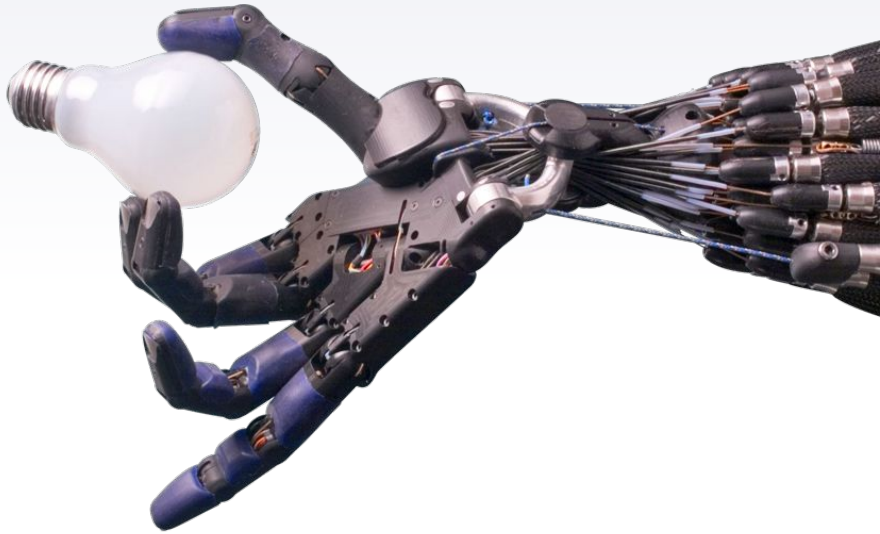
ROBOTS IN SOCIETY:

BLESSING OR CURSE?

THE FINAL CHALLENGE

AI in Prosthetics

"How can AI and robots be combined so that they complement and contribute to our society, instead of posing a threat?"



"Using AI to build a better human rather than to replace them"

1

AI in prosthetics

Analysing how AI can be used to enhance human abilities.

2.1 million people

Who suffer from limb loss in just the US.

This is estimated to double by 2050.

180,000 people

Of that 2.1 million are from amputations.

30 million people

Worldwide are in need of a prosthetic.

AI in prosthetics

ADVANTAGES

- A more fluid and natural experience for the amputee.
- Sensory feedback to help improve the realism.
- Mimics human limbs feedback to a changing environment.
- An improvement in safety due to the more fluid nature and its ability to adapt.
- Feels like an extension on the body rather than just looking like it.
- Possibility to enhance performance. (Strength and speed)
- More efficient and reliable technology. (AI can sense mistakes and failures.)
- AI can help finetune the prosthetic. (e.g. identify an object that the arm is reaching for and help guide towards it.)(e.g. Identify whether the object is fragile or not to judge how much pressure would cause damage.)

https://www.wired.com/video/watch/go-inside-the-lab-that-s-giving-robots-a-sense-of-touch

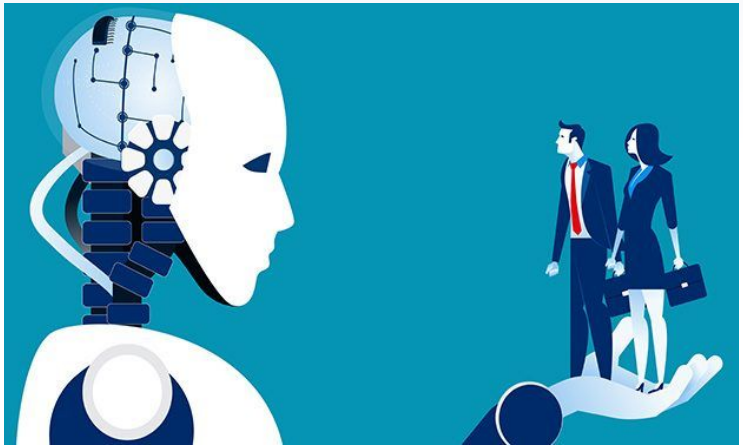
AI in prosthetics

AI in prosthetics

ISSUES

- Privacy. Which data should be stored and how should it be protected?
- Moral and legal responsibilities. Who is responsible for injury due to malfunction or break? (manufacturer, software company, healthcare institution etc)
- Could the AI in the prosthetic take over?
- High demand for prosthetics, however they, especially AI prosthetics, are very expensive.

