

Data & Infrastructure (with Laura Forlano and Ranjit Singh)

Annie Galvin (AG): Hello, and welcome back to *Public Books 101*, a podcast that turns a scholarly eye to a world worth studying. I'm Annie Galvin, an editor and producer at *Public Books*, which is a magazine of arts, ideas, and scholarship that is free and online. You can read the magazine at www.publicbooks.org.

Natalie Kerby (NK): And I'm Natalie Kerby, digital content associate at Data & Society. Data & Society is a research institute that studies the social implications of data-centric technologies and automation. You can learn about our work at <https://datasociety.net/>.

AG: This is the third season of our podcast, so if you're listening for the first time, I invite you to subscribe to Public Books 101 in your podcast feed and listen back to season 1, which was about the internet, and season 2, about the novel in the 21st century. This season, we are excited to partner with Data & Society to explore the past, present, and future of human life being quantified as data. Natalie is your host this season, so I'll let her take it from here. Thanks for listening.

NK: In this season, "Becoming Data," my guests and I are considering a few main guiding questions. How long has human life been quantified as data, and in what contexts? What are some major implications of humans being quantified or measured as data? How are people pushing back against the datafication of human life, work, health, and citizenship, among other things?

Today, my guests are Laura Forlano and Ranjit Singh. We'll be talking about the different infrastructures that data interacts with and flows through. Both Laura and Ranjit see infrastructure as relational. In our conversation we ask, how are these data infrastructures complicating what it means to be human?

Alright, let's dive into my conversation with Laura and Ranjit.

NK: Thank you, Laura and Ranjit so much for chatting with us today about data and infrastructure. I think it would be great if you could both just introduce yourselves. Ranjit, do you want to start?

Ranjit Singh (RS): I am Ranjit Singh. I am a postdoctoral scholar at Data and Society Research Institute. Before joining Data and Society, I was a Ph.D. candidate at the Department of Science and Technology Studies at Cornell. My topic of research was India's biometric base national identification infrastructure, it is called Aadhaar. I focused on how using this identity verification system and a digital ID is fundamentally transforming the way in which Indians experience their citizenship rights.

Laura Forlano (LF): My name is Laura Forlano, and I'm an Associate Professor at the Institute of Design at IIT, Illinois Institute of Technology in Chicago. I am a social scientist by training

and a design researcher as well, so that means that over the last ten or so years, I've looked at a variety of digital infrastructures, everything from community wireless networks, groups of people that were building their own broadband infrastructure, as well as the ways that those networks were being used in the mid-2000's to more recently looking at network medical devices and in particular my own experiences using those, and engaging both in a traditional social science critique mode of looking at, you know, how are the rituals and cultures around these technologies, how are they being used, how to think about them, but also from a more inventive perspective, working on more speculative and participatory engagements with technology.

NK: I want to ground us with a pretty simple question that we're asking everyone in this series, and that is: what is data?

LF: For me, I like to think about data in tandem with the cultures and practices around it. It is not only important to think about data as the information that might be transmitted between patients and doctors for example, but also the rituals and practices around that.

NK: Ranjit, how about for you, what is data?

RS: I will pick on the last thing that Laura put forward, that data is a combination of technical and social practices. So, I look at it more from the perspective of how state-citizen relationships are managed. In that sense, I find data to be a product of a translation. What I mean is that it represents something real and something happening in the real world, but it must fundamentally manifest in zeros and ones to be an abstract machine readable format.

NK: I really like that you highlight that is not just one direction, it is this loop where we are abstracting, but then it comes back to real world consequences. My next question is perhaps a more fun one: what is one way that you really see yourself interacting with data in your everyday life, and I bet, Laura, I will have you go first, because I know that part of this conversation will include your use of an automated insulin pump.

LF: Yeah, absolutely. One of the questions that arises for me is the labor involved in maintaining data systems and that is a part of this relational understanding of data technology systems and social practices. For me, I often say, this AI system is keeping me alive, but it is also ruining my life and the reason for that is that with the particular smart insulin pump system that has been out for the last several years in the United States, one of the problems that people are having is the constant interruption of their day-to-day activities due to the alerts and alarms on the device. The alerts and alarms are there in the most urgent life preserving sense to make sure that the Type 1 diabetic doesn't have a severe low blood sugar incident, and so after several years of using this and being awoken in the night very frequently, sometimes multiple times a night, I actually started to believe that I was in some sense sleeping like a sensor, developing new patterns of sleep that were biologically, somehow I knew, oh, I am going to get woken up again, so I better wake up. Basically, it is a little bit of an exaggeration of course, but I think the point here is that there are lots of alerts and alarms on the device. Some of them are medically essential. Some of them are legally necessary, but then there are also the technical functioning of the device and the range of explanations that are given for, you know, why some people seem to experience many

more difficulties and others don't. I am actually on a number of Facebook communities where people share stories about what seems to be working for them.

