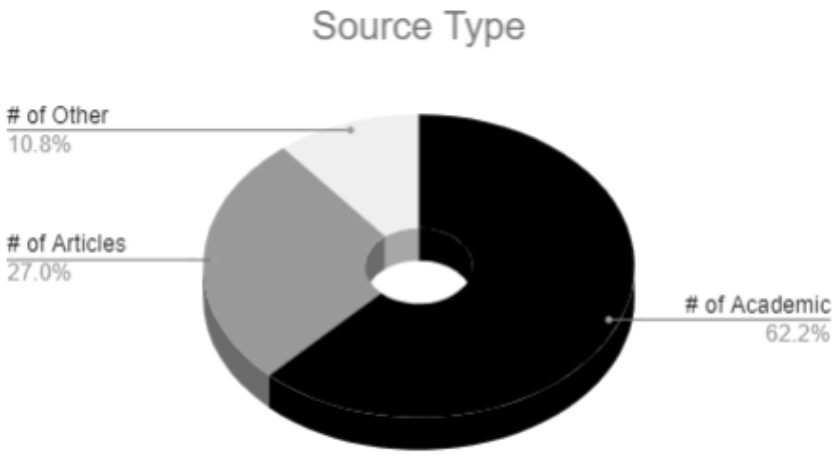

Figure 1: Source Type Graph

Further, of the sources collected, 75% were directly related to the intersection of big data and anthropology while the other 25% either originated in other humanities groups with a focus on wider social science applications with big data, were specifically interested in certain aspects of big data, or dealt with wider quantitative/qualitative data debates that overlapped with the relevant topics.

Perspective of Sources

In order to build a holistic sense of how the fields perceive the intersection of big data and anthropology, sources were collected from a variety of standpoints. Figure 2 presents a graphical representation of the perspectives of the sources utilized. As Figure 2 demonstrates, the sources are split relatively evenly between anthropology (48.6%) and non-anthropological sources (51.4% totaled). Of this 52% of non-anthropological sources, 16.2% come from a business standpoint, 21.6% from data science, and 13.5% from other or miscellaneous perspectives.

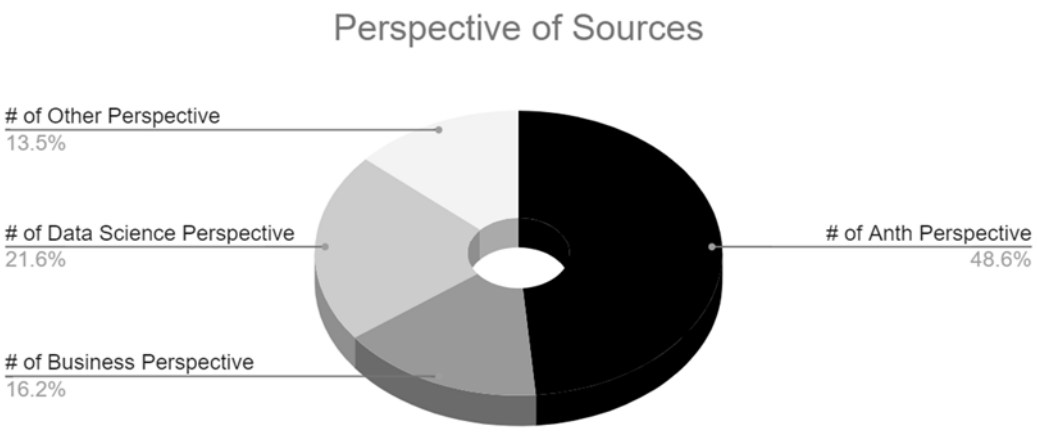

Figure 2: Perspectives of Sources Graph

From this collection of sources, notes were compiled surrounding the major themes and goals of the papers. Interesting quotes and ideas were also captured on the note taking matrix that facilitated the organization and sorting necessary for the above figures. Notes were sorted into four major categories: positive and neutral statements about the intersection of big data and anthropology, negative statements, statements about the application or utility of the intersection, and statements regarding concerns surrounding the intersection of the fields.

