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Robots at work

Stealing, creating and transforming labour in the digital age

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Robots are closely linked to work. The word robot has Slavic origins (робота) and refers to the labour and activity of workers. In the 1920s, author Karel Capek used this connotation in his play Rossum's Universal Robots (RUR), which takes place in a factory of artificial beings that eventually turn against their human creators.

Robots convey visions of work. They are our modern-day slaves. And their use, particularly in industry, raises questions directly linked to the cost of human labour. This question actually precedes the birth of robots as we know them. It emerged, for example, in the work of the eighteenth-century engineer Jacques Vaucanson, particularly through one of his inventions: the automatic loom. By automating human gestures and activities, these automatic looms disrupted human activity, which was now in competition with machines. This led to widespread social movements, such as the Canuts revolt in the Lyon area, or the Luddite movement. These 'machine-breaking' movements have often been described as forms of resistance to technological developments. Eric Hobsbawm describes them more as movements to defend wages (Hobsbawm, 1952).

However, it would be wrong to consider this relationship as the only one that can characterise the relations between humans and machines at work. The whole thing is a little more complex than a single competition between humans and machines. And we need to ask ourselves to what extent anthropology and its methods constitute a way of addressing these relationships. To do this, we need to ask ourselves what kinds of activities are carried out by robots today and what we can conclude from this.

In this presentation, I will address three problems raised by machines at work. These problems are interconnected but, for the sake of clarity, I will make a distinction between them. The first problem, as suggested with Vaucanson, is that robots steal work from humans. The second is that they create jobs, even new kinds of jobs. And finally, robots are transforming the way in which existing activities are carried out. To tackle these three problems, I will be using examples drawn from my own field work and will be examining objects that appear to be very diverse, but which all have in common to be robotic and computer systems that are retroactive, i.e. based on a measurement and capable of performing adaptive actions in relation to this measurement.

Job taking and its (sometime very visible) forms

The first aspect I would like to address is the way in which machines replace human activities, which is a quite old issue. Research and development in robotics and artificial intelligence is looking for instance to conceive objects that could be considered as artificial nurses. During my internship in the French company Aldebaran Robotics in 2009 I saw a few projects aiming to design humanoid robots like Romeo which is intended to carry objects, communicate with people, provide help in the kitchen or help people to get up.

Although Romeo has never been finished, many research project in robotics aim to complete tasks usually done by human workers. Today, replacing human activity is still a matter of concern in hospitals and more broadly in care centers. It raises old problems, like the social cost of technological unemployment, an issue raised for instance by John Maynard Keynes (1932), which designate the fact that technological means to replace human at work are found more quickly than the means used to keep humans at work. In today's research, robots must be able to learn how to fold laundry coming out of a washing machine, to help people in various ways, for example by bringing meals or by delivering drugs. With the social distancing related to the pandemics context, their role also consists of taking the temperature of people, or complete cleaning and disinfection tasks.

The replacement issue is also at stake in medical imagery. During a stay in a facility of the French National Institute for Computer Science and Automation in the years 2010's, I met researchers using bio-inspired means to work on the automatic detection of gray pixels that could one day be used to detect tumors. Although it was then difficult for me to believe that this day would come, I must admit that the recent evolutions of machine learning and convolutional neural networks can automatically create the categories which help determine whether a group of pixels in a picture can be related to cancer or not. Here, the computer's eye is more precise than the human's one, contributing to detect cancer at very early stages and thus contributing to save lives but not jobs so much.

The economic cuts implied by this particular approach has also been largely explored in agricultural settings. For instance, in a robotic dairy farm in which I worked with my colleague Severine Lagneaux, we saw that robotic techniques help one farmer to work alone among 160 cows. I wont describe this farm too much but I would like to highlight that the farmer choose to give the most mechanical aspects of his work to autonomous machines like unmanned ground vehicles used for instance to push the food toward the animals four times a day, or like milking robots capable of detecting the udders of a cow and to place cups on it thanks to a laser camera. In his terms, the farmer made this choice to not having the feeling to become a machine himself, thus focusing on what he considers the most interesting part of his work.

