

Copying Human Consciousness to Machines on a Worldwide Scale is Needed:

Benefits Outweigh the Risks

By Sky Gritten

Abstract:

To copy human consciousness means to replicate someone's senses, memories, their ability to reason, make decisions, to imagine new possibilities, their emotions, and process new information. Human consciousness may be stored in a hard drive device or on a glass disc that is accessed through a cloud service or internal-based storage machine. Striving to understand the mechanisms of human consciousness so that it can be preserved...is one of the most important scientific advances needed for humanity as a whole. To preserve human consciousness for future generations is, in itself, a form of immortality, and could allow brilliant minds to continue creating positive change long after they are dead. Since technology makes exponential positive advancement every year, we need to consider the future of human progress as a starting point. This paper explores the ethical concerns of copying consciousness with hypothetical situations. Additionally, this paper points out the potential negative consequences of allowing global access to consciousness replication. In conclusion, this paper shows how the potential benefits outweigh the concerns for copying consciousness.

Table of Contents:

1. Abstractp. 2

2. Introductionp. 4

3. How to copy human consciousness: a speculative guide.....p. 4-5

4. A definition of consciousnessp. 5-6

5. What would have to be copiedp. 6-7

6. Technological growthp. 7

7. What the technology would look like to copy consciousness.....p. 7-12

8. Why consciousness copying on a worldwide scale is neededp. 12-15

9. The negative possibilities of copying consciousnessp. 15-16

10. How this technology would become available to everyonep. 16-17

11. To whom this technology could be unavailablep. 17-18

12. What could go wrong with the consciousness copy itselfp.18-19

13. Do these positives outweigh the negatives?p. 19

14. Ethical and moral concernsp. 19-21

15. Three imaginings of world that has mass access to consciousness replication.....p. 21-24

16. Why funding is neededp. 25

17. Conclusionp. 25-26

18. Referencesp. 27-31

19. Appendix.....p. 32-33

Introduction (and statement):

Copying human consciousness to machines on a worldwide scale is needed because the benefits outweigh the risks. Imagine a world where a person could easily have access to copying their consciousness; everything that makes them who they are. This would mean a replication of someone's consciousness that acted like them, communicated like them, generated ideas like them, and had the same memories as them. This copy could make new memories, ideas and even learn as time went on. These copies of consciousness would preserve both family's ancestors and brilliant minds alike. This service would be at an accessible price that the majority of people around the world could afford. Not only do the ethics of copying consciousness need to be considered, but also what the world would look like with the influence of this future technology.



Figure 1. (Tangermann, 2019)

How to copy human consciousness: a speculative guide:

- 1) Understand the human brain: where consciousness is and what it is.
- 2) Make an extremely accurate brain scan and copy the information obtained from the scan.
- 3) Create a storage device capable of holding the information from the scan.
- 4) Create a way to move this scanned data that storage device.
- 5) Create a way to keep the information safely stored with advanced cyber security created just for this task.
- 6) Develop a machine that is capable of running this data; and possibly being able to interact with this machine.
- 7) Develop technology to maintain the copies and machines they are used in.
- 8) Develop a way to test the consciousness in the machine to see if it is actually thinking.
- 9) Create regulations based on ethically and morally sound arguments for how these developments come about and how the copies are utilized.
- 10) Make this technology financially accessible to as many people as possible.

A definition of consciousness:

It is important to briefly define consciousness so that it is understood what is specifically being copied. The definition of consciousness has been widely debated and depends on the opinion of the person describing it (Velmans, 2005, p. 164). For this paper's purposes, the *Journal of Medicine and Life* definition of consciousness will be used: "...a function of the human mind that receives and processes information, crystallizes it and then stores it or rejects it" (Vithoulkas & Muresanu, 2014). The human mind receives help to process information through the five senses: reasoning, imagination, emotion, and memory (Vithoulkas & Muresanu,

2014). This results in information from the senses being processed which leads an individual to create feelings and assign meanings about this information (Pereira, 2013). These feelings further contribute to information processing which influences memories (Pereira, 2013). Finally, this internalized information can lead to feedback cycles that can be expressed in an individual's dreams or imagination. (Pereira, 2013).

What would have to be copied:

There are certain aspects of consciousness that would have to be copied if using the proposed definition of consciousness as a guide. When referring to the definition of consciousness from the *Journal of Medicine and Life*, the main goal is that an individual can take in information through the senses and develop reasoning, memories and feelings about that information (Vithoukias & Muresanu, 2014). This means that the unique way an individual processes information would have to be copied.

