It is a physical fact that technology will not be able to keep up with Moore’s Law the way it has over the past half century, at least with conventional fabrication and chip architecture. Increasing the density of transistors is leading to thermal issues, as well as reliability issues as the channel length shrinks.

Clearly, a new technology will need to replace the traditional transistor over the next decade to keep up with technological growth. I believe that neuromorphic computing architecture will be significant in the future due to its low power consumption, ability to adapt, and speed. Even if quantum computing becomes dominant in the marketplace, neuromorphic computing will hold some distinct advantages in computer vision and hearing, data processing, cybersecurity, and education. Education is one field that I feel very strongly about. One of the grand challenges of Engineering, according to aoeuaoeu, is personalized education. It simply is not possible for education to be personalized to a great extent unless the ratio of students to teachers were one to one. I believe that neuromorphic computing could be a solution to this problem, as neural networks have the ability to blab la.

Although education is a societal investment with delayed gratification, I believe it is the single most important factor in improving quality of life world wide and ensuring that human society will continue to thrive. A few years ago, I had the unique opportunity to support primary education in rural Tanzania. I already had years of experience “joggling,” or running and juggling simultaneously. I had the idea of setting a Guinness World Record in the sport in order to raise support for the primary school and children’s home in Rhotia Valley, Tanzania. I trained for months to run the fastest 5k, mile, and 400m while juggling five objects, breaking records that were set in the late 1980s. Along the way, I worked with local businesses in South Florida, as well as the international juggling community, to raise donations and help the children’s home continue to expand and introduce One-Laptop-Per-Child laptops into the primary school. These laptops are rugged, inexpensive devices designed specifically to empower underprivileged students worldwide through education. I considered my contribution to be a success, as I managed to raise about $2000 worth of donations. As a juggler, I was also excited to have a partnership with a juggling company that donated lots of juggling-related toys to the village for the children.

Also stemming from my career as a joggler is a profound interest in the marvels of the human brain. I am always trying to test my personal limits, whether it is running while juggling five objects, sprinting while juggling three balls blindfolded (my next challenge and fundraiser for Rhotia Valley that I am currently training for), or even relearning to type on a Dvorak-layout keyboard. Traditional electrical engineering has taught me to understand how computers work, from the basic PN junction to low-level programming in assembly. However, this whole architecture and core of electrical engineering has very distinct differences from the way mammalian brains function. To train a computer to distinguish between a house and an office building is a wildly complicated task to program, yet the most uneducated human can spot the difference in a fraction of a second and use a hundredth of the power. As new technologies emerge from materials science labs, such as memristors, it is becoming increasingly possible to build an electronic system that mimics the brain and is fundamentally different from a CPU. I find this thought fascinating. My goal is to have a profound understanding with this new architecture as it enters the market, as there will be a dearth of people familiar with the architecture and able to utilize it to its full potential compared to the amount of people who are familiar with current computer architecture.

Although the applications to autonomous robots, computer vision, and genomics are fascinating, I am particularly interested in how this new technology could be used to educate students globally who would not have access to teachers otherwise. The selection of material, rate of learning, assessment of knowledge, and reward system could be optimized in such a way that was never before imaginable. With more educated people, the creativity and capabilities of the whole species would improve as more people are better equipped with tools and knowledge to solve global problems.

After completing two internships at SpaceX, a private rocket company determined to send humans to Mars, and being a fan of science fiction, turning humans into a multiplanetary species is another fiction that I want to turn into reality. However, modern computers are highly susceptible to radiation and data corruption as computations are bottlenecked in a processor and data encoding is not inherently redundant. However, a brain is highly plastic and robust, as we do not forget our multiplication tables after a night of drinking, as one example. Since data flow is massively parallel, neuromorphic computing is highly advantageous in deep space applications. I see it as a component in turning my vision of the future of humanity into reality.

The Machine Intelligence Lab at Oxford has already produced novel research and applications to artificial neural networks. In order to understand the requirements of building a neuromorphic architecture, it is important to thoroughly understand the optimal algorithms and capabilities of a neural network. By pursuing a post-graduate education in the Department of Engineering Science, I would be making progress towards my ultimate goal of enhancing modern technology to essentially keep up with Moore’s Law.