



CUDA® is a parallel computing platform and programming model developed by NVIDIA for general computing on graphical processing units (GPUs). With CUDA, developers are able to dramatically speed up computing applications by harnessing the power of GPUs.

In GPU-accelerated applications, the sequential part of the workload runs on the CPU – which is optimized for single-threaded performance – while the compute intensive portion of the application runs on thousands of GPU cores in parallel. When using CUDA, developers program in popular languages such as C, C++, Fortran, Python and MATLAB and express parallelism through extensions in the form of a few basic keywords.

The CUDA Toolkit (/cuda-toolkit) from NVIDIA provides everything you need to develop GPU-accelerated applications. The CUDA Toolkit includes GPU-accelerated libraries, a compiler, development tools and the CUDA runtime.

[Download Now > \(/cuda-downloads\)](#)

Thousands of applications developed with CUDA have been deployed to GPUs in embedded systems, workstations, datacenters and in the cloud.





See More Applications (<http://www.nvidia.com/content/gpu-applications/PDF/gpu-applications-catalog.pdf>)

CUDA serves as a common platform across all NVIDIA GPU families so you can deploy and scale your application across GPU configurations.



DESKTOP  
DEVELOPMENT



# DATA CENTER SOLUTIONS



# EMBEDDED APPLICATIONS



# GPU-ACCELERATED CLOUD

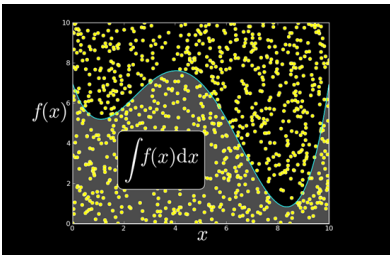
The first GPUs were designed as graphics accelerators, becoming more programmable over the 90s, culminating in NVIDIA's first GPU in 1999. Researchers and scientists rapidly began to apply the excellent floating point performance of this GPU for general purpose computing. In

2003, a team of researchers led by Ian Buck unveiled Brook, the first widely adopted programming model to extend C with data-parallel constructs. Ian Buck later joined NVIDIA and led the launch of CUDA in 2006, the world's first solution for general-computing on GPUs.

Since its inception, the CUDA ecosystem has grown rapidly to include software development tools, services and partner-based solutions. The CUDA Toolkit (/cuda-toolkit) includes libraries, debugging and optimization tools, a compiler and a runtime library to deploy your application.

You'll also find code samples, programming guides, user manuals, API references and other documentation to help you get started.

## Libraries



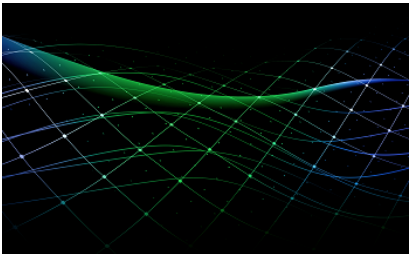
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cuRAND



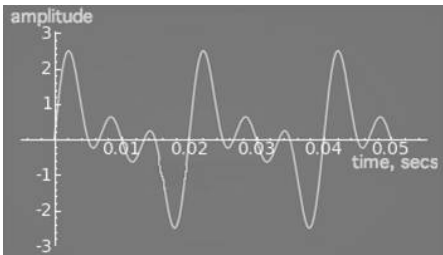
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NPP



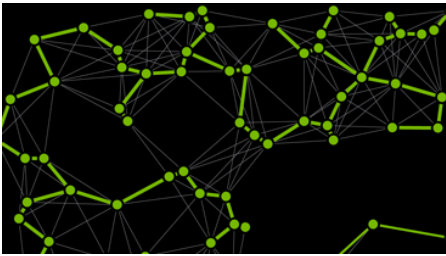
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Math Library



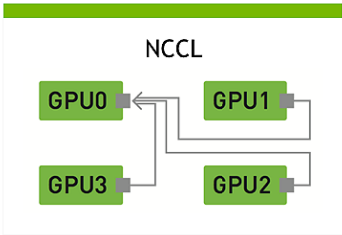
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cuFFT



(/nvgraph)

nvGRAPH



(/nccl)

NCCL

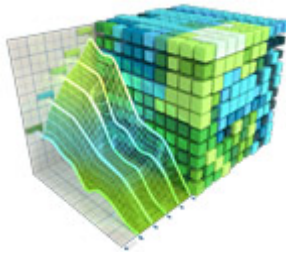
[See More Libraries \(/gpu-accelerated-libraries\)](#)

## Tools and Integrations



[\(/nsight\)](#)

