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Robotization of Work as Presented in Popular Culture, Media and Social Sciences (part two)

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Robotization of Work as Presented in Popular Culture, Media and Social Sciences (part two)

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This text is a continuation of the project Robotization of Work as Presented in Popular Culture, Media and Social Sciences. It is chapter five of a work that contains seven chapters (see below). Chapters 1-4 were presented in GRI-report 2018:1.

Contents

5. Robotization in the media: 2014-2017

A spectre is haunting the planet—a spectre of robotization…

Like robots themselves, the fears (and hopes) related to their entrance in workplaces started long before 2014. Louis Anslow (2016) helped us a lot summarizing what media said about robotization of work since 1920.[1]

In 1921, *The New York Times (NYT)* published a book review with the title "Will machines devour man?" and a picture of a person being fed into a sausage grinder. On 26 February 1928 *NYT* published an article "March of the machine makes idle hands. Prevalence of unemployment with greatly increased industrial output points to the influence of labor-saving devices as an underlying cause."

When Albert Einstein gave a speech in Berlin in August 1930 at the opening of the Seventh German Radio and Audio Show, he "laid the world ills to machine". John Maynard Keynes shared his opinion, saying in the same year that "We are being afflicted with a new disease, 'technological unemployment.'"

By 1939 everybody was using the term, though, in Anslow's opinion, the employment was steadily rising. Thus, Henry Ford tried to defend the machines in the *NYT*'s World's Fair edition, writing a piece titled "Machines as ministers to men", and predicting that machines will create more jobs than they will take away.

A year later, the President of MIT and President Franklin D. Roosevelt quarreled over the issue: the former did not see any problem, but the latter did. Also in 1940, a US senator proposed a tax on machines, just as Bill Gates did 77 years later.

The Pulitzer Prize winner for 1949, Hal Boyle, wrote an article called "Machines are laughing at men" (as we shall see later, the journalists were, and are, most threatened by robots).

Then President Dwight Eisenhower called the popular fears of automation groundless in 1955. Yet the *NYT* reported in 1956 that "Automation in Britain stirs unrest in labor" A year later, the newspaper published a balanced piece called "Promise and peril of automation".

When John F. Kennedy was elected in 1960, there were immediately appeals to him to solve the problem of technological unemployment. In 1961, the *NYT* ran an article that began: "The rise in unemployment has raised some new alarms around an old scare word: automation." What happened after that deserved a name of an escalating hysteria, according to Anslow. It prompted Peter Drucker to write an article in 1965 titled "Automation is not a villain".

[1] Though the title of his text speaks of "more than 200 years", based on some commentary by Luddites from 1811. But it did start in the 1920s, together with Čapek.

There was a quiet decade or so, but at the end of the 1970s, emerged a threat of computer chips. By the 1980s, the computer fear cycle was in full swing. The *NYT* warned in 1980: "A robot is after your job". Later, however, the topic of the threat of automation seemed to disappear from the media. Yet after the dot-com crash, positive attitudes towards technology crashed, too. And now, Anslow concluded, with the promise of self-driving cars and consumers facing accumulating AI applications, "the fear of automation is once again at a fever pitch".

As we see in the analysis that follows, even now the picture is more complex than that. But before we start, we need to report that the review of news, blogs and articles in popular media (175 of them) revealed a certain repetitiveness. This is due to the fact that media in other languages often refer to English texts (even when speaking of Japanese roboticists), and that they quote the same reports and the same scientific books that we review in parts two and three (in case of scientific books, the journalists quite often interview the authors, who are invited to give a short version of their works). Additionally, practically each of the articles or news we are quoting can be found in numerous other versions in the same language and in other languages. The media do what they are supposed to do – that is, they mediate.

In the analysis, we will mostly use the same categories that we derived from reviewing the works of science fiction, though some of them are missing, some became slightly reformulated, and some other added. The most important addition is the category "It is more complicated..." containing media voices that put together negative and positive effects of robotization in some kind of balance.

Obviously, our classification is subjective. Yet if we asked a robot for help, at present it could only count the number of words used, which is not exactly our objective. Thus, it is a discourse analysis more in a Foucaldian spirit, then in the technical DA meaning.

To make reading easier, we shall only use numbers of sources quoted (the complete list is to be found in the Appendix). We present categories in order of the decreasing number of instances a given topic has been mentioned, and set the new category "It is all more complicated" last.

5.1. What robots can do to people: Good

Perform all "dirty, dull and dangerous" jobs (30 instances)

In their latest book, *Machine, Platform, Crowd* (2017) MacAfee and Brynjolfsson added a fourth D: "dear" jobs. But just like the alliteration itself, the idea seems rather forced and was mentioned only once (158).

