



NVIDIA Testimony  
June 14, 2017

## **Senate Commerce, Science, and Transportation Committee Hearing**

Thank you, Chairman Thune, Senator Nelson and distinguished members of the Committee.

I appreciate your invitation to give testimony today on the important subject of self-driving vehicle technology.

My name is Rob Csongor. I am vice president and general manager of NVIDIA's Automotive business. NVIDIA is one of the world's leading computer technology companies, headquartered in Silicon Valley, with more than 10,000 employees around the country and the world.

NVIDIA is focused on computer innovation at the intersection of visual processing, high performance computing, and artificial intelligence or AI — a unique combination at the heart of the world's next-generation computer systems. Our work has pioneered a supercharged form of computing relied on by the world's most demanding computer users including scientists, engineers, designers, and artists.

This form of computing is based on our invention nearly two decades ago of the GPU or graphics processing unit. The GPU was originally designed to power computer graphics, the pixels on our computer screens, but it has evolved into a powerful computer brain that processes massive amounts of data at extraordinary speed.

Ten years ago, researchers began to use GPUs to accelerate mathematically intense applications, such as mapping the human genome and predicting weather. More recently, scientists working in a new field of AI called deep learning, discovered that GPUs are critical to creating algorithms that enable computers to learn from experience and data, similar to how the human brain works. In a short period of time, AI algorithms rapidly outperformed code written manually by programmers. As a result, deep learning has become a strategic imperative for companies across many industries.

Google, Amazon, Microsoft, and Facebook use our AI technology in thousands of consumer applications. In the healthcare industry AI is accelerating the search for

cancer cures. For scientists and researchers, NVIDIA delivers supercomputing solutions used at the Department of Energy, the Department of Defense, and the National Institutes of Health among other organizations. Our nation's fastest supercomputer, at Oak Ridge National Lab, is powered by over 18,000 NVIDIA GPUs. And we are working with them to upgrade the system later this year to our newest processors, which should help the United States recapture the title of the world's fastest supercomputer.

Self-driving is an immense computational challenge. The car must be able to detect and perceive many objects, determine its precise position, plan safe paths from one point to another, and then drive while navigating complex situations. AI is the new breakthrough in computing that can solve these problems, and NVIDIA is focused on delivering this technology.

To this end, NVIDIA has created an open computing platform comprised of powerful processors in both the car and the data center, as well as a full, open software stack that carmakers and the ecosystem are building on.

Today, we are working with virtually every automaker on research and development of advanced self-driving vehicles using AI. Our technology is being used by more than 225 automotive companies worldwide. Audi, Tesla, Toyota, Volvo, and Mercedes have announced they will deploy vehicles using our technology.

We are now at the point where we can create AI systems that have levels of perception and performance far beyond humans, and importantly, do not get distracted, fatigued or impaired.

Much like humans gain knowledge through experience, AI systems improve over time with additional training data and testing.

The ability to create and test new features and functions, then securely update the car over the air like a smartphone or personal computer, enables us to quickly provide cars with safer algorithms and add more autonomous capabilities once they are proven.

Borrowing from our expertise in visual computing, we can use computer simulation to test challenging conditions like snow or blinding sun, as well as potentially hazardous situations without putting anyone in harms way. Our methodology, along with our partners, will combine multiple types of testing – in a data center, on proving grounds, on the road, and in computer simulations.

While we are working with our partners in industry to develop these technologies, NVIDIA looks forward to working with this Committee, the Department of Transportation, and NHTSA to ensure the safe deployment of autonomous vehicles.

With safety as the top priority, we believe new regulations are necessary. But we also believe there are opportunities to facilitate development and testing for companies developing these solutions. Safe, robust AI algorithms are improved through the collection of large amounts of data. Ideally, we would be able to test fleets across all states with their diverse driving conditions. A patchwork of different regulations in different regions hampers development and progress. It would be enormously beneficial to have a unified set of regulations across all states.

Together, as industry and government, we will work to safely and expeditiously bring autonomous vehicles to market and realize their enormous benefits: saving lives, improving traffic flow, increasing productivity, and providing mobility to the elderly, the blind and others who do not have it today. We are committed to this important mission and to driving the safe development and deployment of autonomous vehicles in the United States and the world.

Thank you for your time and consideration. I look forward to answering any questions.