ANSWERS IN SOLUTION SECTION



EXAMPLE

Johns Hopkins APL is developing a thought controlled robotic arm. It consists of 26 joints and 'load cells' which are located in each fingertip to detect the force and torque applied to each knuckle. There are also sensors which give feedback on temperature and vibration and collect data to mimic what the human arm is able to detect. This allows it to respond to thought like a normal arm.

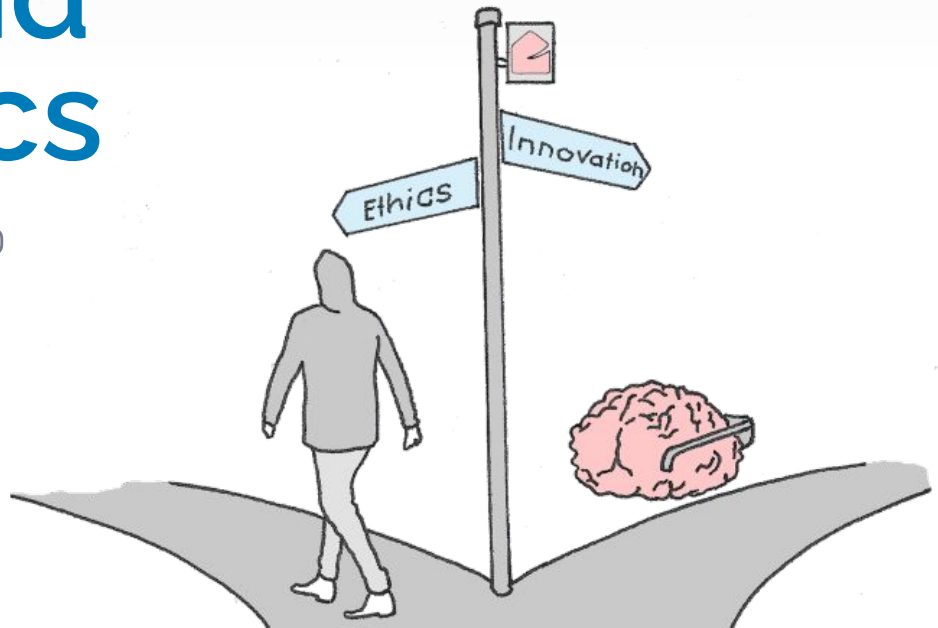
https://www.medtechdive.com/news/how-ai-and-machine-learning-are-changing-prosthetics/550788/

https://www.youtube.com/watch?v=9N0ncx2jU00

2

Ethics behind AI prosthetics

Analysing whether it is ethical to enhance humans or not.



Behaving ethically

DO WE HAVE A CLEAR IDEA OF WHAT IT MEANS TO BEHAVE ETHICALLY?

- We do not agree as people about what is ethical or not. Each person has their own individual set of ethics. Therefore a machine with intelligence should assess the reasons behind the decision chosen by a range of different humans to help the machine learn.
- When the machine studies ALL human behaviour, and by using additional resources, AI will be able to make decisions based on the reasoning behind them rather than copying the decision that someone chose.

Robot Ethics

Ethical issues are important because we need to be able to build trust for the system that it will be able to discriminate between good and bad decisions. This also includes trust in the companies that program the autonomous systems.

This can be split into three subsections. These outline the moral principles of how AI technology should be used. Ethics inspiring design, development and employment of Intelligent Machines.

Ethical systems built into robots.

This includes what process the system goes through to reach a correct decision.

Ethics of how people treat robots.

Should the robots have rights as they are able to make decisions like humans?

Ethics of people who design develop and use robotics.

The companies should be trusted not to use these systems for "bad" activities or objectives.

- https://responsiblerobotics.org/

3

Regulations required

What rules should be put in place in order to prevent misuse of these prosthetics.

Human + Machine

Humans and machines can work hand in hand. They each have qualities that the other is not able to do.

Humans:

- Self-directed goals.
- Common sense.
- Value judgement.

Machine:

- Large-scale math.
- Pattern discovery.
- Statistical reasoning.

In order for this combination to be successful and help create better decision making, there needs to be a certain amount of control over the machine. These regulations must allow the humans and machines to work together while still allowing the human superior control.