The media agree on all three "Ds", but the first one, that is, robots that do cleaning, is treated as the most obvious. The use of domestic robots is growing

(13, 21, 78, 97). The readers are informed that the 36 Eye "costs a lot, it isn't perfect and it certainly isn't a must-buy for everyone. But it is the best robot vacuum right now." But robots can also do sewer reconnaissance (147).

As to dull jobs, there are of course varying ideas as to which jobs are dull, but there is a general opinion that robots doing those will make people's lives easier (42) and less monotone (20, 67, 78, 92, 97). There is also a list of "13 things Apple should automate after driverless cars", which contains all boring everyday activities, including tooth brushing (153).

While milking and livestock farming seem to be unproblematic (13, 59), a relatively new area of "dull jobs" is cooking, or at least "simple cooking". "Sally" at Casabots in Stanford makes salads, but the owners look for a celebrity chef to come with new recipes (113). There is also talk about robot butlers (118). Microrobots can also perform simple medical tasks, like scraping plaque from arteries (46, 147).

The most discussed among "dull" jobs is journalism, or at least some part of it. According to Associated Press, robots "will free journalists to do more journalism and less data processing" (11). Robots make less factual errors, but are unable to make analysis (36). They can also "inform the readers about events that journalists never should bother about", like some local information and events (40).

Dangerous jobs are many (4, 12, 13, 74, 112, 115, 119, 147, 154). Humanoid robots are already working in disaster areas (4). The Da Vinci system sends robot surgeons to the frontline (12). Robots can do mine clearance (13). DARPA, Defence Advanced Research Project Agency, which will be mentioned here many times, organized Robotics Challenge, a world competition for robots that can work in disaster areas (natural or caused by people, 39). In 2015, the winner was the South Korean DRC-Hubo, which was prepared to act in situations like the one caused by Fukushima disaster (41). In 2017, the Australian roboticist Rodney Brooks actually visited Fukushima, to which his iRobot sent earlier six robots to help cleaning the effects of reactor's explosion (154).

The Italian competitor, Walk-man, lost the competition, and was degraded to doing dull jobs (55). The work on robots able to work in hazardous areas continue: Honda built an Asimo (74), and South Korean Hankook Mirae Technology comes with still new Methods (119).

Dangers come not only from objects: Duke University School of Nursing came up with Trina, Tele-Robotic Intelligent Nursing Assistant, which helps to limit contacts with infectious diseases (115). In general, there is an agreement that robots should do dangerous jobs. An US survey revealed that, though many opinions were split between the two parties, 85 percent of surveyed persons were of the opinion that automation should be limited to dangerous jobs only (159).

Offer companionship, sympathy and care (18 instances)

We expected mostly negative opinions concerning the possibility of interpersonal relations between robots and people, but we were wrong. Apparently, says Sherry Turkle from MIT (who is not pleased with it at all), "Child schema and animal button eyes… trigger an anthropomorphic reflex. (...) We perceive the machine as a creature, although we know it is only a machine. If she then shows interest in us, the Darwinian buttons are pressed"(2). It seems, indeed, that US soldiers develop emotional relationships with military robots (164).

So, there are human-like toys for autistic children, and robo-pets for all children (14). Little Fish, produced by Baidu (Chinese competitor of Google) helps children to maintain contact with parents who work far away (117). ASIMO (Asimov gives inspiration to many robots), which is short, so as not to frighten the children, lectures them on the value of mathematics (74). iCubs, produced by Istituto Italiano di Tecnologia in Genua will grow, from a child to an adult, together with their (future) owners (21).

A big area of use for robots is health care and care for elderly. There is an "animatronic nurse" (12), a Justocat, which is a therapy cat (47), and Charlie from University La Trobe, Melbourne, which helps to care for elderly, but is not meant for children (96, 112).

Sweden and Japan are two countries facing aging population and not enough care personnel, so both countries are interested in care robots (63). Yet the Swedish elderly are not fond of humanoid robots, so there is a Giraffe plus, which provides information about old people living alone (57), and cats playing with dementia patients (76). Cardiff Lab works with robots that are to care for the elderly, but also work as "a butler in the house", controlled via internet (46).

In fact, there are several robots in development that are supposed to keep healthy adults company. There is a "social robot" Jibo, developed by MIT's Cynthia Breazeal (10) and Sony's Aibo dog (88). The famous SoftBank's Pepper (operated by AI Watson, the one that won chess tournament with a human), which is "intended to make people happy" has been introduced to UK in 2016 (88). The prediction is that it will be in Swedish households by 2026 (116).

And then there are sexbots. Turkle again: "We may actually prefer the kinship of machines to relationship with real people and animals." After all, the owner of RealDoll admits that he "doesn't really like to be around people" (65).

