Algorithmic Vision to Notice Differently: Entrusting Software to Protect Trees and Gun Farmers

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Abstract
This paper examines the arts of noticing from the perspective of algorithmic vision: the trained ways of learning how to see and notice with software. Instead of suggesting that software prefigures new ways of noticing, this paper features how others *learn to notice* through algorithmic vision, entrusting software as credible agents to attend to environmental loss at the expense of reproducing racialized difference.

Author Keywords
algorithms; trust; STS; ethnography; forest

CSS Concepts
• K.4.0 Computers in Society: general.

Introduction
“The texture of the tree crowns tells me how old these palm oil trees are. When the leaves gather and clump close, these palms are older than three years old. They are no longer productive,” Ila, an Indonesian remote sensing scientist senses texture with a classifier algorithm, noticing the temporal rhythm—or lack thereof—in Borneo’s plantation monoculture. Ila works for the Indonesian Space Agency where she was assigned to monitor the productivity of smallholder

Peatland: Peat is partially decayed, dead vegetation, which has accumulated over thousands of years. It is typically saturated with water and therefore almost impossible to set alight. But when peatlands are cleared and drained to make way for plantations, like they are for palm oil and pulp and paper, carbon-rich peat becomes dry and vulnerable to fires [1].

What is a smallholder? Smallholders can be contracted to a palm oil corporation or work independently. According to the Ministry of Agriculture Decree No. 98/2013, smallholder farms must be less than 25 hectares [5]. Currently, smallholders produce more than 40% of palm oil production [18]. It has been reported that smallholder work with low wages and poor working conditions [8].

farms from capital city Jakarta, "It's not easy to identify a smallholder but an algorithm helps me to see these farms differently – and see them faster." Ila's observations only make sense in the context of Indonesia's palm oil frontier, where more than 25 million people are dependent on the palm oil sector [1]. Indonesia is the world's biggest palm oil producer and is expected to increase their supply three times in the next decade [1]. As a result, Indonesia's peatlands and forests, cleared and made vulnerable to fires, are increasingly regulated by the Government of Indonesia. In the last 5 years, remote sensing scientists in the Indonesian Space Agency are tasked by the state to develop algorithms with data scientists for monitoring palm oil expansion in the outer islands, reasoning that prior state maps have been falsified by district and forestry officials involved in illegal logging networks [9].

This paper briefly examines two instances of how earth scientists view and sort images of palm oil expansion with algorithmic systems. It aims to expand the arts of noticing by foregrounding the embodied labor that goes into algorithmic or "data vision" [12], the otherwise "co-constitutive and mutually defining relation between computing and corporality" [19]:3]. In particular, I show how state-affiliated scientists assign responsibility to software in an attempt to notice forest different from prior modes of mapping nature as resource. Yet in enabling software to authorize diagnosis of forest and peatland loss, scientists have begun to problematize land clearing practices by poor and indigenous smallholder farmers as unruly and illegal. In this way, noticing also means demarcating who harms nature and inevitably distinguishes and targets the other (that which threatens nature). Instead of suggesting that software prefigures new ways of noticing, this paper features how others *learn to notice* through algorithmic vision, entrusting software as credible agents to attend to environmental loss at the expense of reproducing racialized difference.

Algorithmic Trust, Embodied Labor, and Noticing Differently

Amidst scholarly critiques of bias and discrimination in algorithmic-decision making e.g. [10],[14], the question of who makes knowledge and how it is regarded as credible becomes ever more pressing. The problem of scientific authority has always been closely bound up with the identity of the knowledge-maker. My interest in trust and authority stems from my 1-year ethnographic fieldwork with Indonesian earth and data scientists who emphasized that instead of state officials, algorithms are trustworthy agents for producing maps. They can coordinate consistency and prevent self-interested officials from producing unreliable visualizations. For historian of science Steven Shapin argues, trust is how we come to know what we encounter as truth [15]. We regulate our beliefs on the basis of our moral estimate of those upon whom we depend for our information. As Steven Shapin [16] and Shapin and Schaffer [17] show in 17th century experimental science in England, scientific experiments and the credibility of its results were inscribed in norms and ideology around gentlemen-philosophers as "reliable truth-tellers." Scientists of the mid-19th century later entrusted recording technologies with eliminating human intervention in mechanical reproductions of nature such as in photography [3]. In the data sciences, HCI scholars Samir Passi and Steven Jackson show how trustworthy data solutions are a result of collaboration and translation across domains and the perceived reputation and knowledgeability of business analysts and senior scientists over engineers in corporate data science settings [11].

