Ask A Genius 84 - Connectome and Genome (1)
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February 9, 2017

This session has been edited for clarity and readability.

Scott: There's the idea of the connectome, which is a structural-functional mapping of the brain. It is supposed to be used in connection with the genome for people to be able to draw a highly accurate map of an individual and their consciousness (Griffiths, 2016; USC, n.d.).

Rick: The most fun or science fictioney thing is to be able to technically resurrect people based on the information that you have about them. The most direct way to technically resurrect people is to use their actual brain.

If people are cryonically preserved, you bring them back, then they still use their same brain. Or you send in a bunch of Nanobots to trace every single dendritic connection in the brain, which seems crazily overly ambitious, or some scan that replicates the brain molecule-by-molecule.

The more ambitious stuff is super science fictioney, but people are still going to try to resurrect people. There are projects right now that try to program a computer to write like Shakespeare. They are crappy right now.

It seems reasonable to think that 50 years from now that resurrecting people with various degrees of fidelity will be a project that people will take on. There's an arms race between resurrecting people and human existence being trivialized and debunked by future forms of existence – to the point that people or future beings that are almost people aren't as heavily invested in our resurrection.

In the next years, technical resurrection will be pretty big. You mentioned the genome. The genes that go into making an individual's body. Then you mentioned the connectome, which is a fairly detailed map of what regions in an individual connect to other regions in the brain of the individual.

It looks like one of those old airline maps in the 60s through the 90s, maybe even now. It shows all of the cities connected by an airline with all of these curved lines. A connectome looks like a big circle with hundreds of curved lines crisscrossing and showing which parts of the brain are most directly connected to each other via neural pathways.

It's not unreasonable to think, given the genome, you would get some information out of it. With the connectome, right now, if you are going to map somebody's brain, you need to do this non-invasively. We don't have Nanobots to trace dendrites.

You have to refer to the record people leave, the words they say, the words typed in social media, PET scans, CT scans, maybe injecting a dye and taking pictures of that (Canadian Cancer

Society, 2017; Mayo Clinic Staff, 2015).[1,2] I think the genome will be much more useful in the future than it is now.

We can estimate percentages. If you were going to build somebody now, if you were going to replicate or build a replica of somebody that would pass something like a Turing test, where a computer would not only sound human but like the person you're trying to replicate, what usefulness would various information sources be (Encyclopædia Britannica, 2016)?

You've got the genome. It's probably only worth 5 or 10% because the brain is super fluid, super plastic. It is always rebuilding itself by sending out new patterns of dendrites. So, the blueprint for the architecture of the brain in the genome is mostly useless because the brain is always being remodeled.

The records of words people use given the modern state of technology can probably account for half of the information out there that you can exploit to create a replica of what somebody might sound like, the person you're trying to replicate.

The words that people have already said give you a template for generating more words that that person might say in the form by which they're going to be evaluated, whether they are the real thing or not.

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[1] *Positron emission tomography (PET) scan* (2017) states:

> *A PET scan is a nuclear medicine imaging test that uses a form of radioactive sugar to create images of body function and metabolism. PET imaging can be used to evaluate normal and abnormal biological function of cells and organs.*
> *PET uses a radiopharmaceutical made up of a radioactive isotope attached to a natural body compound, usually glucose. The radiopharmaceutical concentrates in certain areas of the body and is detected by the PET scanner.*
> *The PET scanner is made up of a circular arrangement of detectors. These detectors pick up the pattern of radioactivity from the radiopharmaceutical in the body. A computer analyzes the patterns and creates 3-dimensional colour images of the area being scanned. Different colours or degrees of brightness on a PET image represent different levels of tissue or organ function.*

Canadian Cancer Society. (2017). Positron emission tomography (PET) scan. Retrieved from http://www.cancer.ca/en/cancer-information/diagnosis-and-treatment/tests-and-procedures/positron-emission-tomography-pet-scan/?region=sk.

[2] CT Scan (2015) states:

> *A computerized tomography (CT) scan combines a series of X-ray images taken from different angles and uses computer processing to create cross-sectional images, or slices, of the bones, blood vessels and soft tissues inside your body. CT scan images provide more detailed information than plain X-rays do.*
> *A CT scan has many uses, but is particularly well-suited to quickly examine people who may have internal injuries from car accidents or other types of trauma. A CT scan can be used to visualize nearly all parts of the body and is used to diagnose disease or injury as well as to plan medical, surgical or radiation treatment.*

Mayo Clinic Staff. (2015, March 25). CT Scan. Retrieved from http://www.mayoclinic.org/tests-procedures/ct-scan/basics/definition/prc-20014610.

The Turing Test was presented something taking place via typed messages. You couldn't see what's sending it to you because you're in a room, but it was slipped into the room where you are via teletype or something.

The second-level Turing Test where you're trying to convince people your machine is a specific person. So, the words somebody has already said is a major information source. Then you have whatever you can discern based on brain architecture, whatever you know, and use whatever you can find out via PET scans and CT scans.

But it's still a really incomplete picture. The future, say 80 years from now, when it is possible to replicate people with a high degree of fidelity – maybe, not their exact consciousness – to what they might say. I still don't think the genome is going to be that much more important.

It will be all of the new technology that will let you explore the individual layouts of people's brains, whether it is Nanobots or fast PET scans with super precise imaging.

References

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