Nsight



[\(/nvidia-visual-profiler\)](#)

Visual Profiler



[\(/cuda-gdb\)](#)

CUDA GDB

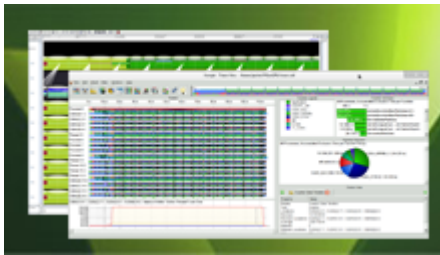


[\(/CUDA-MEMCHECK\)](#)

CUDA MemCheck

**OpenACC** [\(/openacc\)](#)  
OpenACC





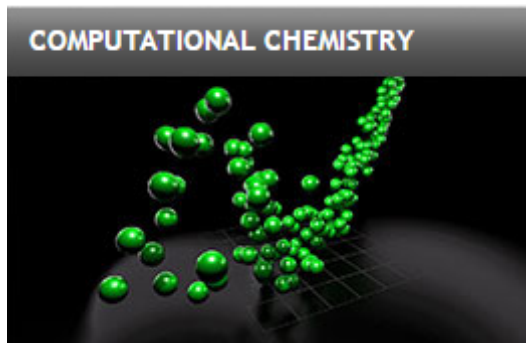
(/cuda-profiling-tools-interface)

CUDA Profiling Tools Interface

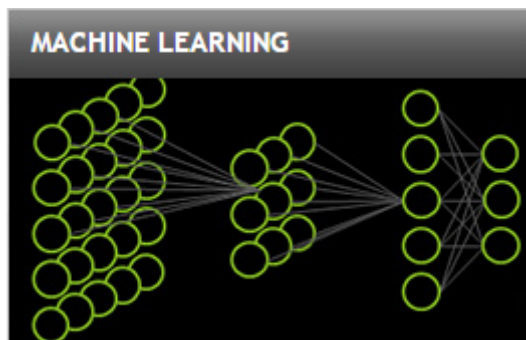
See More Tools (/tools-overview )

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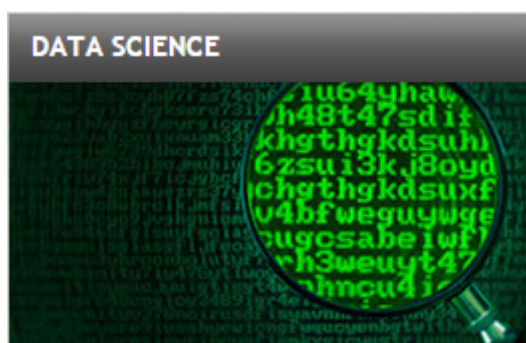
CUDA accelerates applications across a wide range of domains from image processing, to deep learning, numerical analytics and computational science.



([http://www.nvidia.com/object/computational\\_chemistry.html](http://www.nvidia.com/object/computational_chemistry.html))



(<http://www.nvidia.com/object/machine-learning.html>)



(<http://www.nvidia.com/object/data-science-analytics-database.html>)

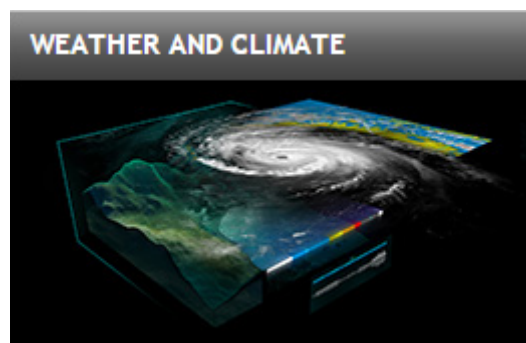




([http://www.nvidia.com/object/bio\\_info\\_life\\_sciences.html](http://www.nvidia.com/object/bio_info_life_sciences.html))



([http://www.nvidia.com/object/computational\\_fluid\\_dynamics.html](http://www.nvidia.com/object/computational_fluid_dynamics.html))



(<http://www.nvidia.com/object/weather.html>)

More Applications (<http://www.nvidia.com/object/gpu-applications-domain.html>)