Automation is now affecting other sectors, such as production logistics. Here's a game to show us how. Since Alan Turing developed an imitation game known today as the Turing test (1950), the integration of machines into games has been a practice that has spread far and wide across the fields of artificial intelligence and robotics. Games provide a didactic framework for addressing specific problems, while at the same time giving a certain visibility to the work being carried out in these fields (Becker, 2011).

Long before artificial intelligence systems were integrated into our everyday objects, machines of all kinds were competing with the human mind (see Becker, 2012). Whether they

are computer agents capable of reaching the level of a chess player or, more recently, systems that can beat the masters of the game of Go, these machines raise a very general ontological question, leading us to redefine our representations of intelligence, but also adding a little to the metaphysics of robots and AI by leading us to imagine that one day a strange post-biological life form, a general AI capable of performing any task, could appear and even surpass us. This aspect fascinates and worries the public as much as anthropologists.

Many studies have already been carried out into the effects that robots and so-called intelligent agents have on our representations of life, of others and of the self (see Becker, 2023). But these investigations have more rarely focused on the processes that make these machines so singular, particularly when they address specific needs that constrain their design at the same time as they bring humans and machines face to face. The game situation provides an opportunity to look at these particular modes of arrangement and association. On the one hand, it shows how robots are designed to solve a set of specific problems relating to the task they have to perform. On the other hand, it allows us to describe the successive stages in the invisible work of the humans who build them.

Humans play. Robots and computers don't. They know nothing about the situation in which they are involved. These objects are nothing without the humans who create them. Like the fighting cocks studied by Clifford Geertz, they appear as metaphorical expressions of their owners. And they are at the centre of a vast network of people concerned with common problems (Geertz, 1972).

In the context of the RoboCup Logistics League (RCLL) for instance, these problems relate to the industrial contexts of production logistics, an area that is now widely covered by research into robotics and artificial intelligence. Numerous competitions have been set up, including the *DHL Robotics Challenge* and the *Amazon Pick-Up Challenge*. Because they offer the opportunity to test new solutions to problems which are analogous to those experienced by industry, games provide a good way of imagining what the future of logistics might look like. RCLL is a foresight game which vision is contained in its rules:

“Two teams share a common factory floor. Each team comprises up to three autonomous robots which can produce using seven machines. Each robot builds on the standardized Festo Robotino robot platform which can be extended individually with sensors and computing devices. The robots are cooperative in the sense that they need to communicate and to interact physically with the machines, e.g. fetching raw material from a dispenser machine or delivering intermediate products to machines that refine them. A central agent (called Referee Box) randomly generates product orders with varying configurations and delivery windows. These orders are communicated to the robot teams that need to derive a production schedule and to distribute the tasks among the team robots. Hence the RCLL posts challenges in the full range from Mobile Robotics over communication and multi-agent systems to planning and scheduling.”

Job making and its (often invisible) forms

As we have just seen, the way machines can replace human at work is also a central element of what we now call hybrid systems. Thanks to their sensing and learning capacities, these special kind of ecosystems combine relationships between human actors, sometimes animals

or plants, and a computer system capable of intervening (through mechanical actions or by sending alerts to human actors) to ensure that the whole reaches an optimal level of performance. Many of them are used to monitor activity.

This is for instance the purpose of the PAL Project, born at the INRIA where I worked for a while. One day, the director of the team came to me and exposed the guide lines of a project he and a few other teams were talking about. He was concerned by the conditions of living inside public care centers. The general idea was to monitor elders in order to prevent them to fall, assist them in their daily life or even give them the occasion to interact with social robots in order to fill the lack of real social relations. A show apartment has been constructed. Using intelligent floor, 3D cameras, actimetry systems which aim to detect pathological deviations from automatically determined behavioral profiles, communication interfaces and autonomous robotic agents capable of interacting “socially”, by detecting and manifesting basic social skills, these various elements took part in an approach consisting in adapting the environment of the persons in order to ensure the proper functioning of the monitoring system. To make it short this system’s purpose is to send alerts to distant human operators, or to send a remote controlled robot to the patients.