Article Discussion

From the articles, there were four major themes that clearly emerged as noted in the Methods section. These themes revolved around positive views of the joint application of big data and anthropology, negative view points, joint applications, and privacy or consent related concerns. For this review, I did not gather sources with a specific outcome or desired outcome intended and, therefore, did not specifically vet papers either critical or supportive of anthropological and data science integration. Though there are likely not enough papers to definitively state that the articles curated and reviewed represent a normal sample distribution, I do believe that it can generally indicate the respective fields and overarching opinions surrounding the intersection of big data and anthropology.

Source Sentiment Towards Big Data and Anthropology Intersection

I divided the viewpoints of the sources into five major categories: positive, positive/neutral, neutral, negative/neutral, and negative. In order to assign the source to one of these perspectives, I read the source and gathered notes about the statements made by the authors that seemed to evoke some sort of opinionative stance. From these statements, with my scrutiny being focused in the abstracts, introductions, and conclusions, I placed the articles in one of the above-mentioned viewpoint categories. There were a handful of relatively neutral articles in that they did not profess a specific allegiance or overarching statements about possible future outcomes that implied an opinion. Whereas, other sources pronounced clear support or contempt towards the intersection and direction of the fields. Those which tended towards one side while acknowledging shortcomings or without strong and direct pronouncements were sorted into the more ambiguous positive/neutral and negative/neutral categories.

From this sorting process, the sources in the respective viewpoint categories were aggregated to show the different viewpoints espoused by the sources. Figure 3 shows the outcomes of the sources sorted into their respective category. From the sources reviewed in this study, 54% were either positively viewed or leaned positively towards the intersection of big data and anthropology. Another 27% were nominally neutral towards the intersection of the fields. The last 19% were either explicitly or leaning towards a negative view of the intersection of big data and anthropology. Of those with negative viewpoints, the majority were academic sources almost entirely from an anthropological perspective.

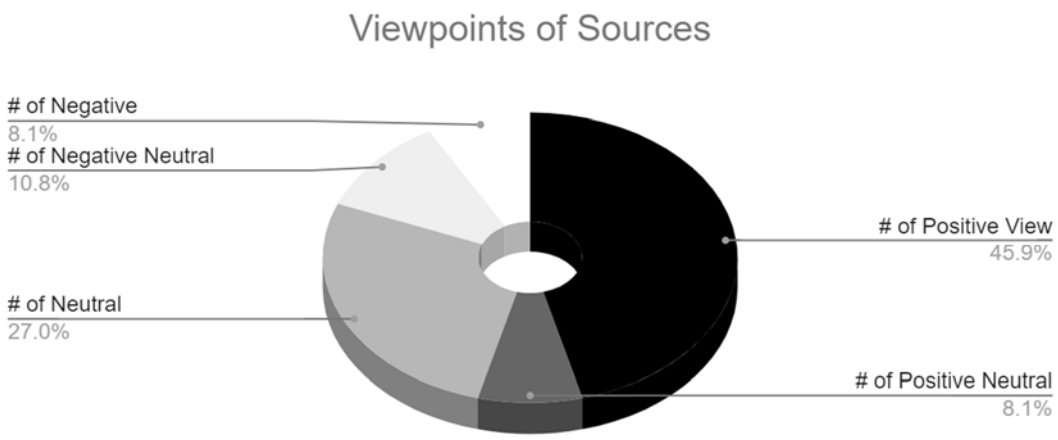

Figure 3: Opinionative Viewpoints of Sources Graphed

Article Comparison and Viewpoints

With these major theme areas and viewpoints established, it is necessary to examine the major points of the articles in order to synthesize the narratives surrounding the intersection of big data and anthropology in order to gain insights about the current and future states of the fields. The positive narratives about big data and anthropology presented by the sources discuss the added context that anthropology can provide data and the methodological improvements for both businesses and the academy.