Create jobs (16 instances)

A completely optimistic tone dominates those media that predict that robotization will create many new jobs, or point out that many jobs are impossible to automate. Moravec's paradox is often quoted: "it is comparatively easy to make computers exhibit adult level performance on intelligence tests or playing checkers, and difficult or impossible to give them the skills of a one-year-old when it comes to perception and mobility" (56). Robots cannot acquire tacit knowledge (27, 54). According to researchers from Centre for European Economic Research in Mannheim claim that only nine percent of jobs are automatable (95).

Thus, what is to be expected is a rapid growth in demand for high-skill tasks involving regular interaction with ITC, and a rise in lower-paid work that is hard to automate, from caring to hospitality (1, 27). This observation leads to another prediction, that of polarization of jobs. One answer to this is that such polarization is a US phenomenon, which becomes unjustly generalized; in general, it will be as usual – some jobs will vanish, some will appear (85). One should be used to that by now, after 200 years of producing worries about automation (144). As Stephen Watt from the University of Waterloo in Canada expressed it: "... this has been happening for decades, if not centuries, and it will continue for decades and centuries" (95).

Which jobs will be created? Nobody knows; after all, in 1900s they were unable to predict the arrival of software and mobile devices (90, 143). In opinion of frequently quoted David Autor, MIT, "just because we can't predict what we'll be doing, doesn't mean we'll be doing nothing" (143).

Besides, polarization could have been caused not by automation, but by outsourcing (90). For example, robotization helped Bicycle Corporation of America to stop outsourcing to China, and created 140 new jobs (129). USA should stop outsourcing, but also start constructing their own robots, not import them from China (130, 137). It is to be expected that, as robots become cheaper, more entrepreneurs will use them, and expand their production. For this to be achieved, USA must beat China in robot production (142).

Although polarization, outsourcing and competition with China can be seen as mostly US problems, similar developments take place in other countries. SKF opened in Gothenburg a fully automated factory, and plans to do it in other countries. "But this means that outsourced production can come back, and that highly competent human personnel is needed" (141).

In general, "as machines take jobs, companies need to get creative about making new ones", says a faculty member of Singularity University (148), Silicon Valley thinktank founded by, among others, Ray Kurzweil, who launched the Singularity concept (of which more later).

Perform complex tasks as well or better than people (15 instances)

The robots will be "reaching deep into previously protected areas of professional work like translation, medical diagnostics, the law, accountancy, even surgery" (1). And they will do these jobs "not necessarily the same way people do, i.e. by imitating them. Professions like health care, law, education, audit, tax, consulting, journalism, architecture and divinity[2] transform in ways opening the doors for robots, and making them welcome" (108). Robots will learn to create not by imitating humans, but by learning from creative works[3] (114). At any rate, they

[2] Apparently, Vatican has approved an app called "Confession" (108).

[3] Again, allegedly a Russian robot wrote a new version of *Anna Karenina* titled *True Love*.

will easily produce fact books and encyclopaedias (121).

Robots are very good at big data processing (67), and because of that they are able to make cancer diagnoses at early stages (114). Ginni Rometty from IBM claimed that a robot operated by AI Watson would soon be "the best oncologist in the world" (96, 125). Brynjolfsson admitted being wrong about "three human skills" (complex perception and manipulation, creative intelligence and social intelligence) – robots are very good at pattern recognition in big data (95). Not only they can diagnose, but also assist surgeons, whose arms age quicker than their brains (12, 13).

In contrast to critics concerned with the fate of professionals (which we will list later), many of the more optimistic voices point out that robotization will help democracy. Public tenders will be truly objective (96). Hassabis, the founder of DeepMind company pointed out that automated financial advice would be affordable to anyone (114, 96), and McAfee agreed (138), adding that the same could be said of basic healthcare.

Somewhat unexpectedly, many people believe that robots can be better bosses than people (173). The Star Wars' enthusiasts pointed out that, at present, real robots can do everything that movie's robots do (175).

The next category is quite close to the present one; the stress is, however, not on complexity, but on speed and efficiency.

Work faster and more efficient; learn new skills quicker (15 instances)

Because of these capacities, the use of robots is especially visible in four areas (three fourth of industrial robots work there): computer and electronic goods, home appliances and components, transportation equipment and machinery (87). Among those, only home use is relatively new. At any rate, competition, especially from Asia, requires robotization (59). Also, the changes in transportation will make city life easier and more fun by 2030 (110), while production will be safer, as robots are more careful and avoid accidents (169).