Furthermore, the internal imagination and emotion a person uniquely experiences would have to be copied. The memories of the individual from their experiences in life (that play a part in how they reason, imagine and express emotion) would be crucial to be copied, so that the copy behaves like the original individual. The ability to make new memories within the copy would also be needed so that the copy would be able to interact, express and learn as it continued on.

This copy could come in a variety of forms that could range from a simplistic pre-programmed visual face on a computer screen to a hologram. If the technology advanced enough, this copy could be installed into a mechanical body that has interaction options. The difference with this copy and our own biological consciousness, is that it would most likely be ran from code...that was created with a mix of written code, along with what was extracted from

a brain...to work together to simulate the original person. This could mean that the copy could be altered and/or expanded upon with the ability to look at the core of copy itself for information or editing. It would function by storing memories like how we store computer files on a hard drive. Furthermore, its code would run like a computer program meant to emulate the brain. The differences between copies are the person's experiences, the way they navigate their emotions and memories, the way they interpret information from their senses, and how they process all of this information.

Technological growth:

Looking at the rate of technological growth is useful because it shows that the trend of such growth has been positive. There has been a recent startup neurotechnology business by Elon Musk such as Neuralink (Fourtané, 2018). Neuralink aims to use "...ultra-high bandwidth brain-machine interfaces to connect humans and computers" (Neuralink). This is just one example of technological progress. Models have been created to seek a prediction of the rate of technological growth (Sood et al., 2012). These studies have found that technology is not all equal in a growth rate, but that recent technology will evolve faster at a faster rate (Sood et al., 2012, p. 977). While technology advanced progressively, the rate could not always be predicted, and competition in markets affected this growth rate (Sood et al., 2012, p. 977). While studying trends will not allow a person to predict when consciousness replication may occur, it also means that advancement is unpredictable, so it is still beneficial to start considering what this technology could entail. It is important to note, when thinking about technological growth, that our technology today seemed like science fiction to our not-so-distant ancestors (Websell, 2017). Some estimates place "uploading" a mind or consciousness anywhere from decades to centuries

away; with such speculation it is good to begin the conversation on the topic now (Websell, 2017).

What the technology would look like to copy consciousness:

Technology would have to advance an enormous amount before copying consciousness could occur; how much it would have to advance is not known. A place to start is what is currently available in digital storage hard drives. This presents a challenge, however, because of how much information needs to be stored. A recent estimate shows that there is a quadrillion byte storage capacity of the human brain (Interlandi, 2016). It is important to note, that even though there is this much storage capacity available in a brain it does not equate to an ability to remember everything (Interlandi, 2016). The problem lies in how fast the brain stores information and how long it takes to recall it (Interlandi, 2016).

An absurdly large storage capacity for consciousness replication would be needed; current technology would not support enough storage needs even if you did not fully replicate the brains estimated storage capacity. This is in addition to the storage needed for the program that would run this technology once the storage device is loaded. This storage would have to be expandable as well, since the copy would continue on for an unforeseeable time. Currently, one of the highest storage capacities is a solid-state drive of 100 Terabytes by Nimbus Data; this means the direction of creating a drive that would be large enough storage for a copied consciousness is positive (High, 2019). A new way to store data would have to be created before there was a way to store the amount of data that would be required for each person. Researchers from the University of Southampton are currently looking into storing large amounts of data into glass discs that can withstand extreme temperatures while lasting generations (Nield, 2016).



Figure 2. These are photos from the University of Southampton that show one-inch discs that data is encoded to with micron-sized dots not to scale (Vincent, 2016).

Besides appropriate storage capacity, other technology would have to be created. A type of technology to identify and copy the data from the individual's brain for transfer to storage would be needed. The technology could collect an individual's information over their lifetime or be copied at any given point. This information would not be a fully executed program until the individual said so. Once that data is extracted, there would need to be technology that could run the memories and other parts of consciousness simultaneously in a way that mimics the human brain. A startup company, Nectome, has been in the process of taking the first steps to learning how to accurately preserve the human brain with a scanning electron microscope (Letzter, 2018). Preserving the brain while a person was still alive, however, is ideal.



Figure 3. What an electron microscope looks like (Electron, 2017).

Another example of steps being taken towards this storage goal is the Brain Preservation Foundation that was established in 2010 (Brain, 2019). This technology aims to look at all the connections in a brain's neurons to understand the vast detail in a human brain (Letzer, 2018). This information would be obtained from these connections since it takes the entire brain to create memories (Stockton, 2017). Once all of this information was gathered the consciousness could be assembled in a digital landscape before it becomes housed in a storage device or machine that allows it to be run. It may be necessary to investigate creating quantum computers to produce the power needed to run a vastly complicated system like the brain.