Positive View

One primary view espoused by the sources discussed how anthropology and particularly ethnography create context and actionable insights for the aggregate data [3] [5] [12] [13] [14] [15] [16] [17] [18]. The main argument articulated by these articles is that data and empirical studies alone are fundamentally inadequate. The trends and opinions highlighted lack context to explain why the data reflects a given trend. Ethnographic work and anthropological mindsets highlight the crucial, but often missing component in data analysis: humans. Individual humans and their actions are fundamentally at the center of the data being collected, but often, empiricism in companies effectively degrades their importance in the aggregate. From a negative standpoint, anthropologists argue that the current state of dominant empiricism distracts from

what the big data aggregates: "actual people and their actual feelings, perspectives, and practices" [19]. Tricia Wang, a prominent anthropologically trained consultant highlights this need for “thick data” or data taken from a small sample size that provides context, narrative stories, and human aspects to data collected [17]. Her argument is that many companies believe that big data or large sample size data is more reliable than small sample sized data. However, the large quantitative statistics don’t capture human experience. Therefore, to have a clear picture, it is necessary to have both thick or dense stories that give deep insights tied with the insights from massive big data sets. Ethnographic thick data also challenges the mono-methodology opening business leaders up to new questions and insights about their subject field [20]. The reflexive mindset and anthropological tools including participant observation also provide managers better means to produce knowledge about their clients and internal business practices [21].

Methodology and Future Entanglement

Beyond this analysis of the positive view of big data and anthropology being used to improve the context and insights created, the intersection is also positively viewed by anthropologists as a way to improve the academy’s methods and ability to study human populations. A number of anthropologists envision big data, under the right ethical constraints, allowing anthropologists to process large quantities of ethnographic data, make them reusable for other anthropologists, and study large trends [22] [23] [24]. Further some anthropologists view the advent of big data as the next social science technology revolution. By studying large amounts of data, it could be possible to explore and answer longstanding questions surrounding individual behavior, life experiences, and agency [25] [26]. Further, this information collected could be utilized to better understand migration, how societies integrate, and build solidarity [27].

Several anthropologists also seemed to indicate that, for better or worse, data science and anthropology were inevitably entangled. Though they raise concerns surrounding data ethics and privacy, they acknowledge it is the apparent direction of the field [28] [29]. Rebecca Lemov places this transformation in the historical context of the study of the first collection of ‘big data’ in anthropology, Don Talayesva, a man raised as a traditional Hopi Native American, but “gave

over his life materials to scientists" [29]. Similarly to the controversies then, big data is likely to have its own controversies, however, but the field will progress to responsibly manage the new types of data.

Negative View

Many articles with negative view-points espoused ideas surrounding the possible abuses of big data, ethical concerns, and privacy concerns. It should be noted that the overwhelming majority of the articles that expressed criticism or skepticism towards the intersection of big data and anthropology were from the academy, rather than from the private sector.

Power and Disregard

A number of sources highlighted criticism focused on aspects of power, control, and data positivism. There are some concerns about how big data with and/or without anthropology could be used to target certain ethnic or religious groups or create reductionist narratives about groups of people [30]. Since conclusions drawn from analyses using data manifest power in the creators of the data, big data could be used in oppressive and surveillance state applications to assert unethical forms of control [10] [24]. The power created can help write narratives in a manner that ignore social disparities and inequalities [31]. However, multiple sources do recognize that anthropology could be used to hold both the academy and private sector accountable for narrative, knowledge, and power creation [31] [32]. By using ethnographic method, anthropologist have a higher degree of accountability by being directly accountable to the study subjects as well as to themselves [32].

A source also expressed concern about inequalities that could stem from relative 'data wealth'. In this, those who are "data rich" have access to the information and power in data whereas the "data poor" do not. From this inequality, there are a number of surveillance and justice concerns that can be raised [33]. Due to the perceived future capabilities of big data and anthropology, anthropologists have also expressed concerns about the ability of this information applied to manipulate human behavior [34]. There are also concerns surrounding the commodification of anthropological epistemology because of some parts of the academy's general opposition to the application of anthropology in the private sector, [31].

Outside of these power related concerns, a number of sources point to the abuse and dominance of empirical data in the current business culture. This "data positivism" [33] that seemingly pervades much of the private sector and data science do not seem to make space for anthropology or ethnography [7]. This disregard of the value of qualitative information sources seems to imply an epistemological superiority of quantitative sources [20]. Due to the perceived and practiced benefits of qualitative work, resentment of this implication is not unfounded [17]. Another source argues that due to the inherent mixed methods approach in data science, it should not function without some qualitative input to ensure its functionality and utility [20]. There is also the clear issue that humanity cannot be fully quantified or datafied [25]. There are qualitative aspects of life that can only be expressed in that manner. Further, since data is commodifiable, there is likely an implied commodification of the individuals that make up the aggregate.