But one thing is very clear is that my own experience of data in my life, helping them to do their job requires a lot of labor, a lot of participation on my part. I have begun to use this term called the disabled cyborg to acknowledge not only my own participation and my own body being part of this technical system, but also the technical system itself having a disability and not functioning the way that it might be expected, either by the company or by myself. It is a really complex issue. I don't think anyone actually knows the answer to exactly why some people are having better experiences than others, but it is very clear that there are really widespread difficulties, problems and failures that are occurring as a result of being in the first several years of using these particular algorithmic systems.

NK: I think you have given us a lot to unpack there, so I'm excited to dive into that. But first, Ranjit, in what ways do you find yourself interacting with data in your everyday life?

RS: It's a great question because as soon as I think about it, I think about when am I not interacting with data. In a way, part of our lives are designed around the idea that we are constantly in interaction with data all the time. When we use the smartphone, when we are looking at television, when we buy stuff on Amazon, when we interact with the government. So, whenever any application is promising personalization of any kind, and this personalization goes both ways as Laura pointed out when she talked about sleeping like a sensor. Because, simultaneously, we are being personalized to the devices that we are using in a way.

We are sharing our data with these applications, and it is figuring out what we like or dislike based on how we respond with cues. Simultaneously, we are responding to what it likes and dislikes depending upon how we are living our lives, especially in the context of healthcare devices. So when we are on social media, it is a part of the combination of things that we continuously are a part of, and it is a part of our everyday life, and we need to accept it in a way where this is not something that is outside of us as Laura mentioned, it is a part of becoming this cyborg entity, which has desperately affected in a way, you know, it is different for different people in how it works. So in a way, we are constantly producing data about ourselves based on what we listen to, what we search for, and now it is even what we wear, right, like the smartphone, a smart watch that I have in my hand. So personally I like tracking fitness through my watch quite a bit. I spend a lot of time obsessing over active calories that I have burned and the number of steps that I have taken, and I find it useful in gamifying some aspects of my life. My fitness goals and adjusting to how to how I am feeling and the amount of time that I spend in front of a computer screen, but at the same time, it is also a way of just organizing life and it has kind of become that over time.

NK: I like that you flipped my question on its head in a way where it is not how are you interacting with data, but how are you not interacting with data. And Laura, your responses also reminded me of the conversation in our labor and data episode where it is not only labor being traditional workers like farm workers who we were talking about having their work tracked and surveilled, but also the idea of how we labor to make ourselves visible to a technology or to work

with a technology, and I think that is the type of labor that intertwines with data that we often forget about.

I want to bring us back to this idea of infrastructure because that is where we are focusing this episode. And I think when a lot of people hear the word infrastructure, they might think about roads and bridges and for some maybe they even think about the internet, and I want to make sure that we are all on the same page about what we're talking about when we say infrastructure. Ranjit, why don't you start.

RS: I think that is a way in which we think about what we intuitively understand of infrastructure, and it is always a thing as you pointed out. It is roads, it is internet, it is a way of pointing to things which are around us and at the same time are a part of how we live our everyday lives.

So, canonical literature and infrastructure studies talk about this in terms of infrastructures are the invisible background of our everyday lives. It is something that is just there and it changes its meaning for different people based on how they experience it, so one of the examples that Susan Leigh Star and Karen Ruhleder use is that a cook considers the water system a piece of working infrastructure integral to making dinner, but for a city planner, it becomes a variable inter-complex situation. So instead of thinking about what an infrastructure is, or thinking about it in terms of it being a noun, they invite us to actually think about when is an infrastructure, which not only brings in a question of time and thinking about what is the moment at which we are thinking about something at the infrastructure of our lives, but also it invites us to think about infrastructure as a verb.

I do that in my work and think about how data shapes state-citizen relationships and how state-citizen relationships then mutually shapes the data that is produced in the process. So, I follow how a state recognizes and delivers services to its citizens through their data, and in this sense, I focus on the process of infrastructuring state managed data systems into the everyday lives of citizens. So you can see this by simply looking at the different identity verification systems that different countries develop over time to verify that a citizen is who they say they are. These identity verification systems range from paper-based documents to the new biometric-based ID systems. Citizen identification in the sense of process constantly evolving through time and it is embedded in particular histories of nation building. Any new ID system doesn't exist independent of these existing systems. They are woven into the fabric of how state bureaucracies operate. So it is not simply a question of using a new technology. So facial recognition to identify citizens for example. For a state to use any technology, it needs to build an infrastructure, a whole set of processes, which require the policy framework of these technologies, it requires new administrative procedures to make it an everyday part of the work that bureaucracies do, and it finally has to consider legally the consequences of what the adoption means and how it impinges upon constitutional rights as citizens.