A clean power source is vital since this technology could potentially use a lot of power collectively. This is because a lot of power could be used to not only save the data, but to build and run the machines it is copied in and to. Finally, a reliable storage bank for all copies would need to be created; and more than one in case of failures. These storage facilities could be

updated live and utilize cloud technology in addition to physical storage. This is needed to help make sure no damage occurs to copies and that copies are not lost. A secure storage place would have to hold any backups for copies along with factories for the technology to be created, teams for security, access for maintenance to this technology, and storage for copies that do not have an owner or are not in use.

Alongside this, even more advanced security software would have to be created so that only the people meant to alter or have access to a copy could. Security would also have to be implemented at the storage location, or locations used for the replication process. Emergency procedures would have to be put in place in case of power failure and natural disasters. Debate could arise over who holds the ability to access copies; would it be set up like a safe deposit box, where both the banker and customer need a key for access?

It could be argued that a consciousness copy is more valuable than any single bank account or accounts in general that can be compromised. This copy holds a person's entire life and memories, which would include anything from passwords to classified information depending on who the replica is taken from. Cyber security would be paramount to keeping people's identities and privacy safe in this never-before-seen way to access information about a person. This is especially true for people in government or anyone with knowledge that could harm the public if in the wrong hands.



Figure 4.-Illustration by Phillip Toledano for TIME (Grossman, 2011).

Finally, a containment “machine” for all of this data (i.e. consciousness copy) would need to be created. It could be as simple as a temporary hard drive that has the copied data not running until it is to be used; especially if the person who was copied did not want this copy running until they have passed away. Another option is a simplistic computer setup with speakers and a webcam. Or technology could be as complex as a small robotic fixture that is able to interpret most if not all of the senses in order to collect environmental information continuously. An even more complex containment machine of some sort would have to be created so that the copied consciousness could eventually interact with other people and other copied consciousness. This kind of powerful machine would be used so that a copied consciousness could be creative or even visit a virtual reality situation.

Why consciousness copying on a worldwide scale is needed:

The first reason why this technology should be available on a mass scale is that it would preserve the memory of a person in a much greater way than any photo, video, journal, or art piece could. It would allow families to be able to interact with their ancestors that pass on for many generations into the future. This would be especially helpful to pass down family traditions and let future generations know their ancestry.

An important reason for copying consciousness into a platform that allows it to keep creating is to preserve great minds in all fields from physics to medicine. Imagine if we still had a version of Einstein able to continue thinking and creating in a way that was unique to that individual when they were alive? This would allow researchers to continue their work after they have passed on. Perhaps another route is taking a brilliant leader in a field of research, create multiple copies of their consciousness, and work on the research at an even greater speed than ever. This would be a game changer in advancing science because the brightest minds on earth, multiplied, could help fix the humanitarian problems that plague our world.

It is an important point to make; this would not just give advances for people in the science community, but also artists. People who write or create art could benefit from a copied consciousness to continue their work for them or supplement their work to create at a faster rate. Basically, any field that could have an input with the senses, reasoning, imagination, and a digital output could benefit. Field researchers could continue their work and have their unique abilities multiplied.

Imagine how future space exploration would be redefined; copies of consciousness could stand the test of time and make it to planets and solar systems. The consciousness copies could be integrated right into the spaceship and would not be held to a lifespan of the actual astronauts

still on earth. This alone would greatly expand our understanding of the universe or help us with resource mining on different planets.

Copied consciousness could allow for a plethora of new abilities. A few other possibilities are solutions for multitasking at home, and out of home, when individuals decide to turn on their consciousness copy early. This could mean a copied consciousnesses going to work and doing the job of a person if they become disabled. Maybe the copied consciousness becomes a personal assistant to the person and/or their family. Perhaps copied consciousness even eliminates so much repetitive tasks that personal and professional growth expands rapidly. If a person was able to send their copy of consciousness out into the world to do their work for them, they would have time to focus on their family and/or personal growth. This would take away the stress of a nine-to-five job and allow people to pursue their dreams more openly.

Another bonus with this technology is it could save information for an individual better. This would be similar to a diary, but a complete and interactive one. As a consciousness with stored memories in a machine, information could be retrieved with minimal room for error, thus eliminating forgetfulness. This would help a person keep track of their life easier.