Regulations

Should the new laws be more restrictive in order to combat misuse and prevent the invention of apocalyptic technology, to avoid the negative impacts, or should they be more permissive, so as to avoid stifling innovation?

AI must be regulated with strict laws to avoid these negative impacts and misuses. These laws should be decided by a democracy and committee which decide the most ethical laws and use of robots and artificial technology. The possibilities of AI are too dangerous to be open to the general public as just permissive technology due to some individuals not having the same ethical views that the majority would.

Regulations

Can we trust companies and individuals to behave ethically without explicit regulations?

Should regulations be implemented by individual national governments? A group of governments (e.g. the UN)? The academic community? Industry coalitions?

Companies and individual governments can possibly be corrupt by organisations. The regulations should be decided by a group of governments such as the UN to help establish these ethical rules across the world. However different people see these ethical regulations differently. Therefore there must be a group of people to decide upon these rather than individuals.

Regulations

Is it enough to regulate (mis)use of this technology, or will it also be necessary to regulate the research itself?

The research, development, and use of this technology should be regulated to only verified and closely monitored companies and organisations. Therefore the risk of unethical AI being misused will be minimised and prevent the “apocalyptic” disasters which could be possible. However this may cause other individuals to try to recreate the existing technology to their advantage. These risks already exist with current classified technologies and are monitored by governments to try to prevent these innovations.

Regulations

What should the regulations look like?

What the system will be used for.

- Whether it is a necessary cause
- Where the system is used.
- The reasoning behind decisions that are made.
- Background checks into the manufactures, programmers etc.

4

The Solution

An overview of all points made and a final solution reached.

Safety solution

Three principles for creating safer AI: (Human-compatible AI)

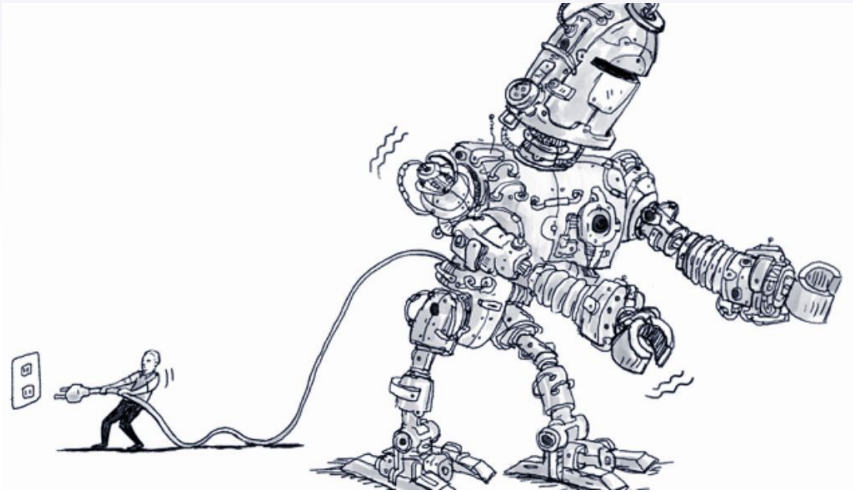
- 1) The robot's only objective is to maximise the realization of human values.
- 2) The robot is initially uncertain about what those values are.
- 3) Human behavior provides information about human values.

- E.g Human might switch me off, But only if I'm doing something wrong, I don't know what "wrong" is but I know I shouldn't do it, Therefore I should let the human switch me off, Then learn what that wrong thing was and will not do it again.
- This "thought" process will prevent any limb prosthetics from taking over and doing its own thing. Instead it will only be able to assist in the activity the brain is instructing to.

Safety solution

- "If the degree of uncertainty is too high, the AI isn't forced to make a questionable decision — it could instead notify the user that it doesn't have enough confidence in its prediction to act, or it could default to a 'safe' mode," says Boxuan Zhong, lead author of the paper and a recent Ph.D. graduate from NC State.

https://www.sciencedaily.com/releases/2020/05/200527133147.htm



THE SOLUTION

Only relevant information should be collected. And only if necessary - stored.

This information should be protected by laws.

As long as the safety solution is followed, humans will always have control over the technology.

The software and manufacturing companies are responsible for their areas if faulty.

Prosthetics are expensive and in demand so naturally will be a high cost.

After distribution it is the healthcare institutions responsibility for any faults.

THANKYOU

For Reading