These alert systems are also used in robotic dairy farming for instance in the farm we have mentioned earlier, although such a system appears less potentially “intelligent” and more mechanic. Here sensors gather informations on the quality of the milk, the activity of each cow, they are used to detect signs of heat for insemination, they give the cows permission to access the milking robots or they are used to guide each cow through the circuit, for example by orienting them to the food area or to a closed space where the farmer can take care of them. The system thus send notifications and alerts to the farmer so that he can focus his attention on the most problematic animals. The farmer can program the system in order to set thresholds or to determine a particular mode of circulation for each cow. He can also control the productivity of the herd, the chemical quality of the milk, and gather precise informations about each cow. The farmer lean on his computer, getting informed by the sensors scattered throughout the barn. He is transformed into an engineer, whose programming activity aims to maintain the routine activity of the animals by encouraging their motivation to use the milking robot while circulating in the barn. Implementing such digital layer to the existing environment have a heavy cost which involve also a deep transformation of the architecture of the building itself. But the reconfiguration does not only concern the material aspects of the work environment. These systems also imply new arrangements between humans, animals and machines in order to achieve an optimized level of performance.

These systems raise a question. Are we all going to become engineers capable of supervising electronic and AI based systems? Is that the kind of new occupation that robotics promises to us all? Are we all going to become some sort of prompt engineers controlling AI systems powered by Large Language Models? Of course not. Robotics and artificial intelligence need unskilled workers perhaps even more than engineers. There are at least two reasons for this. The first is that robots need materials to be built. The second is that they need humans to learn. And both of these activities fall into job categories that are invisible and, at best, precarious.

The first set of activities I'm thinking of relates to extraction and mining. Mining is not exactly a new type of activity that has been made possible by robotics. But the growing

demand for electronic components has had a considerable impact on this particular sector of activity. Robotics is not the only sector responsible for the considerable growth in demand for materials used in the manufacture of electronic devices. These devices are extremely diverse (wind turbines, batteries, drones, cars, etc.) and their development has a direct impact on the environment. The physicist José Halloy shows that the explosion in demand for electronic devices, combined with the short lifespan of these devices, will lead to such an exploitation of resources (to which must be added the considerable energy required to produce them) that lifestyles dependent on electronic systems are doomed to disappear. This explosion in demand for components implies a radical increase in the means of extraction (Halloy, 2021). Given the geographical location of the resources, these means often involve degraded working conditions relying on unskilled or low-skilled labour in safety conditions that are subject to few regulations if any (Panella & De Putter, 2022). Designing robots for work means having to rely on human labour, of course, but also on invisible labour.

The second set of activities is linked to annotation and what Antonio Casilli called the “click workers” (Casilli, 2025). We usually don't think about it, but for a so-called intelligent system to be able to classify the information it receives, it needs to be helped, for example, by showing it that such and such an object must be associated with such and such a category. Systems can hardly learn on their own. Their world has to be organised into a set of labels that are sufficient to ensure that they function properly. The result is a simplification of the perceptible world that sometimes leads to bias and errors. This annotation work is long and tedious. It is rarely carried out by the people who design these systems, who prefer ready-to-use datasets that are sold or made available for free, depending on the funds they have to devote to it. Annotation has become a genuine business, enabling datasets to be created and allowing artificial intelligence systems to train on already categorised labels. This digital labour economy is taking shape mainly in developing countries such as India and Madagascar, where it is invisibilized.

Job changing and its (somehow experimental) forms

But robots and AI systems are not only meant to free the human of work with all the disastrous consequences and the issues that such an idea is raising. They also constitute new tools in already existing activities. They lead to new kind of mediations (Tisseron & Tordo, 2017), some would say to new hopes.

Since a few years in France this topic is emerging and it can be related first to human-machine interaction, artificial empathy and affective computing. While robotics experimented emotional machines for a long time, trying to take human-robot interactions on an emotional level and thus contributing to transform the relations we have with our objects, researchers also tried to find concrete application for their inventions. Care centers, hospitals became privileged domains of investigations in human-robot communication.