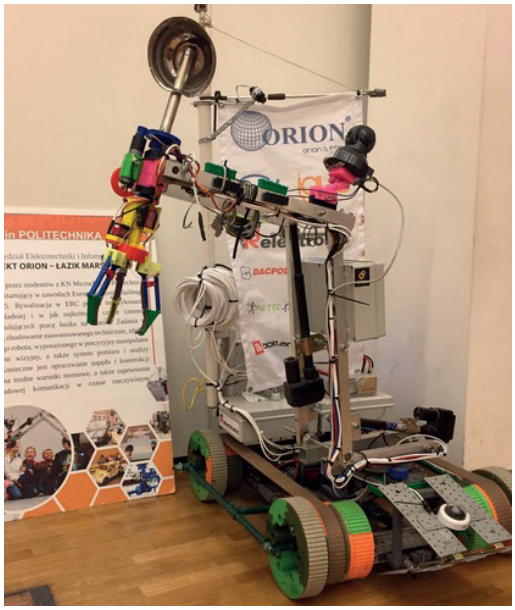
The work of perfecting robots in this aspect continues. Robot Baxter, created by the Australian roboticist Rodney Brooks who now works at MIT, learns physical movement by imitation (2). There are trials of organic robots, who have flexible actuators (the units that provide movement) and can learn many types of movement (101). Robotization mean that knowledge can be truly distributed, according to Gill A. Pratt from DARPA (54). Robots will be also capable of "fluid intelligence" (139).

Specialized robots continue to be produced. Hadrian (from Fastbricks Robotics) builds houses from 3D templates, which means that housing may become affordable to anyone (125). Robot Panda won German Future Prize in 2017. It can be used by anybody, it is "safe, has exceptionally fine motor skills and is designed to collaborate with humans" (166). "Robot doctor" in China passed the qualifying exam getting 456 points out of 600 (a pass requires 360). Still, it is only meant to help human doctors (165).

Such comforting comments are typical when presenting robots entering high skills jobs. Journalism is typical here. Narrative Science analyzes financial data, but only from mathematical perspective (19). German company Aexea uses "robotic journalism" as it means less factual mistakes (43). Chinese robot reporter Xiao Nan writes a story in a second, but "robots will be able to act as a supplement, helping newspapers and related media as well as editors and reporters" (126). And, finally, robots cook, but only according to received recipes, which they can also present to human cooks (37).

Perform jobs that are impossible for human bodies (11 instances)

Probably the least questionable is the idea that robots can do things that human bodies cannot – for varying reasons. The most obvious job is that of exploring other planets, for which there are great many robots produced in many countries, known as Mars Exploration Rovers (70, 112). Drone robots have many uses in construction industry. They are "useful in repairing inaccessible damaged regions of the home or other structure" (14), and, as mentioned before, can print out a 3D house (145). Q-bots are mapping old houses (18). In general, they are useful high up in the air (they can deliver packages, 132), and deep in the water (underwater robots clean shipwrecks in Sweden).



Mars Exploration Rover made in Poland, at Technical University in Lublin. (Foto: Barbara Czarniawska)

Robots can also do things that are possible for human bodies in principle, but not always in practice. They can function as external skeletons, and as sophisticated protheses (56). Also, they do not tire (59); thus Margaret Atwood came with an idea, realized afterwards, of LongPen – a robotic arm for remote book signings (18). They can also simulate human bodies, and not only human – there are robot-plants and robot-animals that permit unique studies of the species (66).

It is also in this context that Moravec's paradox, or at least the first part of it, is evoked: tasks that are tough for humans … are easy for robots" (56).

Free people from (boring, low-paid) work (11 instances)

This issue is more problematic, as much depends on the way the expression "free from work" is interpreted. In the positive way, it sounds like "In the day after tomorrow...", in Arthur C. Clarke's *The World of 2001*. Dutch historian Rutger

Bregman propagates a "utopia for realists": "I believe in a future where jobs are for robots and life is for people" (144). Historical parallels are several: Eric Brynjolfsson imagined "digital Athens", in which people will do important jobs. The economist Jeremy Rifkin spoke of a new Marx-like utopia of "collaborative commons"[4] (16).

Several generally positive views on this matter end with a "but": only if there is a basic income (83), only if universities will offer education "of an intrinsic value", which will teach students how to learn (95), only if governments "overhaul education systems to help a nation's people to race with the machines, instead of against them" (McAfee, 138).

While quite a few voices agree that the basic income is needed, some raise a next "but": but where from will money for paying the basic income come? (8). From being on social media, say some (53), but Gill A. Pratt from DARPA gave a more detailed answer: everybody will have their own robot or robots, and people will make money selling their preferences (53).

Protect and defend people (10 instances)

Such uses are to be found in the army, police, fire services and security (112, 132). The Pentagon spoke of "conversion of the US military into an army consisting to a large extent of robots, including fighting ones" (2). Some of them are dog-like, like in Stephenson's *Snow Crash* (2). Boston Dynamics came up with a robot called Big Dog (121). Like in Stephenson's *Seveneves*, there are also swarming drones in the US military, and an autonomous drone Perdix, developed at MIT (121). But Pentagon came also with Lethal Autonomous Weapon Systems, which caused protests from scientists; Pentagon defended it saying that "robots are not cruel" (51).

