

TensorFlow - Google's latest machine learning system, open sourced for everyone

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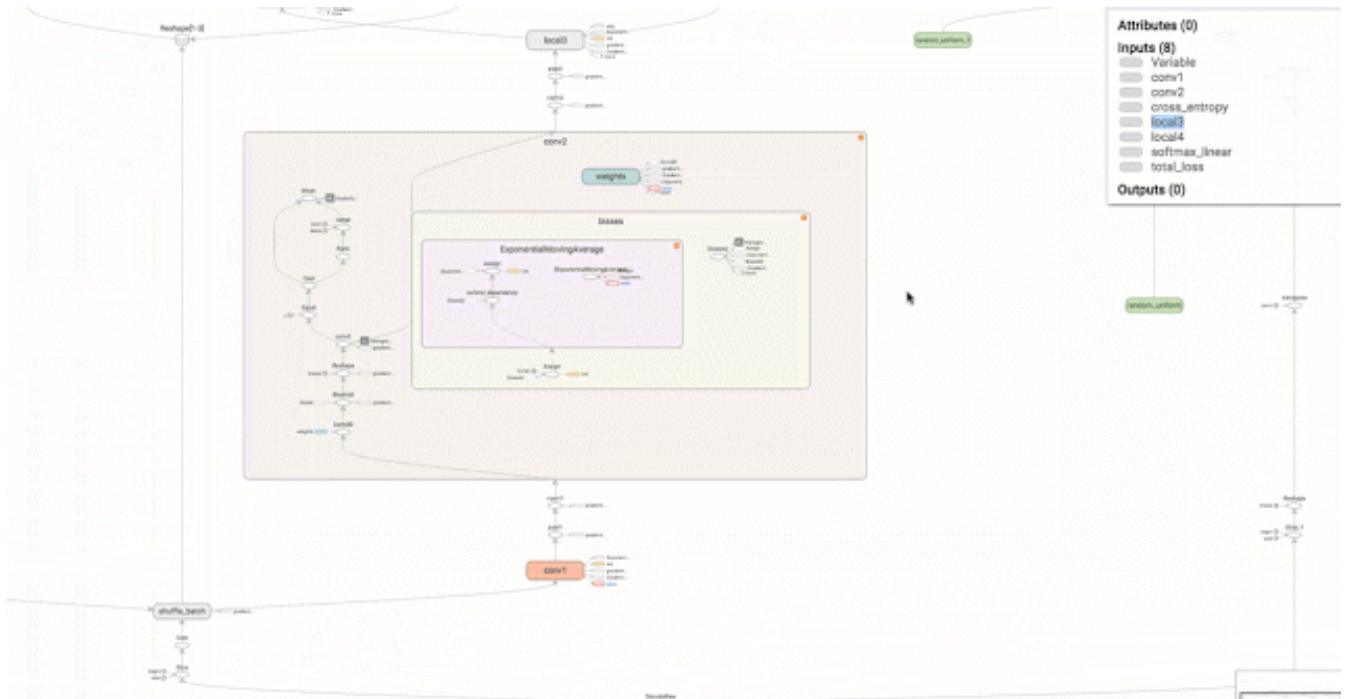
Deep Learning has had a huge impact on computer science, making it possible to explore new frontiers of research and to develop amazingly useful products that millions of people use every day. Our internal deep learning infrastructure [DistBelief](#), developed in 2011, has allowed Googlers to build ever larger [neural networks](#) and scale training to thousands of cores in our datacenters. We've used it to demonstrate that [concepts like "cat"](#) can be learned from unlabeled YouTube images, to improve speech recognition in [the Google app](#) by 25%, and to build image search [in Google Photos](#). DistBelief also trained the Inception model that won Imagenet's [Large Scale Visual Recognition Challenge in 2014](#), and drove our experiments in [automated image captioning](#) as well as [DeepDream](#).

While DistBelief was very successful, it had some limitations. It was narrowly targeted to neural networks, it was difficult to configure, and it was tightly coupled to Google's internal infrastructure -- making it nearly impossible to share research code externally.

Today we're proud to announce the open source release of [TensorFlow](#) -- our second-generation machine learning system, specifically designed to correct these shortcomings. TensorFlow is general, flexible, portable, easy-to-use, and completely open source. We added all this while improving upon DistBelief's speed, scalability, and production readiness -- in fact, on some benchmarks, TensorFlow is twice as fast as DistBelief (see the [whitepaper](#) for details of TensorFlow's programming model and implementation).



TensorFlow has extensive built-in support for deep learning, but is far more general than that -- any computation that you can express as a computational flow graph, you can compute with TensorFlow (see some [examples](#)). Any gradient-based machine learning algorithm will benefit from TensorFlow's [auto-differentiation](#) and suite of first-rate optimizers. And it's easy to express your new ideas in TensorFlow via the flexible Python interface.

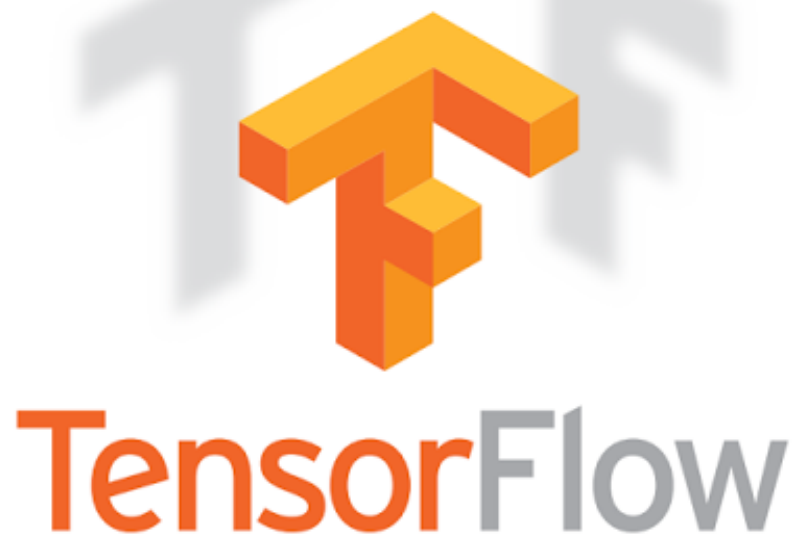


Inspecting a model with TensorBoard, the visualization tool

TensorFlow is great for research, but it's ready for use in real products too. TensorFlow was built from the ground up to be fast, portable, and ready for production service. You can move your idea seamlessly from training on your desktop GPU to running on your mobile phone. And you can get started quickly with powerful machine learning tech by using our state-of-the-art [example model architectures](#). For example, we plan to release our complete, top shelf ImageNet computer vision model on TensorFlow soon.

But the most important thing about TensorFlow is that it's yours. We've open-sourced TensorFlow as a standalone library and associated tools, tutorials, and examples with the Apache 2.0 license so you're free to use TensorFlow at your institution (no matter where you work).

Our deep learning researchers all use TensorFlow in their experiments. Our engineers use it to infuse Google Search with signals derived from deep neural networks, and to power the magic features of tomorrow. We'll continue to use TensorFlow to serve machine learning in products, and our research team is committed to sharing TensorFlow implementations of our published ideas. We hope you'll join us at www.tensorflow.org.



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