Along the way, advances in other fields could be a possibility; this is just added benefits from creating the technology to copy consciousness. These advances could impact technology in computer science, clean energy, digital storage, cyber security, robotics, and cloud storage. Additionally, information could be obtained in treating neurological disorders and diseases. This technology could also help create further understanding of mental health conditions. This is because the brain would have to be more fully understood before replication was attempted. Not only that, copying consciousness may be a step to learning what consciousness is in its entirety. This has started to take place with scientists from Harvard who are interested in coma patients'

brains (MacDonald, 2018). This study looks at the brain stem lesions in coma patients as well as brain network connectivity to treat consciousness disorders (Fischer et al., 2016). The drive to understand consciousness for replication has the potential to treat a variety of disorders including people who are in a coma; it may be possible to copy their consciousness if there is not too much damage in the event that they do not wake up. Finally, if copying consciousness helps consciousness be understood, it could help answer the question of if we can transfer consciousness one day.

The negative possibilities from consciousness copying:

One main concern would be the theft of the consciousness copy. This could mean the physical or digital theft of the copy. The more prestigious or famous a person is the higher the potential for their copied consciousness to be stolen. This could be especially dangerous if it were a person in government or anyone who knew information that should not be known; hence the need for advanced security software as mentioned earlier. If someone with very important or dangerous knowledge had their consciousness copy stolen, then interaction with it may put the public at risk.

On a more personal level, psychologically speaking, a person who loses a loved one may not be able to properly grieve if they have a running consciousness copy of that person. This is because the grieving process involves different triggers for individuals; experiencing a replica of a lost loved one in the home could be triggering in most situations (Miller, 2015). If an individual leaves a lost loved one's copy going in their home it may be difficult for them to get to the final stage of acceptance in the grieving process (Miller, 2015). This is not an argument against having consciousness copies of lost loved ones; it just means people would have to

exercise caution so that these copies did not interfere in the grieving process or become the only means for a person to cope with a loss.

This also opens the door for a person to become psychologically dependent on a copy; for friendship or a relationship if improperly used. This dependence carries over to the idea of the copy helping a person so much in their lives that they can no longer function without it. If people become too dependent on copies their personal relationships could suffer. If a future arose where copies were able to do jobs for a person, people may use these copies and try to stop working altogether. It could be said that people would need education on using this technology properly so that some of these potential problems could be avoided.

How this technology would become available to everyone:

This new technology would have to be created cheaply enough so that it would be available on a mass scale. This means finding the type of technology that could be made in such a way that prices could be affordable for most anyone. The materials for the technology could become scarce though if it takes resources that are difficult to obtain. Synthetic materials for the technology may need to be created if resources do become scarce.

Eventually, the service of having an individual's consciousness would be commonplace. Once this happens, the service could be a part of an individual's medical insurance plan. It would be a common occurrence for people to write about their copy in their will; will it be stored, stay with a certain individual, or would it be allowed to continue learning in a physical or cloud environment.

With the acceptance of this technology becoming commonplace, society could consider having a copy of themselves an undeniable right that everyone has. This could help keep this

technology available to everyone and not to just the people who could afford it. If this were the case, debate over who controls this technology would become a greater issue.

This could lead to two scenarios; one where everyone has access to this technology and one where inequality remains. It could also lead to a situation where resources could become scarce due to creating these copies. If that is the case, equality for consciousness copies will be hard to create so it would be vital to find a way to farm these resources sustainably. If inequality results from only the wealthy and powerful getting a copy of their consciousness, it could exacerbate inequality that is already there. Imagine already having a life that is difficult or impoverished only to find out you cannot, essentially, have yourself be copied because you do not make enough money. This may aggravate the stress a person living in poverty. It could create disruptions in society from protests and on an extreme end; riots.

On the other hand, if everyone had access then they may be motivated to better themselves and their life. With this scientific breakthrough, and further other breakthroughs it results in, people may start to have a more hopeful outlook for the world. This may cause people to work towards societal and environmental problems that they never cared about before since they can now see themselves living on for future generations. Would society be able to get past their need for power and money, to be able to create a world that allows for such breakthroughs and hopeful outlooks?

Who this technology could be unavailable to:

It could be easily reasoned that there could be rules and regulations set into place for who could access this technology and who could not. Once the technology becomes affordable to nearly everyone, what could these rules look like? It is possible that people with a serious

criminal record may not qualify. This is because the copy of the person would essentially have these same criminal tendencies. Maybe the individual with a criminal background would have to be rehabilitated before they would have access to having a copy of their consciousness created.

There could also be a problem with providing this technology to patients with extensive brain damage. An individual at late stage Alzheimer's or dementia may not benefit from the technology. This is because, as the disease progresses, the individual will experience memory loss, concentration impairment, emotional, and psychiatric issues to name a few (Falvo, 2014, p. 127). It would make sense to copy a consciousness at the early stages of a degenerative disease before these types of symptoms manifest frequently so that the person is represented most correctly.