In a way, if you start thinking about infrastructure as a verb, it becomes an organizational principle which allows us to then start looking at the relationship between things and people as it is being put together by a technical system that simultaneously needs so many other kinds of

work, which can be legal, which can be administrative, which can be partly based on just the experience of living with these technologies, which then becomes a part of thinking through what an infrastructure actually is doing, as well as how it is basically being put together. In that sense, I use this lens to then start tracing the kinds of challenges that India system has faced since its inception, and the ways in which it was brought together through all of these interventions being put together at different points of time in the last ten years.

NK: So what I am hearing from you is an infrastructure is a set of processes, an organizing principle. It is something that is almost invisible to the naked eye in this context, but it is connecting disparate parts, and I really like that you brought up that it is, when is something an infrastructure because I think that really emphasizes that it depends on who is looking at this system and how we are using it when it fills that role of infrastructure.

Laura, I would really curious to hear from you because I know that your work, as you already mentioned, has ranged from thinking about community Wi-Fi networks all the way to as we have talked about again, your automated insulin pump. What is infrastructure for you and I would be particularly curious to hear about it in the framework of this medical device that you are using. Do you consider that an infrastructure?

LF: Yeah, absolutely. And I, you know, I talk about the idea of intimate infrastructures, so they are deeply embedded into the body, but they also in certain instances of various devices I have used over the last seven years or so, some of them allow you to share data with friends and family so that they can check that you are having a good day so to speak and so I think about the infrastructure of care that goes around maybe linking you with a spouse and so that you can be connected. Your details about what is going on in your blood sugar can be connected with that person who is looking out for you. And so I think of it that way, it is maintaining both a medical need, but also a social relationship and many other things. So that is how I have applied it sort of in the critical disabilities studies perspective is that yeah, these are definitely infrastructures.

The one thing that you will definitely find if you do a study of this kind is that everything relies on everything else and so this idea of multiple interlinked, overlapping networks, for example, you need a lot of supplies to make all these devices work. A lot of plastic parts, so, you know, you not only have the devices themselves, which include a meter, continuous glucose monitor and an insulin pump, those are the three primary forms of technology, but you also need devices to insert those things into your body, so there are different kinds of inserters, there are batteries, there are tubes, and all of those things depending on which company's devices you are relying on. That means that you are plugged into different sort of networks of reordering supplies and how frequently can you get them. Interestingly enough, when I was transitioning from the previous pump, which was not a smart insulin pump to the current one, there was a period at which there was a backlog of orders. This was in late 2019, and due to the hurricane in Puerto Rico, it had actually disrupted the supply chain, so there was a delay and a lag, and I had never really thought about how climate change might be linked to supply chains, might be linked to my ability to get the parts that I needed to get all of these things to function, and so I think that was a great example. So yeah, you definitely quickly start following a lot of different threads and themes of different things that rely on each other, and if any one of them isn't working, so for

example, if the reader is not working and you can't test your blood sugar, or you have run out of the little lancets that you use to get the blood out of your finger, like then the rest of the system just won't really work, and so that is what is fascinating.

But I like to think both about that intimate infrastructure, such as that example, but then also to in a multi-scaler way think about things like for example the Chicago red light camera system, which I have written a little bit about in one of my *Public Books* essays, but also the Boeing Air Max failures and if you look at those cases what you are going to see is that there are social and political aspects of why those succeed or fail and that includes everything from, for example, in the Chicago red light cameras, it was the fact that people were actually afraid to drive through the intersections where they had red light cameras because they were so worried about getting a ticket that they would often then back up into the car behind them and cause more accidents and the technology was of course focused on trying to prevent accidents and those kinds of things. So they were trying to make a more safe driving environment and they made it less so. With Boeing Air Max, I think that there are lots of different aspects that related to the fact that, you know, many of the employees had interesting relationships with their government regulators, and so I mean, it is just that when you start following these kinds of lines of questioning around this being an infrastructure and not just a tool that is based on social and cultural practices and politics, economics and climate change as I mentioned, then it starts opening up what those dependencies and relationships are and things become a lot more interesting I think from the perspective of research. There are lots of different things that one could study to tell the story of these different infrastructures.