The epistemic virtue of scientific objectivity and authority are perhaps most striking when embodied knowledge is fundamental to algorithmic operations. Anthropologist Mitali Thakor shows this best in how human reviewers train image detection software to produce more accurate results of abused children and police sexual exploiters [19]. Thakor argues that even if the algorithm better detects white children's faces and fails to accurately document non-white suspects, all forms of surveillance are justified through the reviewers' "pressing moral obligation" and instinctual feelings to protect innocent children while punishing sexual offenders at random [19]. This is particularly significant in relation to algorithmically-mediated monitoring systems framed as credible in protecting forest, even if its database and encompassing social and cultural context have inscribed smallholder land as "idle land" and "unproductive". As HCI scholar Anna Laura Hoffman puts, any examination of algorithms "need to be grounded in the political and cultural contexts that make specific people vulnerable or marginalized in the first place" [6]. In a similar fashion, this paper aims to innovate on noticing differently in order to ask not only of "what is and what can be" as suggested by the workshop organizers, but also "how is it and how it can be". With the project of noticing the complexities in sociotechnical assemblages in mind, I ask: What work does trust in algorithmic vision do? How much does the act of noticing differently produce alternative visions of the future? And more importantly, how does algorithmic vision distinguish difference, and with what implications?

Entrusting Algorithmic Noticing

Doubts were cast over Indonesia's forest records for decades. As geographer Jenny Goldstein notes [7], many international agencies discredit 'developing' countries' national land cover databases prior to 1999, making it difficult to set baselines for measuring forest loss. Foreign development experts argue that Indonesia's maps were not regularly updated, and even if they were, they underestimated forest loss [7]. Local scientists were resolute that the Dutch made maps of Indonesia for resource exploration; there were simply no maps to protect forests. They shared with me that since independence in 1945, the Indonesian military kept all these maps to exploit forest resources without updating them. Even if maps showed legally classified 'conservation forest', the same areas might have no tree at sight. To solve this, a scientist told me that "Indonesia's maps have to be remade from scratch".

Thus a 2011 Presidential Decree declaring a nationwide effort to remap the nation's 18, 309 islands should come as no surprise [2]. More recently, these maps are used for training monitoring systems to detect the expansion of palm oil crops in near-real time. With algorithms, scientists believe they can trust what they see from afar. Or at least Eka, an Indonesian remote sensing scientist promised me so. "Monitoring a forest burn scar tells me who set the fire. My algorithm detects illegal deforestation by correlating fire in a forest to the nearest palm oil or timber plantation." "How do you know what is a forest?" I asked. Eka replied, "Trees above 5 meters with canopy cover of more than 30% density and an area larger than 0.25 hectares is a forest," Eka recited the biophysical properties of forest defined by the UNFCCC, even if the legal status of the same area might indicate otherwise. In a newly built 'control room' with eight LCD screens aligned to face us, Eka's algorithms are put to punitive work for the Forestry Department's Law Enforcement Agency. The Agency's Directorate General touched one of the screens with his index finger, ordering drones to capture field evidence of the culprit clearing trees close to a palm oil concession. Rumors spread between mid-level officials in the room that local military commanders claimed that smallholders had deliberately set fires for palm oil corporations and had issued a shoot-on-sight order for anyone caught. Here, the algorithm is presented both as a challenge and supplement to institutional norms and trained expertise. Even as it notices forest in parameters, it also competes with legal definitions of forest land and presumably corrupted officials who were previously put in charge of making state maps.

Noticing Difference: Who is the smallholder?

Yet, policy makers and development experts have increasingly fixed their target on the so-called culprit of these fires—smallholder farmers [18]. Smallholders—mostly poor migrants and indigenous farmers—are gradually narrowed as the main drivers of forest and peatland destruction. Scientists recently concluded that inexperienced and poor indigenous farmers, when left unmonitored, convert more peat than corporations in the period between 2002 and 2016 [13]. Technical initiatives to redress this amongst others include deep learning frameworks developed between big tech companies such as Microsoft and forestry ministries to identify and police smallholder farms. It has been argued that palm oil corporations are well-equipped to manage fires on their own plantations. Smallholders, on the other hand, can only afford to clear land in illicit and cheap ways, triggering massive fires and harming forests and peatlands. Yet, there is little mention of how indigenous lands have been historically allocated for resource exploitation for centuries or how The Plantation Law of 2004 permits corporations to only allocate 20% of their concession to smallholders instead of the 80% that smallholders had farmed on for close to 40 years [5].

In a recent remote sensing talk with Ila, we listened to a Japanese remote sensing scientist identify how to surveil smallholders clearing land illegally. He declared bullishly, "I am lucky that all industrial oil palm corporations plant their trees 7 metres away from one another. This makes it so easy to filter away all smallholders in a satellite image. Their patches are so messy and disorderly!" Smallholders, to him and many others in law enforcement, are encoded through the marks of land they have been historically displaced from. In algorithmic vision, indigenous and poor farmers have no history, only ruins. Ila, perhaps already sensing my discomfort, whispered to me: "But who, exactly, is the smallholder?"

Conclusion

Scientists entrusted software with noticing differently, with varied implications on what and who is to live, prosper, and retire. Noticing through algorithmic vision not only enables asking how else it could be, but also problematizes practices without consideration for how and why forests were exploited in the first place. Algorithmic vision spares little notice for history. By learning how to notice with algorithms, my paper examines the conditions in which certain visions are guaranteed a future while others are "gunned" on sight.

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