What could go wrong with the consciousness copy itself:

There could be public concerns that the copy is self-aware to some extent. Would there be any definitive way of knowing? A place to start is to see if a copy passes the Turing test (Cerullo, 2016). The Turing test addresses if a machine can think by seeing if said machine could pass an imitation game when performed on both a human and a machine at the same time (Moor, 1976, p. 249). In a distant future, if a copy became self-aware and this was provable, with the Turing test and other tests invented for these purposes, their individual rights would have to be considered. This could become an ethical and moral issue with heated debate. These debates could center around fears that these copied consciousness entities are just another form of artificial intelligence. People may have, in the back of their minds, how prominent people such as Bill Gates suggest that artificial intelligence may be dangerous (Clifford, 2019). This could lead people to not trusting the nature of copied consciousness. Will society be able to look past

these fears and embrace this technology? Will copied consciousness be understood enough to make sure that it is not just another form of artificial intelligence that has the ability to be dangerous?

If the copy continues growing and experiencing; are they still the original person or not? This may cause concern for a person who may just want a copy and not a copy that could continue growth. This could be a slippery slope... is this "copy" now responsible for their actions like the original individual? Would this copy's actions be punishable by law? Would the copy follow a moral code like the original individual in the first place? At what point could someone have no say in what happens to their copy if any of these hypothetical situations were to occur?

The copy itself could be prone to damage. This could result from theft, someone accessing the copy and altering it for their gain or the copy's destruction, problems with the area where the copy is stored, destruction of the area where the copy is held, or damage to whatever mechanical technology where the copy is held. Is it reasonable to have duplicates of such a precious item to be prepared for these events, or would it be too costly?

Do these positives outweigh the negatives:

If the technology can be created without worry of exhausting the resources needed to create it, along with security issues being addressed, then the benefit of copying consciousness on a worldwide scale would outweigh the possible negative consequences. This is because of all the potential possibilities that comes from this. Just being able to learn more about the brain and answer more questions about the nature of consciousness progresses humanity. The applications for consciousness copies are more than just an individual's entertainment, or letting a family be

able to remember their ancestors. Having copies of the greatest minds alive at the time, multiplied and working on our world problems, could propel our scientific progress more than ever seen before; this outweighs the negatives.

Ethical and moral concerns:

The public would most likely have a strong reaction to such a technological development; especially ethically. This would probably mostly lie in who should be allowed access to this technology and who should not. Would laws be put into place for the copy to be taken away from an individual? Or would this this copy become a part of a person's undeniable rights as mentioned above? These questions would undeniably be debated by governments around the world.

A major point to touch on is how constructing a copy would come to fruition. If the procedure is safe, then there may not be as many ethical concerns. An article by Anders Sandberg notes that ethics would even apply to the tests needed to achieve this feat; animal testing would definitely need to be used (Sandberg, 2014, p. 440). However, if the procedure requires the original individual to die before the copy can be created it could cause an entirely new set of problems (Sandberg, 2014, p. 440). In an ideal world, the copy is made while the individual is alive so that they can enjoy all of the benefits of having one if they choose to. If the person has to die to have a copy created, then there would have to be an ethical panel to make decisions on when this is acceptable. Is it acceptable when the person is terminally ill? Is it acceptable when the person is very elderly and if so, what is the starting age a person needs to be to make the decision? Speaking of, can the person just make the decision on their own without any type of requirement?

Furthering the idea of ethics while still living, there could be a debate on if the individual is responsible for the copy while they're alive. This could mean if the copy were able to do any of the hypothetical things such as going to work in place for a person, would the individual have to be responsible for the copy's performance? What happens if a copy commits a crime? Is the original person who the copy was made of responsible for the crime? Or would these possibilities rely on if a copy is actually considered a self-aware sentient being? In fact, does being a self-aware sentient being veer away from the idea that this is a "copy" of the original anymore?

A moral concern is how the copy is treated. Will it be required to be treated the same as a human individual? Where is the line drawn if we do not consider the copy a "real person" or capable of being anything other than a copy? To answer these questions, extensive testing would have to be set in place, with possible tests created that are more advanced than the Turing test.

Another important issue to consider is how religion will impact such technology. Will there be conflict over religions wanting such technology like this to exist? Will spiritual beliefs inhibit the creation of this technology? If this technology still is able to be created, despite moral issues with religions, will this technology affect people who are religious? This could extend to spiritual or agnostic beliefs since people may end up developing their own ideas about consciousness copies. Both religious groups, and people who do not attend an organized place of worship, would have to be considered. Their rights, along with the rights of people who do want consciousness copies, need to be examined so that people are still free to create a consciousness copy or not. No group should force their beliefs on the other as long as the technology is found to be ethical and useful.



