It felt like my arms were about to fall off and my heart was going to beat out of my chest as years of practice were put to the test. Every time I changed my bearing to follow the athletics’ track’s curves, the wind turbulence battered my 5-ball juggling pattern differently. As minutes went by, it became increasingly difficult to accurately throw the balls without mid-air collisions. As sweat collected on the juggling balls and in my eyes, it became increasingly more difficult to make catches. Nevertheless, six minutes and 34 seconds after the gun went off, I became the world record holder for the fastest mile while juggling five objects.

“Joggling” has become an inseparable part of my identity. Not only has it been a way to challenge myself physically and mentally, but it has also given me a unique opportunity to help people worldwide. I used the publicity from my three joggling world records to raise support for the primary school and children’s home in Rhotia Valley, Tanzania. The community is introducing One-Laptop-Per-Child devices into the education system to allow young kids to connect with the world and gain experience with computers, to pursue their own interests and become members of the global community in the 21st century. From a cultural perspective, I found this program fascinating and inspiring and wanted to support it. From a technological standpoint, I was excited to see low cost, efficient, and well-designed technology be applied constructively to solve problems, as I studied electrical engineering as an undergraduate.

However, I see this project in Rhotia Valley as merely the tip of the iceberg of the much broader and intricate challenge around which I plan to build a career. It is a fact that we are approaching the physical limit on the miniaturization of CMOS transistors and it will soon be necessary to design innovative architectures and technologies in order to keep up with Moore’s Law. As stated by the influential computer pioneer, Alan Kay, “the best way to predict the future is to invent it.” I anticipate that neuromorphic computing architecture will be a significant player in the future of computing, and I plan to be involved in the invention of this technology.

From a reductionist point of view, my training as a joggler is analogous to the way neuromorphic architecture functions. Just as my training is a subconscious challenge of improving throws, predicting the trajectories of objects, and eliminating unnecessary physical exertion, neuromorphic architecture inherently seeks to build shortcuts and recognize patterns to optimize efficiency in performing specific tasks. Compared to the modern CPU, neuromorphic architecture would use a fraction of the power and perform certain data processing tasks in a way that is far less susceptible to data corruption. My studies as an electrical engineer have given me a deep understanding of today’s CPUs work, from the most basic level of PN junctions to the processes involved in handling gigabytes of data, but it was my personal curiosity that led me to branch out to other paradigms that force me to question every aspect about conventional electronic design. Neuromorphic architecture has advantages that make it a vehicle for enabling the two changes in the world that are most important to me; making humans an interplanetary species and advancing personalized education.

According to the National Academy of Engineering, one of the greatest engineering challenges of the future is advanced personalized learning. Although the proliferation of education through the One-Laptop-Per-Child program inspired me to use my talents to get involved, I believe that much larger revolutions in education are on the horizon as technology advances. Not only will it be important to equip children worldwide with access to the collective knowledge of the human species, but to personalize each student’s education in order to maximize their potential. While a human teacher can presumably provide a student with a very powerful and customized education, it is not logistically feasible to have one teacher for every student. Machine learning algorithms and neuromorphics will be the key to cracking this global challenge.

It is nearly impossible to intern at SpaceX twice and not dream about the future of space. Being around the brightest engineers and other like-minded individuals has done nothing but invigorate my interest in space and develop the ultimate, long-term goal of helping humans become an interplanetary species. One of the current challenges with deep space missions is that radiation has the ability to flip bits and corrupt data. Modern CPUs are highly susceptible in the way data is bottlenecked through the processor without much redundancy. However, neuromorphic computing has an inherent advantage in the way that it processes data in massive, parallel networks and data is stored redundantly, in addition to consuming a fraction of the power that modern CPUs use.

The Machine Learning Research Group in the Department of Engineering Science is currently researching how to design more efficient and effective machine decision-making algorithms. This research focuses on using decisions of individuals or partial systems to drive decisions of the collective group. If my goal is to help develop next-generation neuromorphic hardware, then why is it necessary that I attend Oxford University to study machine intelligence from the computer science perspective? The computer pioneer, Alan Kay, also said that “those who are serious about software should build their own hardware.” The machine learning research group does work that is analogous to the kinds of problems that neuromorphic hardware architecture would inherently excel at. Working alongside the best researchers in the field at Oxford would greatly enhance my expertise in the area and equip me with the knowledge necessary to tackle the problem at the mathematical, computational, software, and hardware levels. One cannot truly utilize tools to their maximum potential without having a profound understanding of every component that makes the tool function. I believe that I would be an ideal fit in the interdisciplinary and diverse culture at Oxford University, both immersing myself in activities that would help me grow as an individual and sharing my personal values and personality to the community.

On a more terrestrial note,

One of the grand challenges of Engineering, according to aoeuaoeu, is personalized education. It is not logistically possible for traditional education to be personalized for every student worldwide. Although one-size-fits-all courses may be a pragmatic solution to teaching students in Rhotia Valley, it is far from ideal. I believe that neuromorphic computing could be a solution to this problem, as neural networks have the ability to blab la.

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 effectively keep up with Moore’s Law. As the father of object oriented programming, Alan Kay said, “those who are serious about software should build their own hardware.”

However, my interest in joggling has another

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.