There is a first robot police officer in Dubai (149, 150), but when Dallas police used a bomb-disposal robot, the legal experts were worried that it will create a grey area of use of deadly force as a means of law enforcement. Police chief answered: "We saw no other option" (93).

Robots hold great promise for security services, as they master face recognition, which they can remember, but also body shape recognition (112, 118, 121, 125, 132).

Solve the world's problems, as people aren't able to do it themselves

The most optimistic voices claim that robots will be able "to solve all our problems, famine, illnesses, homelessness, global warming" (112). This is the opinion of Demis Hassabis, previously Google's employee, now the founder of its main competitor DeepMind. DeepMind's motto is "Solve intelligence, use it to make the world a better place" (125).

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[4] It needs to be added that the NYRoB reviewer, Sue Halperns, saw his view as "illusory and misleading" (16).

A Swede working now in the USA in Future of Life Institute, Max Tegmark, asked provocatively, what is wrong with being controlled by a superior intelligence? To think so is a sign of "coalchauvinism" (171).

In the meantime, New Zealand claimed to have constructed its first robot politician, Sam. Unlike a human politician, Sam is able to listen to everybody and make impartial decisions (172).

All in all, the positive voices about robots are more numerous than the negative ones (130 versus 89; the number does not add to 175, because some articles or blogs contain both opinions). Yet the negative voices are quite many.

5.2. What robots can do to people: Bad

Deprive people of jobs (32 instances)

This is, of course, the most typical negative message. It can take a shape of a general dystopic prediction, more detailed predictions, and the list of jobs most threatened.

In the first subcategory, "Be afraid!" is the message: the march of the machines is eating into our jobs, pay rises and children's prospects (1). The transition is fast, and therefore shocking. The "recovery, reemployment, reskilling, retraining" do not happen fast enough, according to McAfee (3). And it needs to be remembered, that "work is not just a means for distributing purchasing power. It is also among the most important sources of identity and purpose in individuals' lives" (105). Carl Benedict Frey, a Swedish researcher working at Oxford, is quite sure that "AI will butcher the job market" (though Sweden may prove somewhat more resilient, 168). And even before it happens, both threat and reality "are having adverse effects on physical health and mental wellbeing across a range of occupations". The transition will be "dramatic and painful" (160). Among other events, Brexit will trigger a "robot revolution" (120).

More specifically, robots could replace 80 percent of jobs – low skill, low wage, but also middle skill, middle wage in USA (5). Moshe Verdi from Rice University predicted that there will be 50 percent unemployment if politicians do nothing (73). In China, FoxConn, the world's tenth largest employer has already replaced 60,000 workers with robots (125). Amazon supermarkets operate with three humans only (a news denied by Amazon, 131). The Future of Humanity Institute at Oxford asked 352 experts, and they were convinced that all jobs will be automated in 120 years (152). As for now, Forrester Market Research predicted that by 2021, six percent of all jobs in the USA will be automated, especially transportation, logistics, customer service and consumer services: call centers, taxi drivers and truckers (104).

Great many voices are concerned with the future of specific occupations and professions. There is a pessimistic reading of polarization: jobs in the middle

will vanish, the top and low jobs will grow (34). Not only middle jobs, but also middle class will vanish (118). Polarization will concern not only people, but also countries. It should be obvious that "it is better to own a robot than to work with a robot", said the UBS economist Lutfey Siddiqui (72).

As to specific occupations, cooks are among those who should fear for robots (2, 4), as robots already make pizzas (113). Call centers' personnel will vanish (96, 104), but so will lawyers (2, 4, 61, 92, 95). Traders and brokers will not be needed (29, 95), but this may create a favorable position for those who can afford a robot (81). Jeffrey Sachs and other researchers predicted that even programming will suffer from stagnation as a consequence of an economic boom ("The robots are coming for your paycheck", 24). Doctors and nurses will be replaced (2, 4, 61, 92). Scientists and university lecturers will share their fate (61, 92); in general, the definitions of "creative" and "routine" jobs will have to change (95). Add to this the fact that the new generation of bosses is very positive towards automation (31), and then it is easy to believe Martin Ford who said in his *The Rise of Robots,* "no job is safe".

Special attention has been paid to journalism (4, 36, 43, 45). Narrative Science (36, 45) has been joined by Wordsmith, which can produce number-based news about finance, sport and weather (45). Journalists will end up like Chaplin in *Modern Times* (43) unless they mobilize their last defenses: wit and surrealism (38). On the other hand, entertainers will be replaced by robots, too (61).

What to do? The US commentators think that one should remember what Abraham Lincoln said: "As our case is new, so we must think anew, and act anew" (5). Still, it could be "a difficult transition rather than a sharp break with the history", according to James Bessen, an economist at the Boston University School of Law. People are afraid of self-driving cars like they were afraid of cars replacing horses. But "companies and governments will need to make it easier for workers to acquire new skills and switch jobs as needed" (90).