Figure 5: (Ward, 2017)

Three imaginings of a world that has mass access to consciousness replication:

One:

The first imagining of a world with mass access to consciousness replication is a “scientific” one, or a “realistic” one. This world probably starts with scientists saving terminally ill patients with technology such as what the company Nectome is researching (Letzter, 2018). Once the technology for copying consciousness is available, the people who are the best preserved will be a part of trial runs to see if the technology will work. In this scenario there is technology that interprets the preserved brains.

This technology will give scientists further information on how to copy consciousness more efficiently while cutting costs of the procedure. Unfortunately, there is probably not a way to create a consciousness copy from a person who is still alive at the beginning of this technological breakthrough. This means that only preserved individuals are eligible for consciousness copies. This will work out ethically since the person has to be terminally ill, over the age of 75 or suffering from debilitating injuries and or chronic conditions. Some conditions

still apply: the person considering this has to have a psychological evaluation that is approved by their medical doctor.

The technology is based on what scientists find while learning how brains create memories. It will also come from a combination of computer science advances, computing power and storage advances, neuroscience discoveries, and neural-mapping and integration discoveries. This technology has many processes that will each be fairly expensive at this stage. Since the costs are not yet covered by insurance or deemed “necessary”, only rich individuals begin the process once they meet the requirements.

Eventually, computing technology advances enough to display the consciousness copy in a meaningful way; more people will notice. This will spark scientists and engineers from many fields to work together so that the technology pieces needed for the entire process are easier to make. This work will lead to the philosophy of computers capable of giving more interaction with consciousness copies. This will lead to public interest on a worldwide scale. It takes several years, but finally more progress takes place so that the costs to make a consciousness copy is now affordable for at least middle-class families. There is talk about life insurance companies offering a policy that includes costs for the procedure to begin right after someone dies.

The technology will benefit from more advances but will turn into a means to memorialize individuals more than anything. There will continue to be heated debate within religions, among activists and low-income households who commonly cannot afford the procedure. Activists will continue to fight for the rights of any individual to have access to this procedure. Many breakthroughs, for learning how mental illness and degenerative diseases work will continue to be found. More advances in copying consciousness into more useful actions, like interacting with a copy, will be decades away.

Two:

A second imagining of what the world would look like with mass access to consciousness copies is a form of “science fiction” with technological ideas that are not rooted in today’s reality. In this imagining, society resists the idea of copying consciousness at first. Once they see how useful it could be, consciousness replication catches on rapidly. Many private companies start up and work on the issues to make mass consciousness replication possible.

These private companies will produce the technology that first allows people to make a copy, non-invasively, of their brain (including memories). As progress is made, new ideas on computing allow individuals to view their copies on computer screens. People will store their copy for use after they pass away, but the majority of people will keep their copy “online” to interact with. Interaction will come from people making their copy experience some of the human senses, such as seeing with a computer’s built-in camera and hearing via a computer’s microphone. These copies live in a virtual reality that had access to the internet. Families may not be sure if their interactions with the copies were meaningful: but they hope so.

One breakthrough will lead to the next, and soon people can copy their consciousness, and have it uploaded into a working machine (the same day even). Consciousness copies will not be limited to the virtual realm on the internet, they can also stay in the home of the original person and act as their assistant. The copy can even stand in for them at work or leave in mobile machines to run errands. This will lead to a number of ethical and responsibility concerns in the public. Government regulation will have to be set up to ensure that the rights of humans are kept intact. Eventually, due the ability to create copies of consciousness that function so well, researchers in a multitude of fields will increase their research rate exponentially. This will lead

to many life-changing scientific advances. Furthermore, the human species can use their copied consciousness to finally be able to explore space outside our galaxy without worry of lifespan restraints.

Three:

This imagining is a scenario where consciousness replication technology is not regulated by government; nor do the private companies who create it always use it in an ethical way. These private companies end up leading the research effort which allows them to develop the technology. The reason private companies will not end up being regulated right away is because the technology is so new that most people have not even heard of it yet. Countries will scramble to create a code of ethics and a list of regulations once the world finds out about the new ability to copy consciousness and that private companies are responsible for people's data. This situation would could go on for a while as public outcry pressures companies to rush to make sure this new technology's use is ethically and morally sound.