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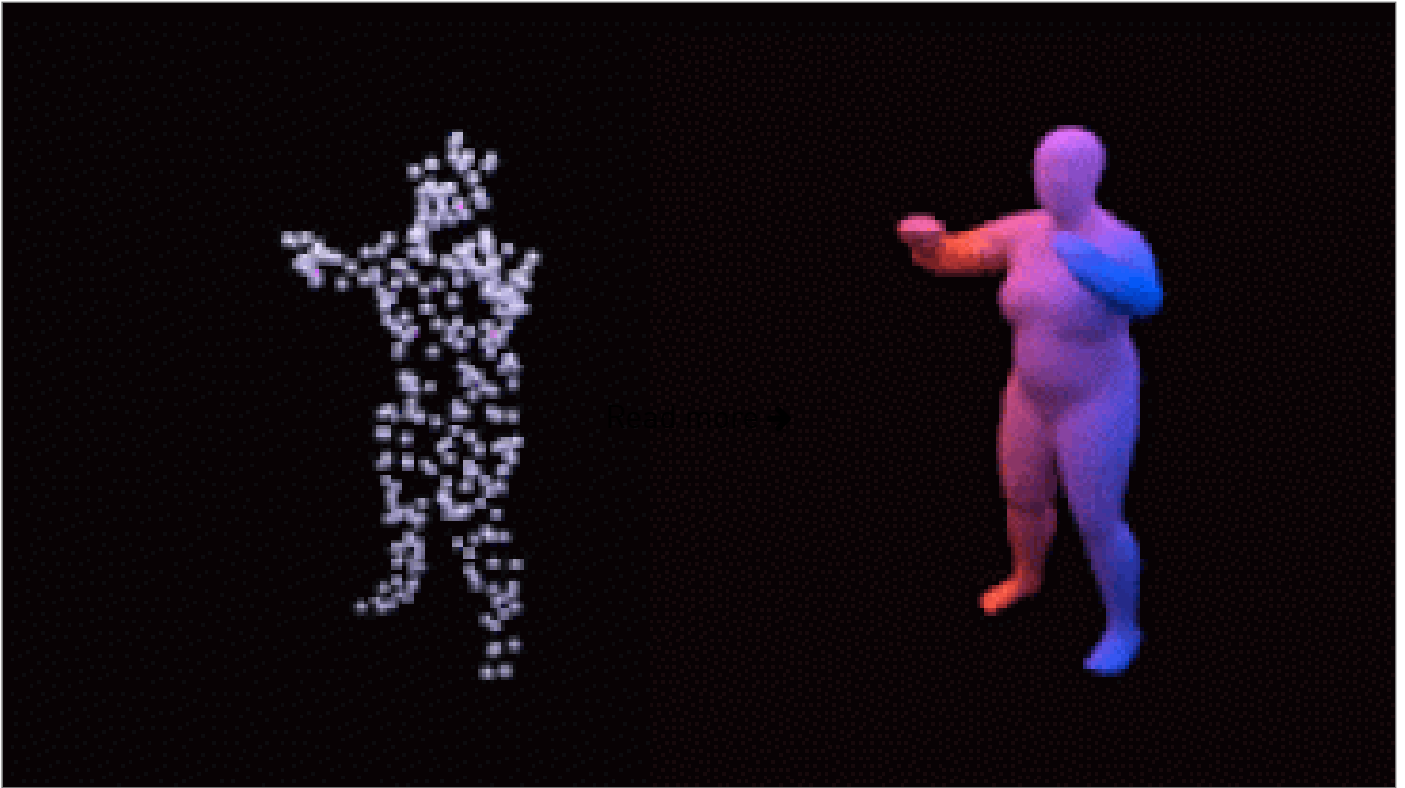
Get started with CUDA by downloading the CUDA Toolkit and exploring introductory resources including videos, code samples, hands-on labs and webinars.

[Download Now > \(/cuda-downloads\)](#)

[Get Started with CUDA > \(/how-to-cuda-c-cpp\)](#)

## Accelerated Computing News (<https://news.developer.nvidia.com>)

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(<https://news.developer.nvidia.com/?p=15733>)

AI / Deep Learning - Jan 10 2020

Occupancy Flow: 4D Reconstruction by Learning Particle Dynamics

(<https://news.developer.nvidia.com/?p=15733>)

This story is a guest post from researchers at the Max Planck Institute for Intelligent Systems. In this article, the researchers describe a new method for dense 4D reconstruction from images or sparse point clouds.

Read more (<https://news.developer.nvidia.com/?p=15733>)



(<https://news.developer.nvidia.com/?p=15729>)

AI / Deep Learning - Jan 09 2020

Nuance Accelerates Conversational AI Training by 50% (<https://news.developer.nvidia.com/?p=15729>)

Using Automatic Mixed Precision running on TensorFlow, Nuance has realized a 50% speedup in ASR and NLP model training on NVIDIA Volta GPUs without loss of accuracy, helping to reduce their time to market.