Yet, dramatic as it sounds, job deprivation is not the worst things robots can do to people.

Take over the world (23 instances)

Stephen Hawking and others depicted a future world in which robots are "outsmarting financial markets, out-inventing human researchers, out-manipulating human leaders, and developing weapons we cannot even understand" (7, 17). There could arise "distributed autonomous corporations" with no human owners, running the market (28).

Boström was speaking of superintelligence (8, 84, 112), but in a later interview suggested that they will be many: Multipolar Outcomes fighting for advantage (52). But it is Ray Kurzweil's notion of "Singularity" (16) that is dominating the comments. According to Yuval Noah Harari, the Israeli historian (*Homo Deus: A Brief History of Tomorrow*), it will be an intelligence decoupled from consciousness (30). According to Kurzweil himself, people need to develop

their intelligence to keep up (112). The DeepMind group started an AI Safety Group to foresee and defend people from Singularity-like AI. But Elon Musk does not trust them and said they were the only ones who he was afraid of (125); AI should be regulated (15, 17). In the meantime, the SoftBank's CEO claims they work for achieving Singularity (162).

What is actually happening? "A robot has passed a self-awareness test. Next step world domination" (49). There are attempts at robotic brain emulation, pointed out Robin Hansson, the author of *The Age of Em* (111). And while Sophia the robot was granted citizenship by the Kingdom of Saudi Arabia, a professor from UNSW-Canberra raised "three concerns", the most serious of which was the right to reproduce: the robots "can easily exceed the human population of a nation" (161). Also, it has been suggested that robots can acquire consciousness without people knowing it, especially as people do not really know what consciousness is (75).

If this sounds like science fiction, it needed to be pointed out that some commentators believe the world is on its way to the situation presented in *Avengers: Age of Ultron* (32), and that Asimov's laws are obsolete in the face of Singularity (124), much as his dystopian predictions all come through (135). *Die Welt* took a humorous approach: "It will be a wonderful world: credible, safe, beautiful, intelligent and delicious. At least for the machines" (71). And machines that think and feel will not have much respect for humans (77).

There are also predictions of humans exploiting superintelligence: the most likely scenario is that "robots will indeed subjugate the mass of the population, but at the behest of a narrow elite of human masters" – robots will kill democracy (91). So, "let normal people beware of AI researchers" (77).

Cause damage by faulty performance (9 instances)

As we have shown earlier on, great many commentators praise robots' skills and capabilities. How about making errors, though? Robots can cause an atomic war attack by wrongly reading important signals (8), or by misunderstanding a command (136). The usual question in this context is about responsibility (6, 10, 33, 35). Who is responsible when a self-driving car causes an accident (6)? If a surgeon assistant makes a mistake (12)? If there is an accident caused by following a GPS or, like it happened in flight accidents, by leaving controls to the autopilot (22)? Another often quoted incident is that of a security robot at Stanford Shopping Center in Palo Alto that ran over and injured a toddler (98).

Make people lose some of their capacities (7 instances)

It could also happen that people will trust robots too much, and will become less attentive (examples of incidents caused by GPS or autopilots are quoted again, 69, 112). When it worsens, people will lose, for instance, navigation skills (22, 26, 135), which will lead to a "human impotence" (135) or even dementia (22).

At work, people may start imitating robots in order to keep their jobs (103).

And according to Sherry Turkle, children's relationships with smart toys will crowd out those with friends and family (167). These developments, like the ones described next, were not present in popular culture works that we analyzed.

Interfere with what people are doing (7 instances)

At the extreme, there can be a "robot smog": other people's machines will invade personal space (1). While this might be happening in the distant future, San Francisco has already restricted the use of delivery robots (they have to produce warning noises, have headlights etc.), which were found to interfere with pedestrians (151). Also, robots observing people will mean that there will be even less privacy, as the surveillance cameras at least remain in one place (10).

Quite a few media mention "creepiness", quoting examples of intrusive robotic products (16). This problem intensifies in many countries whose population is visibly aging. Swedish patients and nurses do not want robots, but there are severe personnel shortages (47), so that robots are practically forced on the elderly (25). The Australian commentary ended with a conclusion that robots interfering with what people do are creepy, but it also contained a picture of a robotic Santa Claus with a robotic reindeer... (125).

Commit criminal acts (5 instances)

They can do it either when they are owned by people with evil intentions (136), or when hijacked by the hackers, even for fun (10, 16). Indeed, dangers lies not with Singularity, but human criminals taking over the markets, the military, etc. (35). There was a suggestion that online bots conned Brexit voters (91).