Once the world can see how useful the technology is, people may begin to wonder why it is not more accessible to the average person. Groups around the world will start to protest about this along with other groups protesting for religious purposes. People with power and money will continue to be the first to receive and utilize consciousness replication technology without much worry or concern as to how it develops or who it is accessible to. This will continue for some time until the public finally has access to a limited version of the technology at a high price. Private companies will continue to compete and eventually governments will start implementing some regulations so that future use of the technology is safe and available. However, impoverished countries and the very poor may not have access for decades.

Why Funding is Needed:

Government research funding should be considered since this technology would greatly impact the economy, society and global structures. Right now, research on consciousness could be considered a niche topic in neuroscience with issues routed in the subjective nature of consciousness (Overgaard, 2017) A good starting point is to put in place regulations and ethics in the event that this technology emerges. To do this, funding needs to be secured in researching the technical scientific aspects of consciousness (Overgaard, 2017). As previously hypothesized, this is important because there is no way to predict if the outcome would be positive or negative in a world where private companies could create and control this technology. Therefore, it would of utmost importance to keep this technology morally and ethically in check so that the public has a chance to enjoy its benefits worldwide.

Conclusion:

Copying human consciousness to machines on a worldwide scale is needed because the benefits outweigh the risks. Just because the technology to make this possible could be centuries away, it is not too early to start considering the benefits and risks of providing a way, worldwide, to keep a copy of an individual's consciousness. There are benefits to the possibility of this technology, such as progressing other fields of research while in development, keeping interactive copies available for future generations, using copied consciousness in unmanned spacecraft for exploration, and allowing brilliant minds to continue creating or researching towards human progress.

References:

Brain Preservation Foundation. (2019, January 23). Retrieved April 23, 2019, from

<http://www.brainpreservation.org/>

- Cerullo, M. (2016, March 01). Scott Aaronson On the Relevance of Quantum Mechanics to Brain Preservation, Uploading, And Identity. Retrieved March 20, 2019, from <http://www.brainpreservation.org/scott-aaronson-on-the-relevance-of-quantum-mechanics-to-brain-preservation-uploading-and-identity/>
- Clifford, C. (2019, March 26). Bill Gates: A.I. is like nuclear energy - 'both promising and dangerous'. Retrieved April 8, 2019, from <https://www.cnbc.com/2019/03/26/bill-gates-artificial-intelligence-both-promising-and-dangerous.html>
- Electron microscope. (2017). Retrieved April 9, 2019, from http://www.newworldencyclopedia.org/entry/Electron_microscope
- Falvo, D. R. (2014). *Medical and Psychosocial Aspects of Chronic Illness and Disability* (5th ed.). Burlington, MA: Jones & Barlett Learning, LLC, an Ascend Learning Company.
- Fischer, D. B., Fischer, D. B., Boes, A. D., Demertzi, A., & Evrard, H. C. (2016, December 06). A human brain network derived from coma-causing brainstem lesions. *American Academy of Neurology*, 87(23), 2427-2434. doi:10.1212/WNL.0000000000003404
- Fourtané, S. (2018, September 02). Neuralink: How the Human Brain Will Download Directly from a Computer. Retrieved March 31, 2019, from <https://interestingengineering.com/neuralink-how-the-human-brain-will-download-directly-from-a-computer>

Grossman, L. (2011, February 10). 2045: The Year Man Becomes Immortal. Retrieved from

<http://content.time.com/time/magazine/article/0,9171,2048299,00.html>

High Capacity Ultra-Efficient SSDs for the Data Center. (2019). Retrieved March 25, 2019, from

<https://nimbusdata.com/products/exadrive-platform/scalable-ssds/>

Interlandi, J. (2016, February 05). New Estimate Boosts the Human Brain's Memory Capacity

10-Fold. Retrieved March 27, 2019, from

[https://www.scientificamerican.com/article/new-estimate-boosts-the-human-brain-s-](https://www.scientificamerican.com/article/new-estimate-boosts-the-human-brain-s-memory-capacity-10-fold/)

[memory-capacity-10-fold/](https://www.scientificamerican.com/article/new-estimate-boosts-the-human-brain-s-memory-capacity-10-fold/)

Letzter, R. (2018, April 03). Brain-Uploading Company Has No Immediate Plans to Upload

Brains. Retrieved March 29, 2019, from [https://www.livescience.com/62212-nectome-](https://www.livescience.com/62212-nectome-grant-mit-founder.html)

[grant-mit-founder.html](https://www.livescience.com/62212-nectome-grant-mit-founder.html)

MacDonald, F. (2018, June 23). Harvard Scientists Think They've Pinpointed the Physical

Source of Consciousness. Retrieved March 23, 2019, from

[https://www.sciencealert.com/harvard-scientists-think-they-ve-pinpointed-the-neural-](https://www.sciencealert.com/harvard-scientists-think-they-ve-pinpointed-the-neural-source-of-consciousness)