Read more (<https://news.developer.nvidia.com/?p=15729>)

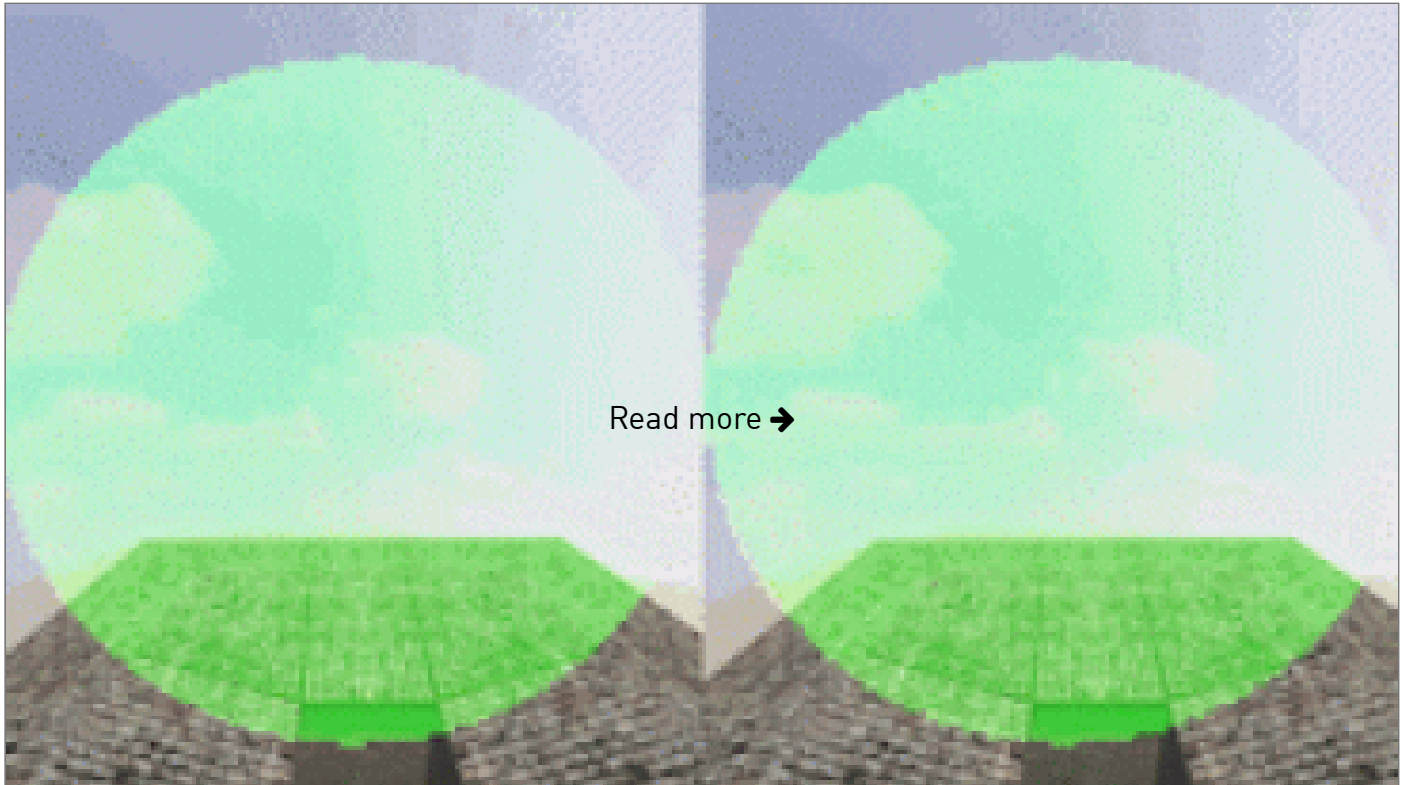


(<https://news.developer.nvidia.com/?p=15726>)

**AI / Deep Learning - Jan 08 2020****AI Helps Improve Tumor Diagnosis in the Operating Room (<https://news.developer.nvidia.com/?p=15726>)**

University of Michigan developed a deep learning-based imaging technique that can reduce the tumor diagnosis process during surgery from 30-40 minutes to less than three minutes.

