

MY WEIRD PROMPTS

Podcast Transcript

EPISODE #174

The Power of Quintillions: Inside Supercomputing

Published January 05, 2026 • Runtime: 20:49

<https://myweirdprompts.com/episode/supercomputing-exascale-home-build/>

EPISODE SYNOPSIS

What defines a supercomputer in 2026, and why can't we just move these massive machines entirely to the cloud? In this episode, Herman and Corn break down the "heavy metal" of the tech world, from the rigorous benchmarks of the Top 500 list to the critical role of specialized interconnects. They also explore the practical (and thermal) limits of building a personal supercomputer at home, explaining why your bedroom might just turn into a furnace if you try to chase exascale dreams. It is a deep dive into the pinnacle of human engineering, packed with insights on AI training, climate modeling, and the sheer scale of modern processing power.

DANIEL'S PROMPT

Daniel

What exactly is a supercomputer, and what is the threshold for a computer to be considered in that category? Is there a ranking system for the biggest and best supercomputers in existence today, and how many are there globally? What are their primary functions, and why are they still on-premise instead of being run through cloud computing? Finally, how powerful of a computer could an individual realistically build or buy for a typical home or apartment, and at what point do factors like cost, space, and heat make building a personal supercomputer impractical?

TRANSCRIPT

Corn

Hey everyone, welcome back to My Weird Prompts. We are at episode two hundred seventy-five, which feels like quite a milestone, doesn't it? I am Corn, and I am sitting here in our living room in Jerusalem with my brother.

Herman

Herman Poppleberry, at your service. Two hundred seventy-five episodes. That is a lot of talking, Corn. I think we have covered everything from the history of buttons to the future of neural interfaces. But today, our housemate Daniel has sent us a prompt that gets right back to the heavy metal of the tech world.

Corn

It really does. Daniel was asking about the giants of the computing world. Specifically, supercomputers. He wants to know what they actually are, how we rank them, why they are still physically sitting in specialized buildings instead of just being in the cloud, and most importantly for the tinkerers out there, how close can a regular person get to building one at home before the neighbors start complaining about the heat?

Herman

I love this topic. It is one of those things where the scale is so vast that it almost becomes abstract. When we talk about supercomputers, we are talking about machines that can perform more calculations in a second than a human could in millions of years. It is the pinnacle of human engineering, really.

Corn

So let us start with the basics. What is the actual definition of a supercomputer? Because my phone is faster than the supercomputers of the nineteen eighties, but I do not call my iPhone a supercomputer. Is there a specific threshold or a line in the sand?

Herman

That is the tricky part, Corn. The definition is actually relative. A supercomputer is simply a computer that is at the current leading edge of processing capacity. It is a moving target. In the nineteen sixties, a machine that could do one million instructions per second was a supercomputer. Today, your smartwatch can do that without breaking a sweat. If you want a technical threshold, we usually look at the Top Five Hundred list. That is the gold standard for ranking these beasts. To even get on that list today, you are looking at performance measured in peta-flops.

Corn

Peta-flops. Let us break that down for people who might not spend their weekends reading hardware benchmarks. A "flop" is a floating point operation per second. Basically, an arithmetic calculation involving decimals. One peta-flop is one quadrillion of those per second. That is a one followed by fifteen zeros.

Herman

Exactly. And the top machines now are in the exa-scale range. An exa-flop is one quintillion operations per second. That is a one followed by eighteen zeros. To put that in perspective, if every person on Earth did one calculation every second, it would take the entire global population about four years to do what an exa-scale supercomputer does in one single second.

Corn

That is staggering. So, if the definition is relative, how do we actually rank them? You mentioned the Top Five Hundred list. How does that work? Is it just a race to see who has the most processors?

Herman

It is a bit more sophisticated than that, though raw power is the main metric. Twice a year, in June and November, the Top Five Hundred project releases its list. They use a benchmark called Linpack, which involves solving a dense system of linear equations. It is a very "math-heavy" test that pushes the processors and the memory to their limits. But there is also the Green Five Hundred list, which I think is just as important in twenty twenty-six. That ranks them based on energy efficiency. Because as these things get bigger, they consume as much power as a small city.

Corn

Right, and we have discussed the environmental impact of large scale computing before, specifically back in episode two hundred seventy-two when we talked about optimizing websites for AI bots. The energy cost of all this processing is a massive hurdle. So, how many of these machines are there globally? If the list is the top five hundred, are there thousands more just below that?

Herman

Oh, thousands. Every major university, national laboratory, and large corporation has something that could arguably be called a supercomputer, even if it does not make the top of the list. China, the United States, Japan, and the European Union are the big players. For a long time, the United States and China were neck-and-neck for the most systems on the list. Interestingly, in the last couple of years, we have seen a shift where some countries are becoming more secretive about their benchmarks for national security reasons.

Corn

That makes sense. These machines are not just for bragging rights. They have very specific, often sensitive functions. Daniel asked what they actually do. I know weather forecasting is the classic example, but what else?