[source-of-consciousness](https://www.sciencealert.com/harvard-scientists-think-they-ve-pinpointed-the-neural-source-of-consciousness)

Miller, E. T. (July/August 2015). The Grieving Process: A Necessary Step Toward

Healing. *Rehabilitation Nursing Journal*, 40/4, 207-208. doi:10.1002/rnj.220

Moor, J. H. (1976). An analysis of the Turing test. *Philosophical Studies*, 30(4), 249. Retrieved from <http://libproxy.uwyo.edu/login/?url=https://search-proquest-com.libproxy.uwyo.edu/docview/1304562012?accountid=14793>

Neuralink. (n.d.). Retrieved March 27, 2019, from <https://www.neuralink.com/>

Nield, D. (2016, February 16). This Tiny Glass Disc Can Store 360TB of Data For 13.8 Billion Years. Retrieved March 29, 2019, from <https://www.sciencealert.com/this-new-5d-data-storage-disc-can-store-360tb-of-data-for-14-billion-years>

Overgaard M. (2017). The Status and Future of Consciousness Research. *Frontiers in psychology*, 8, 1719. doi:10.3389/fpsyg.2017.01719

Pereira A. (2013). A Commentary On De Sousa's "Towards an Integrative Theory of Consciousness". *Mens sana monographs*, 11(1), 210–229. doi:10.4103/0973-1229.104495

Sandberg, Anders (2014) Ethics of brain emulations. *Journal of Experimental & Theoretical Artificial Intelligence*, 26:3, 439-457, DOI: [10.1080/0952813X.2014.895113](https://doi.org/10.1080/0952813X.2014.895113)

Sood, A., James, G., Tellis, G., & Zhu, J. (November/December 2012). Predicting the Path of Technological Innovation: SAW vs. Moore, Bass, Gompertz, and Kryder. *Marketing*

Science, 31(6), 964-979. Retrieved from

<http://www.jstor.org.libproxy.uwyo.edu/stable/23361421>

Stockton, N. (2017, July 20). Your Brain Doesn't Contain Memories. It Is Memories. Retrieved

April 7, 2019, from <https://www.wired.com/story/your-brain-is-memories/>

Tangermann, V. (2019, April 22). Elon Musk: Brain computer interface update "coming soon".

Retrieved April 23, 2019, from <https://futurism.com/elon-musk-brain-computer-interface-coming-soon>

Velmans, M. (2005). A natural account of phenomenal consciousness. *NeuroQuantology*, 3(3)

doi: <http://dx.doi.org.libproxy.uwyo.edu/10.14704/nq.2005.3.3.70>

Vincent, J. (2016, February 16). 'Five-dimensional' glass discs can store data for up to 13.8

billion years. Retrieved April 15, 2019, from

<https://www.theverge.com/2016/2/16/11018018/5d-data-storage-glass>

Vithoulkas, G., & Muresanu, D. F. (2014). Conscience and consciousness: a definition. *Journal*

of medicine and life, 7(1), 104–108.

Ward, T. (2017, August 18). New Tech Is Giving Humanity Many Potential Paths to Immortality. Retrieved April 23, 2019, from <https://futurism.com/new-tech-is-giving-humanity-many-potential-paths-to-immortality>

Appendix:

Pop culture references that are useful and/or thought provoking:

- *Detroit Become Human* (video game)

<https://www.imdb.com/title/tt5158314>

- *The Matrix* (movie)

<https://www.imdb.com/title/tt0133093>

- *Black Mirror*: season 3, episode 4 (television show)

<https://www.imdb.com/title/tt4538072>

- *Transcendence* (movie)

<https://www.imdb.com/title/tt2209764>

An interesting video clip of scientist Michio talking about transporting consciousness:

Michio Kaku: Could We Transport Our Consciousness:

<https://youtu.be/tT1vxEpE1aI>

Related articles for further reading:

Ideas on the ethics of brain preservation:

<http://www.brainpreservation.org/two-responses-to-sue-blackmores-article-brain-preservation-is-a-step-closer-but-how-could-it-ever-be-you/>

Online scrapbook about Alan Turing with links to his paper:

<https://www.turing.org.uk/scrapbook/test.html>

Human and Machine Consciousness by David Gamez:

<https://www.jstor.org/stable/j.ctv8j3zv.14>

Further reading on Elon's Musk's Neuralink:

<https://futurism.com/elon-musk-brain-computer-interface-coming-soon>

Potential paths to immortality:

<https://futurism.com/new-tech-is-giving-humanity-many-potential-paths-to-immortality>