[Read more \(<https://news.developer.nvidia.com/?p=15726>\)](https://news.developer.nvidia.com/?p=15726)



[\(<https://news.developer.nvidia.com/?p=15690>\)](https://news.developer.nvidia.com/?p=15690)

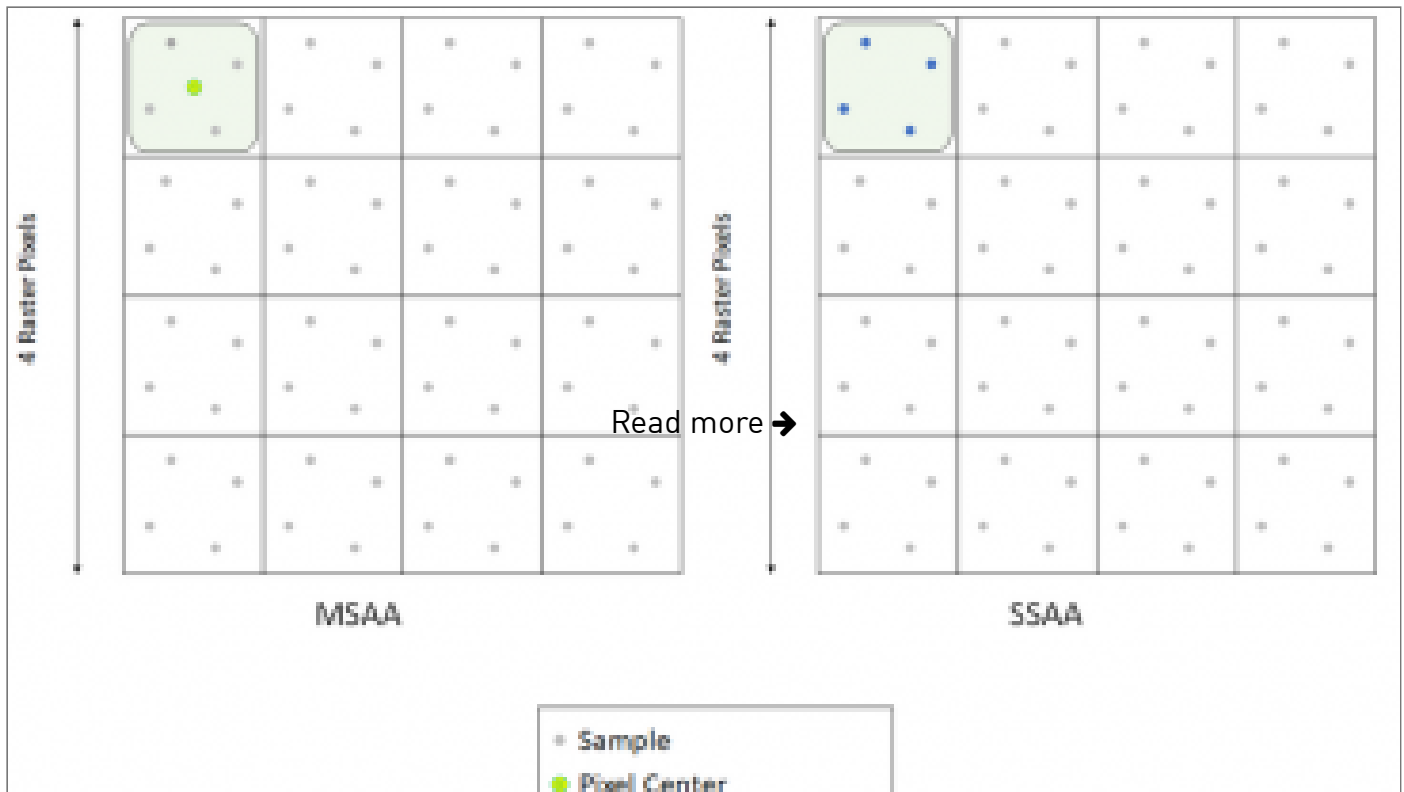
**Graphics / Simulation - Jan 07 2020****VRSS Boosts Image Quality in VR Without Writing a Single Line of Code (<https://news.developer.nvidia.com/?p=15690>)**

Submit your VR Game and Pro VR Apps to Boost Image Quality up to 8x without writing a single line of code.