Kill or damage people in fights among groups of people (4 instances)

As Pentagon works on developing robots that can choose and eliminate their own targets, UN and Human Rights Watch wants to forbid it (7), arguing that such robots can kill people under the pretense of "defense" (9). Thus the 123 nations participating in the 2016 Convention on Certain Conventional Weapons voted to look at the possibility of banning autonomous robots that can select targets without human control (125). In the meantime, it has become known that North Korea's Hwasong-15 can reach USA (170).

Surpass their programming and do strange things (2 instances)

Apparently, a robot escaped from the Russian company "Promobot" (89, 125). It "died" on the street when its battery died (89). It has been suggested, though, that the designers left the doors open twice, hoping to produce a PR coup (125). Google Translator, however, "came out with a new way of learning – all on its own" (125).

5.3. What people can do to robots: Good

Give them (consciousness) human traits and privileges (16 instances)

Consciousness may appear by itself. Robots should acquire all human rights, including voting (112). It is unclear whether Sophia has consciousness, but she has become a citizen of Saudi Arabia, and her example led some to believe that, in order to help people, robots must have, like her, "mobility, dexterity, and autonomous perception" (162). Less dramatic solutions are being proposed by EU, which ordered a draft of an "electronic personhood", to ensure rights and responsibilities of robots, analogous to corporate personhood (123). Luciano Floridi suggested that it should be based on the Roman law for slaves (134).

LSE researchers took up less known Stanley Milgram's research[5] on "cyranoids": chatbots speaking through humans. But "if a machine can mimic physical and behavioural dimensions of us, then why wouldn't we call that human?" (50).

The most common suggestion is, however, that of instilling moral values in robots, making them "moral machines" (8, 9, 48, 58, 80, 82, 106, 161). One could first make an ethical evaluation of every kind of robot being produced (25). British Standards Institution produced official guidelines relating to robots. "It should be possible to find out who is responsible for robot and its behavior" (106). Then, one could start with programming in Asimov's three laws of robotics (it has been pointed out that Asimov's story from 1942 takes place in 2015), and then teach robots ethical decision-making (48). But the Asimov's laws do not seem to be enough, and there are several research places, like UWE in Bristol, that are working on a new, adequate ethical code (80). Engineering and Physical Sciences Research Council (EPRSC) produced five Principles of Robotics (82). The Future of Life Institute came up with 23 principles known as Asilomar AI Principles (161).

More practice-oriented suggestions are to teach robots to differentiate between "right" and "wrong" orders (felicity conditions), but also trust their human collaborators (136). It amounts simply to teaching robots to collaborate and assist humans at work (107).

Make them unthreatening (remove "uncanniness") (8 instances)

EPRSC's fourth Principle of Robotics says that robots "should not be designed in a deceptive way to exploit vulnerable users; instead their machine nature should be transparent" (82); an opinion many agree with (80, 81). The ways of achieving it are varied. Some think that uncanniness can be removed by simply giving robots a smile and gentle features (112). Others think that robots should be

[5] The US social psychologist Stanley Miligram was famous (infamous, to some) for his experiments on obedience (https://en.wikipedia.org/wiki/Stanley_Miligram, accessed 2018-09-03).

humanoid but not too realistic (23), perhaps like children's robot Cozmo (167). Swedish researchers collected popular culture stories about "Caring Monsters" to find inspiration there (47). At least one Japanese robot maker considered Star Wars' R2-D2 an ideal model (88).

5.4. What people can do to robots: Bad

Make them human-like, and equip them with human failings, or make them provoke human failings (6 instances)

Microsoft AI Tay got itself a Twitter account, and soon reproduced the worst hate messages (79, 114). An experiment that made HAL (from *2001*) speak to Samantha (from *Her*), revealed that "men, even male-defining AI, are real assholes" (100). Also, "it's difficult to listen to, because it is entirely human" (100). According to Alan Winfield, professor of robotics at UWE Bristol, "To design a gendered robot is a deception", as it provokes gender-cued responses and sexism (80). The journalists watching "Professor Einstein" (produced by Hanson Robotics) decided that even if it was small to decrease uncanniness, it was creepy (128). Margaret Atwood commented, that in this aspect, real life gets closer to fiction (18).

Treat robots as slaves (2 instances)

Here can be counted both Luciano Floridi's suggestion that Roman laws for slaves should be a model when construing an electronic personhood (134), and Eric Brynjolfsson idea of "digital Athens", in which people will do really important jobs, like Greek men did (2).

Make robots that can hurt people (1 instance)

This is a truly exceptional idea, but the engineer Alexander Reben, an MIT-trained scientist and roboticist did it "just for fun" (125). But there are other amateurs that are designing "defense robots", while the professionals in South Korea, Germany, Israel and of course Pentagon are designing autonomous killer robots, ostensively for legitimate defense only.