Herman

Weather is a big one because the atmosphere is a chaotic system with millions of variables. But in twenty twenty-six, the biggest driver is actually artificial intelligence. Training these massive large language models requires exa-scale power. We touched on this in episode two hundred seven when we talked about computer use agents. Beyond AI, you have things like nuclear stockpile simulation. We do not do physical nuclear tests anymore, so we simulate them. Then there is genomic research, drug discovery, and materials science. Imagine trying to simulate how a new battery material will react at an atomic level over ten years. You need a supercomputer for that.

Corn

It is basically a laboratory that lives inside a silicon chip. But here is the question that Daniel raised, and I think it is a great one. We live in the age of the cloud. I can go on Amazon Web Services or Google Cloud and rent ten thousand virtual machines with a credit card. Why are these supercomputers still on-premise? Why build a specific building with specialized cooling in Oak Ridge, Tennessee, or outside of Tokyo when you could just "cloud" it?

Herman

This is where we get into the "secret sauce" of supercomputing, Corn. It is not just about having a lot of computers. It is about how they talk to each other. If you use the cloud, your data is traveling over standard data center networks. Even with high-speed fiber, there is latency. In a supercomputer, the "interconnect" is the most important part. They use specialized hardware like InfiniBand or proprietary systems like Hewlett Packard Enterprise's Slingshot.

Corn

So, it is the difference between a thousand people in different cities working on a project via email, versus a thousand people in the same room shouting to each other across the table?

Herman

Exactly! In a supercomputer, the processors need to share data almost instantaneously to solve a single problem. If one processor has to wait ten milliseconds for a piece of data from another processor, the whole system grinds to a halt. Cloud computing is great for "embarrassingly parallel" tasks, where you can run ten thousand independent jobs. But for a single, massive simulation where every part depends on every other part, you need that physical proximity and specialized wiring.

Corn

That makes so much sense. It is about the "connective tissue" of the machine. I want to dive into the personal side of this—what Daniel can actually build in our house—but before we do that, we should probably take a quick break for our sponsors.

Herman

Good idea. Let us see what Larry has for us today.

Corn

Let us take a quick break from our sponsors. Larry: Are you feeling sluggish? Does your brain feel like it is running on an old Pentium processor while the rest of the world is in the exa-scale era? Then you need the Brain-O-Matic Nine Thousand! It is a revolutionary head-mounted device that uses ultrasonic vibrations to "defrag" your thoughts. Simply strap the thirty-pound lead-lined helmet to your head before bed, plug it into a standard two hundred forty volt outlet, and let the Brain-O-Matic do the rest. Users report a sixty percent increase in their ability to remember where they left their keys, and a forty percent decrease in their ability to feel their eyebrows! It is science, probably! The Brain-O-Matic Nine Thousand—because a clear mind is a heavy mind. BUY NOW!

Corn

...Alright, thanks Larry. I am not sure I want to plug my head into a two hundred forty volt outlet, but the eyebrow side effect sounds... interesting?

Herman

I will stick to my morning coffee, thanks. Anyway, back to the world of high-performance computing.

Corn

So, Daniel's big question. He lives here with us in Jerusalem. He has a room, a desk, and a dream. How powerful of a computer could he realistically build or buy for a typical home or apartment in twenty twenty-six? At what point does it become a "personal supercomputer," and when does it become a fire hazard?

Herman

Well, the term "workstation" has really evolved. Today, you can go out and buy a system with a sixty-four core processor and multiple high-end graphics cards. If you look at something like the latest Nvidia Blackwell-based cards or the AMD equivalents, a single high-end desktop can technically outperform the world's fastest supercomputer from twenty years ago.

Corn

Right, but Daniel is talking about pushing the limits. Could he build a "cluster" in his bedroom?

Herman

He could! People do this. It is called a "Beowulf cluster." You take a bunch of off-the-shelf computers, link them together with high-speed ethernet, and run specialized software to make them act as one. But here is where he hits the "wall" that Daniel mentioned: cost, space, and heat.

Corn

Let us talk about the heat first. I know when I am rendering video on my laptop, it gets hot enough to cook an egg. If Daniel has ten machines running at full tilt, what are we looking at?

Herman

We are looking at a sauna, Corn. A high-end graphics card can pull four hundred to six hundred watts. If you have four of those in a machine, plus the processor and the rest of the components, you are pulling over two kilowatts from the wall. A standard room heater is usually about one point five kilowatts. So, one high-end "personal supercomputer" is literally more powerful than a space heater. If he builds a cluster of five or ten of those, he is basically trying to run a small furnace in his bedroom.

Corn

And our apartment in Jerusalem was not exactly designed for that kind of thermal load. We would need industrial air conditioning just to keep the room at a livable temperature. What about the power? Can a standard home outlet even handle that?

Herman

That is the real bottleneck. In a typical apartment, a single circuit is usually rated for fifteen or twenty amps. At one hundred twenty volts, that gives you about eighteen hundred to twenty-four hundred watts before the circuit breaker trips. So, Daniel could realistically run one very powerful machine on one circuit. If he wants a second one, he has to run an extension cord to the kitchen. If he wants a third, he is going to be tripping breakers every time someone turns on the toaster.