Privacy Concerns

A number sources raised concerns with data security and privacy concerns. These concerns extend beyond the normal concerns surrounding general surveillance and private data leaks [33]. These sources point to the reality that though big data primarily focuses on the collective, the aggregate utilized in the analysis is based on individuals who may not have fully given consent or have knowledge of their contribution [29] [35]. In this concern, social scientists are calling for greater understanding and clarifications in data science and the consent of the subjects [35]. Another source argued that applications of big data and anthropology could create a sort of or assist surveillance states both through direct application and through a sort of panopticism [18] [24]. There are also concerns stemming from recent elections about the ability to utilize data, social media, and ethnographic knowledge to target political advertising and propaganda efforts [34].

Joint Applications of Big Data and Anthropology

The joint use of big data and anthropology were shown by several sources to have wide reaching applications. The sources generally grouped into either business applications or 'other', ranging from healthcare to studying human migration.

Amongst these applications of big data and anthropology, several sources discussed the business utility, some of which has been previously discussed throughout this review. There is a clear utility for combining ethnographic data with big data in understanding consumer behavior and wider economic trends [2]. Some businesses have already seen the benefit in utilizing individuals to better analyze and understand entire populations evaluated with big data [13]. Data has become an integrated part of many successful businesses [15], and, supporters of the joint use of data analytics and anthropology purpose that anthropology can further improve business outcomes [5]. In fact, a number of companies including Spotify, Adidas, and Microsoft have utilized teams of social scientists to attempt to gain greater insights into their customer base and how the company could better tailor its product [5] [16]. One source discussed benefits of using anthropology to "take a few healthy steps away from the ocean of data they may easily drown in" [21]. By taking a few steps away from purely quantitative data, business leaders can continuously work to ask the right questions necessary to understand their industry and customers. All the sources reviewed in this paper proposed that the joint use of anthropology and big data could improve business outcomes [15].

Outside of business, a number of articles pointed to utility of anthropology and data science being used jointly to solve a number of challenging societal problems. For instance, data scientists have new ways of tracking migrations of people [27]. Using anthropology, nations and cities can work to adequately serve and integrate these populations [3]. Further, by matching locational and human knowledge, more effective disease control and symptom tracking methodologies could be implemented to improve healthcare and health outcomes [3] [17] [36]. Big data has already been utilized to reduce fire hazards in cities, in healthcare prevention to target preventative care areas with higher likelihoods of toxic materials, and to guide health inspections [37]. There has also been a case of utilizing ethnography to assist the creation of algorithms to detect bank fraud [12]. Big data and anthropology could also be utilized to make and better understand demographic information in areas without useful datasets and better evaluate cultural trends [22] [30]. There has been effective application of anthropology and data to assist with slum development [11], and there are various future applications in designing safe, smart, and human centric cities of the future [1].

Conclusion

In reviewing the literature regarding the intersection of big data and anthropology, it was apparent that though there was significant support for joint anthropology and big data applications, there were still several concerns espoused by the academy. Nonetheless, even in early applications, anthropology has had significant and beneficial impacts on industry and in the utilization of big data. In order to complete this literature review, I examined 37 sources from both academic and non-academic sources. From those sources, I separated them into groups reflecting their general attitudes and statements reflecting three overarching narratives: positive views, negative views, and applications. Given the length and depth of many of the sources, there was often with significant overlap.

From the positive view, a large number of sources highlighted anthropology's capability of providing context and actionable insights from large data sets. Similarly, big data opens a new academic field and series of methodologies to utilize in research and applied work. From a negative viewpoint, several of sources highlighted negative aspects of power, privacy, and consent in using big data. Academics criticizing the intersection also espoused a sense that data positivism would be a hindrance to integrated ethnographic and analytical research. Lastly, in examining joint applications, there were several clear business applications. Outside of business ventures, however, there were also significant applications in healthcare and other humanistic studies. From the literature review, we can also conclude there is still significant tension between those with concerns surrounding the joint application of big data and anthropology. Nonetheless, the direction presented in most of the readings was one of continued growth and integration. The intersection of big data and anthropology should continue to be studied and applied due to the benefits the mixed-methodology presents.

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