[Read more \(<https://news.developer.nvidia.com/?p=15690>\)](https://news.developer.nvidia.com/?p=15690)

**Parallel ForAll Blog (<http://devblogs.nvidia.com/parallelforall/>)**

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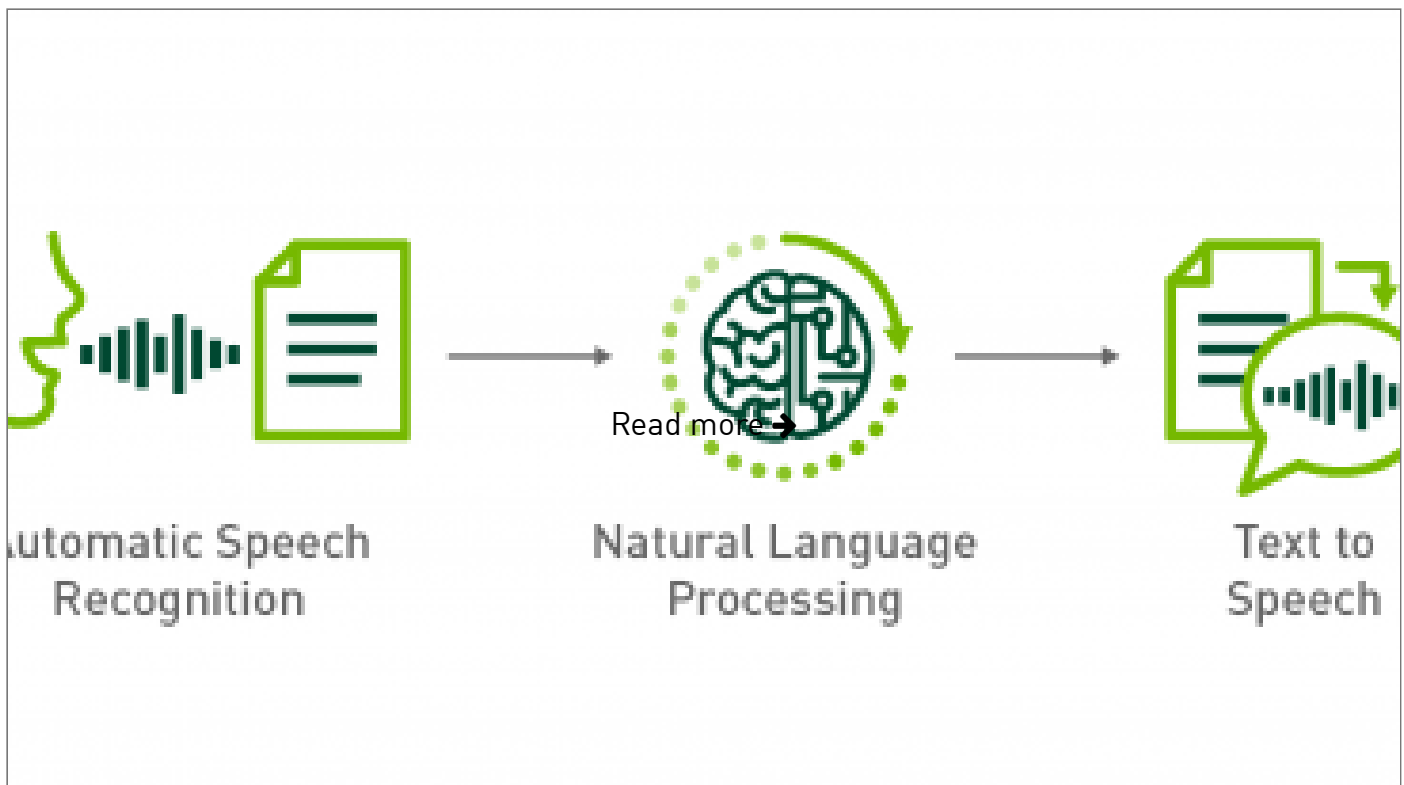
(<https://devblogs.nvidia.com/?p=16227>)

Graphics / Simulation - Jan 10 2020

NVIDIA VRSS, a Zero-Effort Way to Improve Your VR Image Quality (<https://devblogs.nvidia.com/?p=16227>)

The Virtual Reality (VR) industry is in the midst of a new hardware cycle – higher resolution headsets and better optics being the key focus points for the device manufacturers.

Read more (<https://devblogs.nvidia.com/?p=16227>)



(<https://devblogs.nvidia.com/?p=16159>)