NK: Yeah, I think that example you gave between like getting your own medical device to climate change is the perfect, it was just a beautiful example to see how all these systems are interconnected and encompass that infrastructure in and of themselves.

You also at one point, I forget exactly what the line was, but you used the word maintaining, which reminds me of maintenance and I feel like that is something that has come up in some of my conversations recently is the maintenance of these systems as well and how that often totally gets disregarded.

RS: One of the things that came to my mind as you were describing the case study of using these medical devices was to connect it back to one of the ideas that you mentioned initially, which was focused around disabled cyborgs and there is a particular story here which is focused on how do disabled cyborgs as an entity and as a particular kind of people experience infrastructures. I wonder if that is a way in which we can think about how we experience infrastructures in the faith of them breaking down as a relationship or in relationship with the idea or the motion of disabled cyborgs and whether that might be something that might be useful to consider in terms of bringing some of these different ideas together.

LF: Yeah, that makes a lot of sense. I think one of the limitations of taking a critical or social science approach is that we do tend to overemphasize like the way things break down or go wrong, especially in the science and technology studies tradition, and while that is essential

research and super interesting, it doesn't always help us then reorient to what might alternative relations look like.

So not just alternative technologies, but alternative attitudes we might have or alternative metaphors or alternative imaginaries and so, you know, I think in my piece for *Public Books* I wrote that we might aim to have more generous relations between humans and things and in particular these kinds of medical systems, which are very clearly designed around what we might think of behavioral and cognitive and persuasive design traditions and we might think about instead of focusing on nudging the user to make adjustments to their blood sugar or calibrate their sensor at various times of the day, we might think, well, what would a generous relationship of living together or living with these systems look like? And I don't necessarily have an answer, but I do think that that is possible if we think in a more speculative and inventive way about the topic rather than only coming at it from a critical perspective.

RS: I agree. I think this notion of generosity is pretty useful in thinking about relationships with data. You know, how can we be generous with these systems, which are just trying to basically interject in our lives one way or the other, but at the same time, they are trying their best, right, one way or the other. So how we double up those relationships and how we talk about generosity in our scholarship is an important part of this conversation.

NK: I think you are both leading us very nicely into the next section here. I really want to talk about how humans and infrastructure interact, which I think is exactly where you just brought us.

Laura, I know that in your work you are really talking about whether it is your own body or anyone else's having this relationship with technology where you are influencing each other, it is going back and forth, and so I'm curious if you think what it means to be human is changing as we become more and more embedded in these systems?

LF: Yeah, absolutely. I think that's the key to a relational understanding of infrastructure that takes the socio-technical as a concept. That also means that what it is in the category of the human, or what it is in the category of technology itself become more unstable. There are lots of good debates around, especially from critical race studies and critical disability studies, about well, why would we pivot to these other notions of the human when we have been fighting so hard to get rights within the category of the human as is, but there is also great fellowship that really says, you know, these boundaries are already troubled. They were never discrete in the ways that say Western science, Enlightenment thinking likes to isolate these things.

NK: Whose values and orientations are driving the way the algorithms work?

LF: Well, I do worry that persuasive design happens to be extremely popular within design schools and I think engineering programs as well, this idea that we can have this influence on users and we've seen how that plays out with Facebook and Cambridge Analytica and elections and who has agency?

Are we infinitely manipulable as humans or are there ways of resisting or pushing back against that? And I do worry very much that in particular disabled people, not only in my own example, but in many others, are themselves test beds for these kinds of technologies that might then be

rolled out in say discussions around how to track warehouse workers. There is a lot of research going on about tracking emotions to know when an employee is going to have a certain kind of emotional reaction, and so I think that that is where I find very troubling that we aren't having a broad conversation about the ways that infrastructures are social and cultural and political and instead, you know, the majority of thinking does seem to have embraced this very persuasive design or behavioral kind of understanding by nudging people through algorithmic agencies that are deployed in everything from social media systems to a range of other infrastructures.

NK: Yeah, that is super interesting and so Ranjit, my question to you is how do human values come up in your work on citizenship and digital ID? And how do you see the idea of what constitutes a citizen challenge the integration of a digital ID system?

RS: It is a broad question so what I'm going to do is to basically divide it up into two halves. One is the state's conception of how do we think about citizens and why would they extend the investment in digital IDs was first rationalized and accounted for. And the core there seems to be two streams of thought. One is the concern around national security, so, one of the ways in which digital IDs are usually appropriated across the world is centered on the notion of national security. We need to be able to differentiate between who is a citizen and who is not a citizen, and the way in which we do that is by basically assigning different kinds of digital IDs to different kinds of people.