Paro is a well-known example. A Japanese robot that looks like a baby seal, this strange object establishes a particular form of communication with its user that is similar to the one we have with our pets (Bateson, 1972). Paro robots are now finding a place in retirement homes, and as an experimental device, they are used as a mediation tool with people suffering from Alzheimer's disease. While it is still difficult to assess their effects precisely, some recent work shows that the Paro robot contributes to decrease the feelings of anxiety

and loneliness of patients. Many research projects are being carried out on gerontechnology. Given the demographic trends in industrialized countries, the opportunities offered by what is now known as the silver economy are substantial and the investments potentially colossal.

Other research confirms this tendency to reduce anxiety. For example, the study conducted with the remotely controlled teddy bear Huggable and children hospitalized in the surgery and oncology services of the Massachusetts General Hospital showed that they were more likely to engage emotionally with a zoomorphic robot, illustrating the potential of social robots to provide support in mediated pediatric care situations (Jeong et al., 2015). In France, robotic mediation is receiving an increasing attention among psychologists, which is principally motivated by a desire for caregivers to not leave the initiative to mere engineers in term of care protocols (Wright, 2018; Lafont, 2021).

These machines' purpose is not to replace humans by automatizing their ability to take care of people. Their purpose is rather to be inserted in an already existing framework for therapy by mediating the presence of the therapist (in the case of Huggable for instance) or by relying on automatic sensing. Paro for example can react to many stimuli from the human, by producing sounds, by showing signs of interests to what's happening around it, or by leaning on basic learning capacities related to the information sent by its sensors. It is an object with agency on which the therapist can lean. It can be inserted in care situations to support the work of the therapist. This particular use of so-called intelligent machines shows that they are not necessarily intended to replace human work. They can also accompany it, thus constituting new tools for the therapeutic relationship. These machines consist of peripheral objects that find a place in larger settings directly involving humans in a shared space, and they result in an augmentation of the available tools that therapists can use in their daily work.

These highly experimental objects are potential new forms of technical intervention in the field of care, in that they are tools that can be used by therapists, not to treat, but to soothe, to relax and, consequently, to have effects on certain aspects of the lives of people who are suffering that drugs cannot have. These objects remind us of other mediation situations well known to anthropologists in a wide variety of contexts.

Conclusion

In this presentation, I have tried to show that the relationship between robots and humans at work cannot be reduced to competition alone, and that the theme of replacement is a misrepresentation of the complexity of the relationships we have with these technical objects.

Robots don't just steal work from humans. Sometimes they create new forms of activity by reinforcing certain management and programming activities in existing jobs, by relying on old jobs to maintain themselves or by creating completely new jobs characterised by a high degree of precarity. Finally, I have tried to show that the use of robots and other intelligent systems can also be integrated into existing activities, where they are potentially interesting new tools for human workers.

These different approaches convey visions that are sometimes complementary, sometimes opposing, leading us to ask ourselves questions about the meaning we give to our activities, perhaps as much as about the ways in which they are carried out. Why do we work? What do

we work for? This question ties in with what Knut Rio was saying earlier when he emphasized that work, in contrast to labour, is a powerful producer of worlds. And it is perhaps in this respect that anthropology is the best placed discipline to show this.

The work of anthropologists shows us how human societies are concerned to use their techniques to help life develop and maintain itself. Many rites are manifestations of the involvement and responsibility of human societies to reproduce not only their customs but also the substrate in which they develop. The Mnong Gar society studied by Georges Condominas, for example, maintains a relationship of this kind with its environment. Work is not simply about subsistence. It essentially aims to reproduce life and its processes as a whole in a long-term perspective: how work makes it possible to maintain not only technical practices and tradition but also the very possibility of living (Condominas, 1982).

Soon enough, robotics will have to take a radical shift. As José Halloy tells us resources to produce robots are vanishing and in a century or two it could no longer be possible to produce any machine. Robotics needs new visions. One of them is perhaps to reconnect with the way in which in the past (and still in some societies) our technical objects enabled us to weave coproductive links between ourselves and with the world.

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