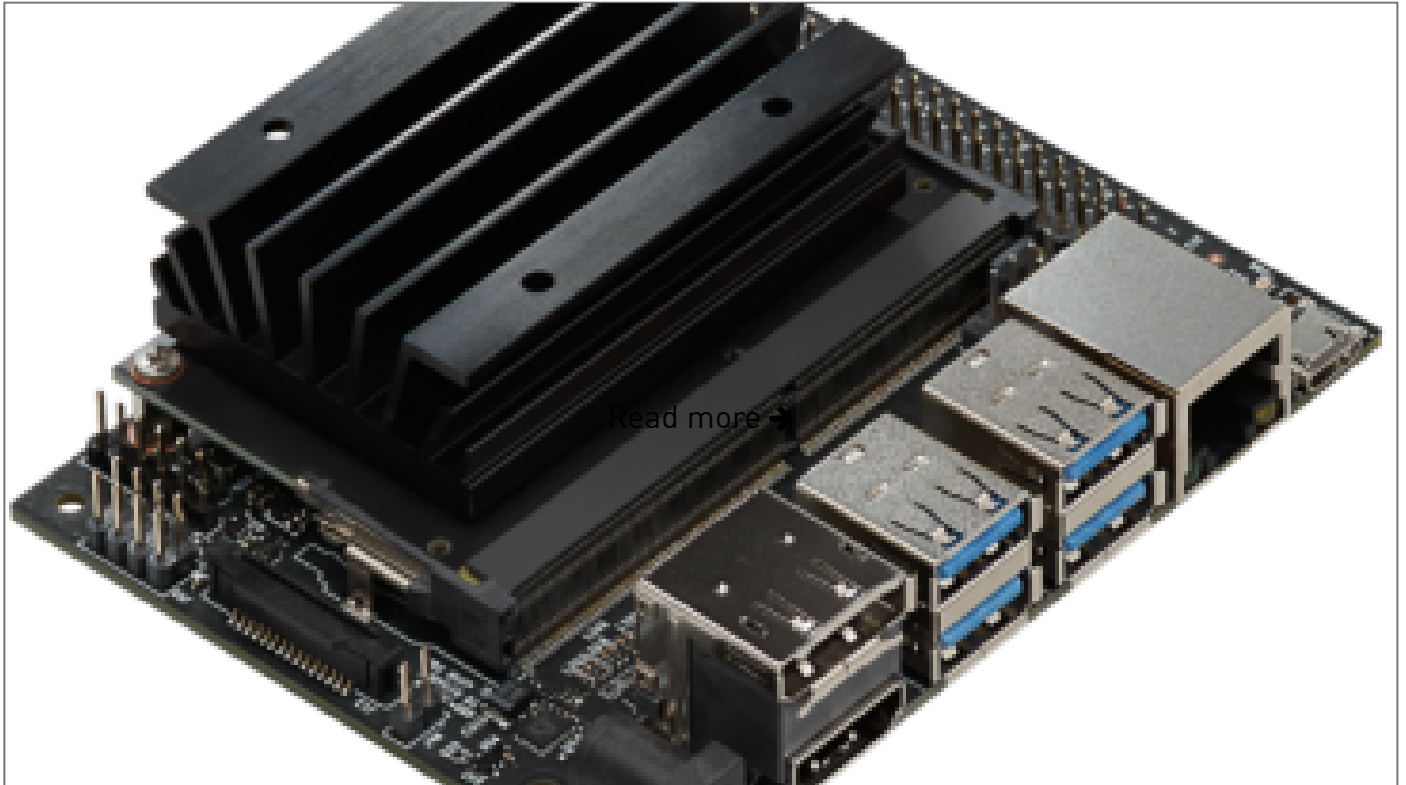
AI / Deep Learning - Jan 06 2020

## How to Deploy Real-Time Text-to-Speech Applications on GPUs Using TensorRT

(<https://devblogs.nvidia.com/?p=16159>)

Conversational AI is the technology that allows us to communicate with machines like with other people. With the advent of sophisticated deep learning models, the human-machine communication has risen to unprecedented levels.

Read more (<https://devblogs.nvidia.com/?p=16159>)