The other aspect and India began with it, but at the same time dropped that as a reason to actually implement the biometric base system, and then went into the other way of thinking about the same problem, which is centered on social security, so the notion there is situated in the idea that there are certain parts of the population that need more support and welfare than other parts of the population, so there is a definite need for targeting certain populations for welfare services and in order to be able to target them, we need to basically be able to uniquely identify them. Because unique identification then is deeply connected with conversations on fraud and forgery in ID documents, which then is used as an excuse or as a validation of the idea that this is the reason why the welfare that is intended for the poor never reaches them, because, you know, there is a lot of corruption in the process, so if you can uniquely identify beneficiaries, then we can figure out actual off-take, off benefits and that will allow us to basically curb corruption in the process.

One of the examples that is generally used in this case is the public distribution system of India, which is designed around providing subsidized food grains to below poverty line families in the country, and the general metric that is basically talked about is partly the number, which doesn't really have quite the solid grounding, but at the same time it is always used as the idea that only 25% of the benefits that were actually diverted from the government to the scheme actually reached the poor and how that 25% comes about, you know, has different sources and you can keep tracking it back as to who said it the first time.

What I mean by this is that there is a trope of corruption that is generally also used as a way of then rationalizing why we need to invest in digital IDs as a way of then being able to make accountable governance where everything is transparent, everything is accessible, and you know,

we can have clear accounts of where the money went and what happened with it, and it all comes out of digital IDs in a way. So that is the general rationalization of it. This produces its own set of challenges from the perspective of citizen. If a technology impinges upon my constitutional rights as a citizen, then I have a right to challenge it, right?

One way in which digital IDs usually impinge upon people's rights is usually imagined around the idea of privacy and surveillance. So it is a way of impinging upon somebody's life, taking their intimate details in order to basically then figure out a number and assign it to them. Now in this case, you know, Aadhaar's design is done in a way where after all the legal battles that were fought on the case, the court basically said that for any government scheme to actually impinge upon a citizen's right to privacy, it must satisfy a three prong test. One was it should be passed as an act by the government. The second was it should have a legitimate purpose, so no right is absolute. If I want to basically provide you welfare, which is also a legal right of citizens in India, then I can impinge upon privacy to some extent in order to streamline the services of welfare services, right, in that sense.

There is this constant give and take and a balance and a tradeoff that is currently being imagined in the construction of digital IDs themselves. What it does challenge to a certain extent is how this representation that is being secured through data can be hard for a lot of citizens, which then creates conditions of data driven precarity and marginalization, which was not the case earlier. It was just paper-based documents were easier for people to manage as opposed to digital IDs. It requires some amount of literacy and the idea of navigating these systems and their interfaces in itself is a challenge, so there are a lot of these different issues that come up in basically living with these systems, and that is what I talk about in terms of thinking about what are the implications of these systems and then how they are experienced, and how that relationality to a certain extent gets complicated and becomes challenging for a lot of citizens.

NK: One of the things that stood out to me in one of your papers was how a lot of unhoused individuals were having trouble working with the system because it required needing an address and they didn't always have a stable address or for older individuals who had cataracts weren't able to take the biometric, so I think already in and of itself it is like the state is saying, in order to be a citizen you need to have an address and -

RS: And you need to have a normal middle-class body basically.

NK: Yeah, exactly.

RS: Yeah, a healthy body.

LF: There is a great project I think about 15 or more years ago by the Coalition for the Homeless in New York City about creating phone numbers for unhoused individuals so that they could actually get job interviews and be called back, so it was a, you know, a tech intervention into that, but it was very interesting in just looking at how does someone, how do you create the infrastructure I think in the idea that Ranjit mentioned, like this idea of infrastructuring, so how do you do an intervention that creates the infrastructure that might not be there?

NK: So, Laura, as we have kind of already talked about, there is this new status quo almost where algorithms and humans are shaping each other and within that you talk about algorithms or more than human entities having agency. So I'm curious how you first started that inquiry into expanding agency to not just human and then what does it mean to assign agency to the more than human?

LF: I think the idea of non-humans having agency is fairly widespread in the science and technology studies field, so we talk about the way things might have agency, so algorithms having agency might just be the latest version of that and I think what is important also to note is that in the ideas that we work with in science and technology studies, it is not that all things must have agency in all situations. It is more that we need to look for the possibility of agency that things might have. So rather than ignoring it or not counting it in our data set, we are open to the idea that that might be one aspect.