5.5. "It is all more complicated..." (27 instances)

McAfee, and Brynjolfsson with him, think that what people witness at present is but another industrial revolution, this time in a form of a digital transformation. It may be difficult, but will end in full employment (3, 22). Others agree: "the real robot invasion won't be a dramatic humanoid uprising. But it will be extremely profitable" (174). Rutger Bregman in his *Utopia for Realists* put it less

elegantly: "Anybody who fears mass unemployment underestimates capitalism's extraordinary ability to create new bullshit jobs" (although it will end with the introduction of basic income, 144).

So, from where come the dystopian images? After all, technology development is not like natural evolution, yet it is presented in such fatalistic ways, with Darwinian analogies (32). Technological progress is not deterministic (56). According to a Swedish teacher of robotics, AI researchers exaggerate to attract attention and funds (32). Similarly, the US Department of Defense considers the alleged development of Artificial General Intelligence (AGI) by the DeepMind company very unlikely to happen, yet it gets a lot of attention. Also, there are cultural differences in perceiving robot revolution, which are usually ignored; for example, 60 percent of surveyed Germans wanted to ban armed drones and robots in wars, whereas 70 percent of US citizens wanted them used (157).

How did the actual predictions look like? They varied, sometimes dramatically. Centre for European Research calculated that 42 percent of German workers will lose their jobs to robots; OECD gave it 12 percent (146). One source listed eight industries that robots will completely transform by 2025 – "predictions that are interesting – and sometimes scary" (64). Predictions of labor shortages in the USA are actually getting worse, because there are many sectors that cannot be fully automated, and will require workers with high skills in working with machines, and they are not many (94). According to the World Economic Forum, five million jobs will be lost by 2020, while 2,1 million will be created. They, too, think that new jobs will require workers who "successfully combine mathematical and interpersonal skills" (102). Robots, in the meantime, will learn such human traits like sympathy, moral judgment and dexterity (95).

In Canada, there is a fear of job-stealing, career-crushing robots, which in the USA will happen in 50–100 years. According to Frank Pasquale from University of Maryland, both predictions are right and wrong: he took a "middle-ground view" (140). The CEO of Deutsche Bank said: "In our bank we have people doing work like robots. Tomorrow we will have robots behaving like people". They might employ fewer accountants, but those who are left will be doing a meaningful work (155). In the USA some predictions claimed that the loss of jobs will mainly affect one group: moderately educated men, thus Trump's victory in elections (146).

And then there is Rodney Brooks again, with his "The Seven Deadly Sins of Predicting the Future of AI". "Predicting the future is really hard, especially ahead of time"; yet there are four general topic or areas where faulty predictions usually appear:

1. AGI: possible in principle, but far away...
2. Singularity: another couple of centuries, if at all? (the nonsense of exponentialism)
3. Misaligned Values between humans and machines. Did horses share

human values?

4. Really Evil AI is mostly propagated by Hollywood science fiction (156).

Well, according to Google's Research Center in Zurich, a robot's intelligence (Sophia included) in the best case equals that of a worm (164). At the same time SoftBank's CEO believes that in next 30 years there will be robots with an IQ of 10,000 (162).

Some voices sounded kind of resigned: Calun Chace, the author of *The Economic Singularity* said that "Homo Sapiens will be split into a handful of gods and the rest of us" (60). Whatever happens, it should at any rate be carefully studied, said Hawking (109), and Boström agreed (118). Robots will take over jobs, so introduce robot taxes, said Bill Gates (133, 134).

Interestingly enough, only two voices raised a question that seems quite central to us: energy. As one source stated, nobody knows whose consciousness prediction will be right, but does anybody know how to solve the energy problem? (62) As Margaret Atwood put it: robotics needs energy: where do we get it from? (18)

And so it continues into 2018, but, it seems to us, at a slower pace, as there are other things to report. Here are some examples: *The Atlantic* thinks that robots will transform the production and sales of fast food, and "that might not be a bad thing".[6] The journalists from the magazine of Swedish university teachers' union visited Hiroshi Ishiguro, who made a Geminoid robot that looks like he himself.[7] In April, the robotics experts told the European Parliament that its civil-law rules of robotics are based mostly on science fiction.[8] The robotists at Nanyang Technological University in Singapore have taught two robots to assemble an IKEA chair.[9] Relatively new is the accusation formulated by Gilberto Corbellini in *Il Sole 24 Ore*[10] who thinks that the intellectuals (especially the humanists) are suffering from technofobia. The rest of the article glorifies uses of robots in medicine. *Wall Street Journal,* however, delivered a "postmortem" on IBM's Watson, and other media joined in, accusing IBM of "overhyping" its capacity to diagnose cancer.[11] In general, however, the hype seems to have

[6] https://www.theatlantic.com/magazine/archive/2018/01/iron-chefs/546581/, accessed 2018-06-20.

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subsided.

Unless something dramatic happens, robot news will be trickling down at a steady pace. So now it is time to leave the middle ground and see what the social scientists have to say.

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