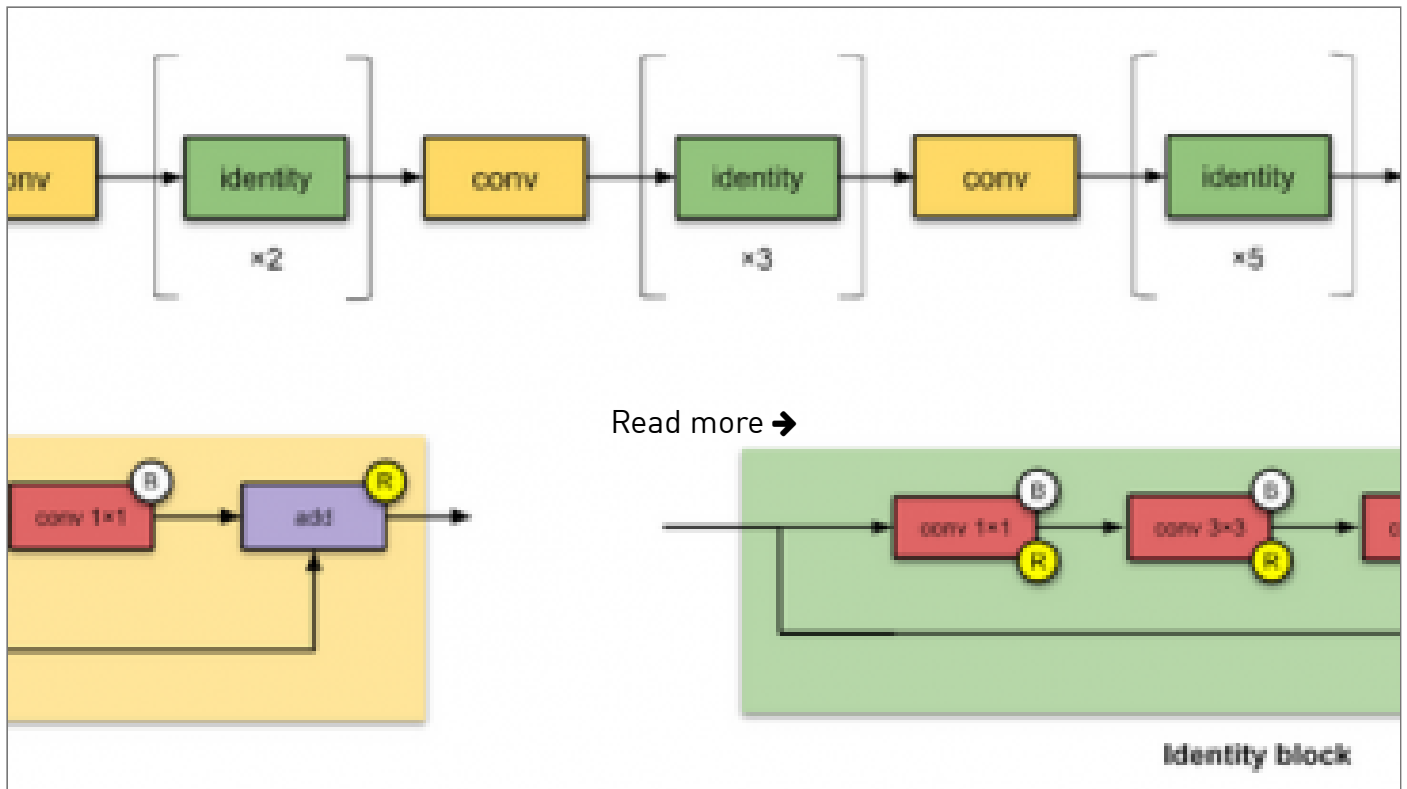
(<https://devblogs.nvidia.com/?p=16183>)

AI / Deep Learning - Dec 19 2019

## NVIDIA Developer Blog 2019 Highlights (<https://devblogs.nvidia.com/?p=16183>)

We published nearly 100 technical blogs this year on the NVIDIA Developer Blog to help developers across a variety of industries develop their GPU-accelerated applications and the site had millions of page views.

Read more (<https://devblogs.nvidia.com/?p=16183>)



(<https://devblogs.nvidia.com/?p=16144>)

AI / Deep Learning - Dec 18 2019

How to Run NGC Deep Learning Containers with Singularity (<https://devblogs.nvidia.com/?p=16144>)

New scientific breakthroughs are being made possible by the convergence of HPC and AI.

Read more (<https://devblogs.nvidia.com/?p=16144>)

HIGH PERFORMANCE COMPUTING (/HPC)

GAMEWORKS (/GAMEWORKS)

JETPACK (/EMBEDDED-COMPUTING)

DESIGNWORKS (/DESIGNWORKS)

DRIVE (/DRIVE)

## GET STARTED

About CUDA (/about-cuda)

Parallel Computing (/accelerated-computing-training)

CUDA Toolkit (/cuda-toolkit)

CUDACasts (<http://www.youtube.com/playlist?list=PL5B692fm6--vScfBaxgY89IRWFzDt0Khm>)



## LEARN MORE

Training and Courseware (</cuda-education-training>)

Tools and Ecosystem (</tools-ecosystem>)

Academic Collaboration (</higher-education-and-research>)

Documentation (<http://docs.nvidia.com/cuda/index.html>)

## GET INVOLVED

Forums (<https://devtalk.nvidia.com/>)

Developer Blog (<http://devblogs.nvidia.com/parallelforall/>)

Contact Us (</contact>)

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