Some of the early studies that I was doing on Wi-Fi infrastructure, an interesting way to think about agency in that case was that as people probably have the widespread experience of, you know, using your cell phone or using your laptop when you are not close enough to the cell tower or the Wi-Fi router, these networks or infrastructures have the ability to intervene in the social world by saying, hey, you need to stand a little closer to the window if you want to have a phone call or use your laptop for example, and so that was a kind of agency. I think what is interesting if we start thinking about algorithmic agency is that yes, in these moments where, you know, for example the sensor needs to calibrate and wakes me up in the middle of the night, we might say that that is a form of algorithmic agency, that it is jolting me from a dead sleep and so it has an influence on my experience of the world. And so it is not only my situated action or my context that is important, but also that the algorithm is dynamically acting in the moment based on real time data that it is getting from my body that creates this unexpected perhaps action. And while these things are still based of course on software that are programmed, because it is using dynamic data, the intersection between situated algorithmic actions and situated human actions becomes an entirely different thing I would argue.

NK: Ranjit, I wanted to talk to you also about this idea of the agency and consent. This digital ID system is mandatory for all citizens in India, so at what point does someone stop being a user of a technology? At what point does it just become a way of life and how does that deal with the notions of consent? Like are you really consenting to this technology if it is required?

RS: I think the first time I encountered this question was when just randomly at a conference I was having a conversation with one of the authors of this book, *How Users Matter*, Nelly Oudshoorn, and she was at that point of time working on pacemakers. And one of the things that she was interested in thinking about was if a pacemaker is inside your heart, inside you, are you really using it? If you have, you literally have no control over this device, it is just, you know, ensures your survival, but at the same time, you are not really using it in a way.

Taking a step back from that particular example, I think there is an argument to be made where if infrastructures are invisible backgrounds of our lives, then we are not really using these infrastructures, we are living with them. And if we are living with them, then the notions of

agency and consent, which we think about in terms of, can we exercise control over something else? And that is how we usually model our notions of, okay, then we have agency to some extent because we have a say in something that is happening to us or we are consenting to this thing happening to us in a way, right? So I am consenting to sharing data with Facebook in order to be using Facebook service.

In the digital ID case, what is interesting is that when it was started, it was designed around the idea of voluntary enrollment. So you really didn't need the ID, but the government was simultaneously arguing that in order to basically prevent fraud from welfare schemes, the number should be mandatory to access welfare services. So, technically, you could choose to not sign up for the biometric number, but what you would give us is access to welfare, right? And that is not a choice that a lot of people can simply make. For many below poverty line families, this is a part of their everyday systems. You can't really make certain choices if you think about it, there is also this question of can we change and shape how we are represented through data? And that to a certain extent has been another part of this conversation where there is one part of the critical data studies scholarship which is focused on the notion of data subjects being subject to your own data in a variety of different ways.

In that particular context, there is simultaneously a need for a conversation, which is kind of centered on what agency and consent do I exercise in order to basically shape how I get represented to systems? And in that particular sense, I focus a lot on thinking about how do people actively work on changing their representation to data systems? And a great example of this would be the ways in which people work towards improving their credit score in America. So there are a lot of ways in which you can basically start working towards improving your score and that to a certain extent is an everyday experience. It is a part and parcel of planning for your financial future and to secure it in a way.

That also means that these systems do not just produce results out of nowhere. They are simultaneously responding to your behavior one way or the other and how you are trying to shape these systems, so there is this balance of agency in a way, which kind of puts it together in a way where these systems are not only just shaping how we live our lives, but we are simultaneously trying to shape what these systems say about us and that relationship and how we unpack it is very dependent on the context of us, but at the same time, they are a part of just living with these systems now and as soon as we could recognize that these systems are here to stay, we can then start focusing on everyday forms of weapons of the weak more or so, where we can start thinking about how such everyday actions can then change how you are represented on a data system, or what you can do with a device so that it works better for you, and you learn with it, you know, you learn to live with it in a way, and that is what a lot of people are doing in India. They are learning to live with their digital IDs.

NK: Yeah, I think through both of your answers and throughout this conversation, I think there is this back and forth nature between data infrastructures and people has become very clear. I think what has also been emphasized in our conversation is that it is all very contextual, which I think is important to highlight, and I think, Ranjit, that even goes to part of what you were saying for some people in their particular context, they might be able to exert agency, but for another,

because of their own status or identity, it is no longer agency, it becomes required and they can't, it is not really consent, it is I have to do this in order to survive.

I think part of what you both have also gotten to a little bit is acts of resistance and ways to push back against these data infrastructures and data-centric systems, and so for my final question I really want to look to the future and ask both what types of tradeoffs do we need to consider in moving forward, but also I would love it if there is particular moments of resistance that you would like to highlight and say that this is a great way of people doing it. Why don't you start, Laura.

