

VRC HS - Career Readiness Challenge

“Nvidia | Fueling AI”

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What is Nvidia:

What started off as a company that made graphics chips for video games has now become one of the highest-evaluated companies in the world for their revolutionary advances in artificial intelligence. Nvidia, founded in 1993, progressed alongside the modern computer and in part helped create the standard for GPUs found today. We'll be taking a closer look at what it takes, how they've done it, and the challenges that come with being the leading company for AI processing chips.

According to Jensen Huang, the CEO of Nvidia, the purpose for starting the company was "We felt, however, that there was a class of applications that wouldn't be possible without acceleration"(Nvidia CEO Jensen Huang on How His Big Bet on A.I. Is Finally Paying off - Full Interview.).



Jensen Huang
Courtesy of Nvidia Newsroom

Which paved the way for the modern graphics processing unit to become a staple in various industries worldwide. From media & entertainment to architecture and engineering, Nvidia's graphics cards are essential when

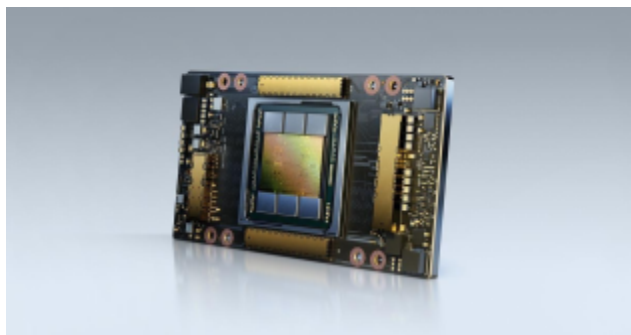
attempting to create detailed, high-quality models and renders for all sorts of applications. However, back in 2006, Nvidia made a pivotal decision to allow software developers to play with their GPUs.



RTX A6000 Graphics Card
Courtesy of Nvidia

The Jump to AI:

They later began constructing their first-ever AI cores. In today's world, it's Nvidia's processors that allow for AI software like ChatGPT, to become a reality and have single-handedly paved the way for the AI explosion. The question lies, what exactly makes Nvidia's AI cores so highly sought after? It boils down to a few things, optimization for scale and groundbreaking innovations. Now, it takes a lot of processors, we're talking thousands of Nvidia's A100s, required to allow ChatGPT to function. When needing processors at that quantity, the smaller and denser packaged they are the easier it is to store and manage each unit. The groundbreaking innovations made by Nvidia, are all thanks to their previous experience with GPUs. As it turns out, Nvidia's GPUs not



Nvidia A100
Courtesy of Nvidia

only excel at determining what each pixel on a screen should represent at a given time; but, thanks to that excellent computing capability, are also terrific at the kind of mathematics that underpins artificial intelligence. Thus with one foot already in the door, all Nvidia needed to do was optimize the processor in terms of efficiency and really focus on its defining feature, the processing speed.

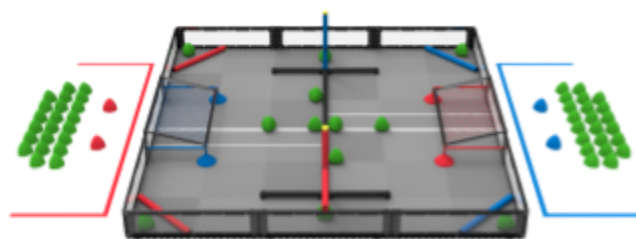
The Engineering Process:

How does this all tie into the engineering process? Let's go through this step by step. At first, the challenge was to adapt their already optimized GPUs to make them more suitable for AI. From there they looked into why their GPUs were being utilized for AI, which was due to their excellent processing speed. After that they delved deeper into what is needed in order to power AI, and made changes to their GPUs. What I believe to be the single greatest groundbreaking change Nvidia has brought to AI is their third-generation tensor cores, which enable training AI from spending weeks to merely hours. The issue AI has is that in order to up-scale it it needs to recognize more

situations and process more scenarios, all this comes from time spent training AI to perceive patterns. Nvidia has essentially industrialized this process, allowing large scale and mass learning to be completed in a fraction of the previously required time. It's breakthrough advancements like these that have propelled Nvidia to the top. They've isolated the strengths of their GPUs and continue to modify them to make them better suited for the desired task. This is a crucial part of the engineering process, being able to isolate flaws and find ways to improve them.

The VRC Program:

Tying all this back to robotics and our team specifically, as well as how the VRC program has prepared us for the future. As second years in the program, our previous experience in Spin Up can be seen as Nvidia's GPU, and entering a new season with an entirely new game; our goal is to take our preexisting knowledge, focusing on the flaws and determine what improvements need to be made for this season. What we as a team have realized is the importance of maneuverability in this year's game, so one of our main priorities is to have a



VRC Over Under
Courtesy of VEX

solid drivetrain which can cross the barrier and traverse the field efficiently. Just like Nvidia, we've spent a lot of time this season testing and adjusting. We've tried almost every possible drivetrain variation with different gear ratios and different wheel sizes. The drivetrain we've determined to be the best for us is 450 rpm on 2.75" wheels, for its swift maneuverability and 8 wheels for easy weight distribution. An initial design comes with lots of testing and adjustments, and just like any tech company in the world we're bound to run into issues; however, the challenge is then finding solutions. In the case of our drivetrain, we initially had struggles with it drifting, then through testing and analyzing we determined there was a major difference in friction for either side of the drivetrain. This thought process has much more application than just in robotics, being able to identify issues or flaws in any line of work is crucial for self-improvement. VRC prepares us for the future by providing us the necessary skills needed to excel like a company like Nvidia. This program trains us to practice the engineering process by giving us challenges that we don't see everyday and forcing us to come up with unique solutions.

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