Building the Next AI-Ready Computer

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Beginnings

How do we revolutionize AI for it to be applicable to our everyday lives?

The answer? **We don't**. What we realized soon after deciding on our topic was that the software portion of AI was not the limiting factor in its success, **it was the hardware**, Artificial Intelligence takes an immense amount of computing power and resources to run. While talking about AI hardware isn't as appealing as talking about a computer brain, like it or not, the hardware is the primary restricting factor in the success of AI.

The Challenge

We decided to focus on the physical storage problem with AI hardware.

There currently isn't enough storage to hold Artificial Intelligence, and once we have an AI up and running, the machine gets very hot very fast.

After some research, we we came accross computer clusters. A computer cluster is when you take a set amount of computers and connect them all. Once they are all connected, you can work with the cluster as if it is **one large computer**, increasing the computing capability and the speed at which it computes.

The Model

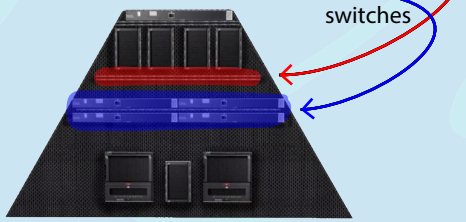

Figure I: Idealized singular trapezoidal computing unit fit with piezoelectric **fans**, state of the art **compute modules** and switches

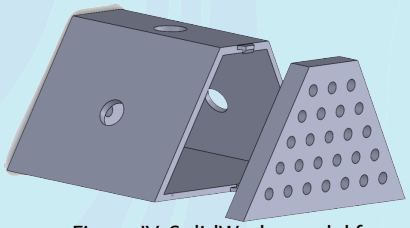

Figure IV: SolidWorks model for prototype testing raspberry pi's and with holes for airflow and slots for on the sides for wires and cables between units

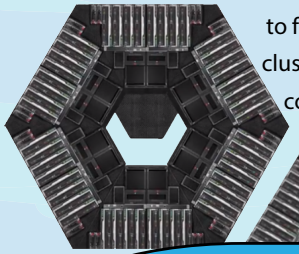

Figure II: 6 trapezoidal units attached together to form a hexagonal cluster of trapezoidal computing units

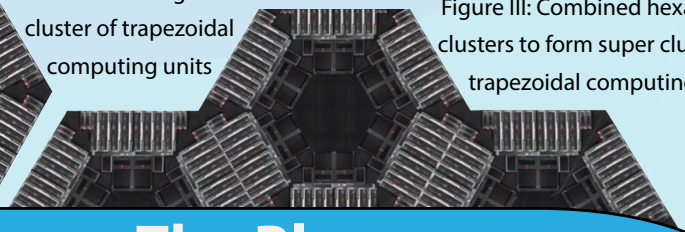

Figure III: Combined hexagonal clusters to form super cluster of trapezoidal computing units

The Plan

Create a computer system that uses a different design to better improve the efficiency of clustered computing architecture.

- By putting multiple raspberry pis in a **cluster**, we can make a computer system that is able to **power** and **cool** a strong enough AI to run for a long period of time.
- For the computer system, we would put these raspberry pis in **trapezoids** (Figure I) to maximize the amount of pis in one system.
- We would then attach these trapezoids to form a **hexagon** (Figure II) to connect the raspberry pis into a cluster.
- Behind the raspberry pis in the trapezoid, we would add **fans**, and connect **power supplies** (Figure I) to power the whole system in a cluster.
- In the end, we plan to create a computer system that has enough **power** and **storage** to power an AI.

Conclusions

Data Storage, Data Processing, and Energy

These are the three main hardware limitations currently preventing significant progress. Of these, **energy** is the most significant and simultaneously difficult to overcome.

Despite the **theoretical** promise of our design; our group was unfortunately placed in a predicament due to the global pandemic. Prior to the shutdown, we decided to work on the element of hardware because we felt it had the most room for innovation. After designing the model, it became clear that we would not be able to pursue designing a physical specimen due to **accessibility** limitations.

Although the true potential of this design was never realized in the scope of the GCI course, we are confident that this could easily lead to tremendous results, if a prototype were to be constructed.

The Future

Our group has decided to continue pursuing this project beyond the GCI class.

We are hoping to find **funding** to actualize this design and experimentally determine our hypothesis. To that end, we will be creating a research grant proposal and submitting it to our institution and other foundations across the country, ideally, we will receive adequate funding to generate a full prototype for testing. Our **estimated** cost for the first prototype is $1,365