LF: One of the things that we haven't quite mentioned, but it is definitely part of looking to the future is the ways in which a lot of these systems are of course embedded in specific companies' plans to upgrade and update the various systems, and so whether it is the biometric systems or medical devices or technologies that we use every day, social media or laptops, there is that inherent determinism, this idea that tomorrow will be better and the next version of the software or the next technology will be better and of course that is a huge money maker for technology companies to get us thinking about the next thing.

In the research I did on the driverless city project, one of the interesting examples was the ways in which Ford Motor Company advertised that their car could now drive at night autonomously so to speak while advertising the current model of the car which clearly could not drive at night. And so this idea of how you get locked in to a particular brand or device or company, and with something like a medical device, there are four year warranties in some cases, so once you get that device and they are extremely expensive of course, you really can't afford to opt out, unless you are either incredibly wealthy and don't need health insurance or for some other reason.

What is partially interesting here is that there are definitely communities that are actively resisting this push to continually upgrade within the medical device area. There are groups of individuals called loopers who have been creating their own like DIY versions of these smart insulin pumps and they actually did so even before the commercial introduction of these systems by most of the bigger players, so they were able to essentially hack an earlier model of an insulin pump and that they can exploit that particular model to create an open source system that does this same kind of thing, a dynamic insulin delivery device. And so that would be a form of resistance.

I have also been very inspired by the example from the residents in Brooklyn Housing Community, where there has been surveillance cameras and other technologies being introduced and they were really active in resisting that system, and so I think that there are some really interesting examples. The Amazon warehouse strikes obviously have been interesting. And I think that definitely attitudes have changed towards the tech industry in general in the last number of years, so while 20 years ago even I found myself quite wrapped up in the excitement about open source software or building these networks and didn't really have the same understanding about infrastructures or about say the ways in which we are constantly having to upgrade to new systems and pay more for the next better future and so yeah, I think there are examples all over.

In addition to these more obvious forms of resistance, I think there is also everyday resistance. Humans are just generally very disobedient. We don't do the things that companies want us to do no matter what. They can be very minor. It is like extending your sensor for an extra week even though it is only supposed to last a week, and that could be a substantial cost savings so that could be economically necessary for you. There is a lot of, I think, everyday forms of resistance that people do that just mean like not using the system as it was intended.

NK: I really like this notion of disobedience, especially as it relates to like agency. I'm curious also because in your work, you talk about socio-technical imaginaries. Could you just talk a little bit about that as well? Like imagining future infrastructures and ones that better center equity and justice.

LF: Yeah, absolutely. I mean, I do think that the conversation around socio-technical imaginaries, which is familiar in the science and technology studies field is a nice bridge or transition between the social sciences and the critiques and the design field, where we actually actively think about could we create participatory processes that create certain kinds of systems? Could we design interventions in a certain way? Could we imagine them and then, whether that is sort of fiction or through participatory workshops or through other forms of inventive and creative works, using those creative works as ways to interrogate systems.

In some sense, a lot of the same questions that we have been discussing today, but taking them in a different direction and that is where I am, you know, with one of my current book projects is just trying to figure out how to pivot into working in a more speculative way with that same set of ideas. I like to think about using STS theory as a design material for a speculative imaginary, and I think what is interesting there is that depending on where you locate any particular question or problem, so, you know, we have just spent the last hour talking about all of the different multi-scaler ways in which these various systems are embedded, whether that is individual bodies or government structures, and depending on where we focus our conversation, we might imagine different responses, different interrogations, different imaginaries that are basically responding to questions or raising new kinds of questions as well.

And so that is what I like to think about is can we develop a form of I would say, something like a speculative praxis, which really brings the critical and the imaginary really more closely together and for the purpose of reorienting towards alternative relations, alternative values, may be some of the things that we talked about today, such as generosity in our relationships with technology, or generosity with respect to the relationship between citizens and their state.

NK: Yeah, thank you, I think that is a good just reminder also that we do have the power to imagine alternatives, it is not all predetermined.

Ranjit, just to reiterate the question, what tradeoffs do you see moving forward when we are thinking about how we interact with data infrastructures and especially in the fight to like make that a more healthier relationship, and then also just access for systems that you find inspiring?

RS: There are quite a few tradeoffs, right, in the sense that as soon as we are living in a digital environment, we are simultaneously thinking about, okay, what are the parts of our life and what

are the parts of our identity we would like to share with any institution and that is always a tradeoff in terms of, you know, do I want to access this service in lieu of giving you some access to my information one way or the other?

