Geekbench 4
Compute Workloads

PRIMATE LABS

Introduction

This document outlines the workloads included in the Geekbench 4 Compute Benchmark suite.

Compute Benchmark scores are used to evaluate and optimize GPU Compute performance using workloads that include image processing, computational photography, computer vision, and machine learning. Performance in these workloads is important for a wide variety of applications including cameras, image editors, and real-time renderers.

Platform Support

Platform	Minimum Version	Comment
Android	Android 5.0 “Lollipop”	
iOS	iOS 9.0	
Linux	Ubuntu 14.04 LTS	CentOS 7.5 also supported
macOS	macOS 10.11	
Windows	Windows 7	

API Support

Geekbench 4 supports the following GPU Compute APIs:

API	Version	Comment
CUDA	CUDA 7.5	Compute Capability 1.1 or later
Metal		
OpenCL	OpenCL 1.1	
RenderScript		

Runtime

Geekbench 4 runs Compute workloads in the order listed here as the Compute Benchmark. Each workload is run for 20 iterations by default.

Scores

Geekbench 4 provides one overall score for the Compute Benchmark. The overall score is the geometric mean of the scores of the individual Compute workloads.

Comparing Scores

Each Compute workload has an implementation for each supported Compute API. While it is possible to compare scores across APIs (e.g., a OpenCL score with a Metal score) it is important to keep in mind that due to the nature of Compute APIs, the performance difference can be due to more than differences in the underlying hardware (e.g., the GPU driver can have a huge impact on performance).

Compute Workloads

Sobel

The Sobel operator is used in image processing and computer vision for finding edges in images.

The Sobel workload converts anRGB image to greyscale and computes the Sobel operator for the greyscale image. The operator uses two integer convolutions (one for horizontal edges, and one for vertical edges) to compute the final image.

Histogram Equalization

Histogram equalization is a method in image processing of contrast adjustment using the image's histogram. The Histogram Equalization workload performs this adjustment on a 2576×3872 image.

The Compute and CPU implementations of the Histogram Equalization workload produce comparable output.

SFFT

FFT (Fast Fourier Transform) decomposes an input signal into a linear combination of a basis of trigonometric polynomials. FFT is a core algorithm in many signal-processing applications.

The FFT workload executes an FFT on a 32MB input buffer operating in 16KB chunks. This is similar to how FFT is used to perform frequency analysis in an audio processing application.

The Compute and CPU implementations of the FFT workload produce comparable output.

Gaussian Blur

Gaussian Blur blurs an image using a Gaussian spatial filter. Gaussian Blurs are widely used in software—both in operating systems to provide interface effects, and in image editing software to reduce detail and noise in an image. Gaussian Blurs are also used in computer vision applications to enhance image structures at different scales.

The Gaussian Blur workload blurs an image using a Gaussian spatial filter. While the Gaussian Blur implementation supports an arbitrary sigma, the workload uses a fixed sigma of 1.0f. This sigma translates into a filter diameter of 9 pixels.

The Compute and CPU implementations of the Gaussian Blur workload produce comparable output.

Face Detection

Implementation of face detection using the algorithm presented in “Rapid Object Detection using a Boosted Cascade of Simple Features” (2001) by Viola and Jones.

The Compute and CPU implementations of the Face Detection workload produce comparable output.

RAW Processing

Processes the raw data from a digital camera sensor into an RGB image. RAW Processing has several steps: debayering, denoising, colour correction, gamma correction, sharpen, and quantization.

Depth of Field

Computes a lens blur “depth of field” image given two images — a depth image and a colour image — by applying a blur to each pixel of the colour image that is proportional to the distance of the pixel from the focal point (as determined by the depth image).

Particle Physics

Similar to the N-Body CPU workload, but the Compute workload includes elastic collision of the particles and ignores other particle-particle forces.