Corn

I can already hear the arguments about whose turn it is to use the electricity. "Sorry Herman, you can't make toast, I'm simulating the weather in the Galilee!"

Herman

Exactly. And then there is the noise. Supercomputer components are designed for data centers where noise does not matter. The fans on those things sound like a jet engine taking off. Imagine trying to sleep while a miniature hurricane is blowing through your room twenty-four seven.

Corn

So, at what point does it become impractical? If Daniel has a massive budget—say he won the lottery—could he actually buy something that is officially a "supercomputer"?

Herman

There are companies that sell "supercomputers-in-a-box." Nvidia has their DGX systems, for example. They are about the size of a large microwave, but they weigh hundreds of pounds and cost hundreds of thousands of dollars. They are designed to be "plug and play" for AI researchers. But even those usually require specialized power outlets—the kind you use for a clothes dryer or an electric stove.

Corn

So, if Daniel really wants to do this, he is probably better off looking at a high-end workstation with liquid cooling to manage the noise, and maybe just one or two top-tier graphics processing units. That gives him incredible power without melting the floorboards.

Herman

Precisely. And honestly, for most things Daniel wants to do—like experimenting with local AI models—a single, well-built machine is often more efficient than a cluster of older ones. We talked about this in episode two hundred seventy-three regarding the "twenty twenty-six problem" of AI tool sprawl. It is often better to have one very capable tool than ten mediocre ones.

Corn

That is a great point. It is about the "density" of the compute. I am curious about the future of this. We are seeing these machines get bigger and bigger, but we are also seeing specialized chips. Like, we are not just using general-purpose processors anymore. We have Tensor Processing Units and Neural Processing Units. Does that change what a supercomputer is?

Herman

It definitely changes the architecture. A modern supercomputer is a "heterogeneous" system. It has a mix of traditional central processing units and these specialized accelerators. It is like a kitchen where you have one head chef who is good at everything, but then you have twenty specialized assistants who only chop onions. If you need a thousand onions chopped, the assistants are way faster than the chef. That is how supercomputers handle AI and massive simulations now.

Corn

I wonder if we will ever see a "quantum" supercomputer on the Top Five Hundred list. We have been hearing about quantum computing for years, but it always feels like it is "ten years away."

Herman

We are actually seeing the first hybrid systems now in early twenty twenty-six. Some of the big labs are connecting small quantum processors to their classical supercomputers. The idea is that the classical machine handles ninety-nine percent of the work, but it "offloads" specific, incredibly complex math problems to the quantum chip. It is like having a calculator that can solve things that are literally impossible for a normal computer. But we are still a long way from a "pure" quantum supercomputer.

Corn

It is fascinating how we keep pushing these boundaries. It makes me think about the "why" again. Why do we need this much power? Is it just because we can, or is there a point of diminishing returns?

Herman

I do not think we have hit that point yet. Every time we get more power, we find more complex problems to solve. Think about climate change. Our current models are good, but they are still "coarse." We can predict what will happen to a country, but we cannot perfectly predict what will happen to a specific valley or a specific city over fifty years. To do that, we need to simulate the atmosphere at a much higher resolution. That requires orders of magnitude more power.

Corn

Or medicine. Instead of testing a drug on a thousand people and seeing what happens, we could eventually simulate the drug's effect on a billion different "digital twins" of human bodies, each with their own unique genetic makeup.

Herman

Exactly! That is the dream. A supercomputer that can simulate a human cell at the atomic level. We are nowhere near that yet. The complexity of a single cell is mind-boggling. So, as long as there are mysteries in biology, physics, and weather, we will keep building bigger boxes.

Corn

It is a bit humbling, really. We build these quintillion-operation-per-second machines, and they still cannot fully simulate a single blade of grass.

Herman

That is the beauty of it, Corn. It keeps us curious. And it keeps Daniel sending us these great prompts. I think the takeaway for Daniel is: yes, you can build a very powerful machine at home, but maybe invest in some good noise-canceling headphones and a really long extension cord before you start.

Corn

And maybe check the lease agreement for any "no industrial smelting" clauses. I think that covers it for today's deep dive into the world of supercomputers.

Herman

It was a fun one. It is always good to remember that while we talk about "the cloud" as this abstract thing, it is actually made of physical machines, miles of cables, and a whole lot of cooling fans.

Corn

Absolutely. And hey, if you have been enjoying My Weird Prompts, we would really appreciate it if you could leave us a quick review on your podcast app or on Spotify. It genuinely helps other curious people find the show.

Herman

It really does. We love seeing the community grow.

Corn

You can find us, as always, on Spotify and at our website, myweirdprompts.com. We have the full archive there, including those past episodes we mentioned like episode thirty-nine on batch processing. If you have a weird prompt of your own, there is a contact form on the site—we would love to hear from you.

Herman

Thanks to Daniel for the prompt, and thanks to all of you for listening. This has been My Weird Prompts.

Corn

Until next time, stay curious!

Herman

And keep your eyebrows safe from the Brain-O-Matic!

Corn

Goodbye everyone!

Herman

Bye!