But I think that beyond this fundamental contract that is basically being established in order to access any service, I will give you a very interesting example, which I'm currently thinking through and working out in my head as well. One of the things that we would expect any government to do when it is organizing a welfare scheme is to be very clear on who are the people who are receiving these benefits? And the government of India does this too, any government does this in the sense that it releases a list of people who are getting these benefits one way or the other and it was a standard practice that Indian government had been doing for a while, but after the release of the biometric number, what these websites are also doing was to release the biometric number itself of these beneficiaries on the public portal as a way of establishing transparency and good governance in organizational welfare schemes, which simultaneously raised the challenge of potential invasion of privacy, financial fraud, identity theft, that could potentially happen in the future, because biometric numbers of these people are basically being displayed publicly on these common websites.

Now here is an interesting tradeoff between thinking about how do we organize these practices, what do we anonymize, what do you de-anonymize? How do we actually start thinking about which parts of these data records can potentially be used for information processing as opposed to which parts need to be actually private and personal and should not be shared? This created a quite fascinating controversy over whether the biometric number, just like social security numbers in the U.S. is a private number or a public number, and in the story of Aadhaar itself, turns from designer of the project saying that it is a public number you can share it with anyone because it always will require a two fact for authentication, so you need the number along with something else to be able to authenticate identity, so you can share the number with anyone who wants, to now where the number is considered private. And you are not supposed to share it, right? And this happened over the span of the last five years. So in a way these controversies and these working outs of what these tradeoffs look like is happening constantly, it is not something that we can basically decide at one point of time and then that is the decision that lasts with us.

As Laura mentioned, there are constantly updates to hardware, as well as software. There are constantly updates to these tradeoffs that we are making in order to actually be using these systems in the first place. There are a bunch of organizations that map in the implementation of public distribution system in India, which is designed around distribution of subsidized food grains to below poverty line families in the country. And when they started looking at the impact of the number on access to these food grains, they started with mapping consumption patterns of people. I was a part of one of these surveys where they were trying to map what did people eat six months earlier when there was no biometric number involved, and what do they eat now, now that the biometric number is basically a part of the process? And what they increasingly realized is that it is very difficult to quantify the change in consumption patterns, but over time, one of the things that they started mapping was the hunger debts that were happening in the country because people didn't have access to their food grains because of the lack of the biometric

number, and then they started recording debts as a quantifiable metric to them talk about the kinds of precarity that this number may raise when it is unevenly implemented in the country, in distribution of welfare.

And that to a certain extent is also how we learn what are the metrics which we use in order to actually talk about these systems and their impact, and then simultaneously a way of constantly being aware of what the systems are doing in the real world, and keeping a track of them one way or the other, and I find that to be an important part of the ongoing resistance to such systems where we have to be constantly aware of not only how to create proxies for the ways in which these systems are having an impact on the real world, but also be willing to change these proxies when we recognize that, you know, whatever we are doing to measure these impacts is not working, and I think that is an important part of how we understand and think through ways by which we are able to account for the consequences that these systems have, and finally on the notion of generosity.

One of the things that the Right to Food campaigners used to tell me was that if we are really being generous, we should stop thinking about targeting, and just make access to food universal, and that to a certain extent is a good and interesting and generous way of reorganizing what it means to actually access welfare because, you know, it is really difficult to figure out who deserves it and who doesn't, but if you make it universal, we can create a system by which people can say that we don't need it and can basically opt out of the system in a way.

NK: And that's our show! A huge thank you to Laura Forlano and Ranjit Singh for sharing their thoughts about data and infrastructure.

Next time, in the final episode of *Becoming Data*, I talk to Sareeta Amrute, an anthropologist and Director of Research at Data & Society who studies race, labor, and class in global tech economies, and Emiliano Treré, a researcher who works on digital activism and algorithmic resistance. We discuss how data is not a new way of organizing human life. Rather, people have deployed data since the Atlantic slave trade and colonial conquest in order to exert power over others.

I hope you'll join us for our final episode, about data and racial capitalism.

This podcast is a production of *Public Books*, in partnership with the Columbia University Library's Digital Scholarship Division. Thank you to Michelle Wilson at the library, for partnering with us on this project. This episode was produced by Annie Galvin and edited by Annie Galvin and Shelby Lohr, with editorial input from Kelley Deane McKinney and Mona Sloane. Our theme music was composed by Jack Hamilton, and our logo was designed by Yichi Liu. Special thanks to Data & Society Director of Research Sareeta Amrute and Director of Creative Strategy Sam Hinds, and to the editorial staff of *Public Books* for their support for this project. Thank you for listening, and I hope to see you next time.