

# Eigen Guide

## Eigen Overview

The Eigen library is probably the most popular C++-based, high-performance dense linear algebra library. It implements matrix and vector operations, geometric transformations, numerical solvers, and related algorithms. Eigen uses template metaprogramming techniques to allow developers to express complex linear algebra in a domain-specific language (DSL). The DSL allows expression trees to be built at compile-time, and used to process data at run-time. The Eigen tensor (n-dimensional array) operations are used as part of the TensorFlow framework along with other Eigen operations.

The library benefits from acceleration using heterogeneous hardware, since matrix and vector operations require many parallel calculations and are thus suited to parallelization on GPUs. Until now, the Eigen library only supported CPUs and NVIDIA CUDA® graphics processors, limiting the hardware options for developers. Codeplay has added OpenCL™ hardware support to Eigen, to offer a wider range of hardware to developers via the SYCL™ open standard.

Take a look at the **Eigen Build Options Guide** to find out about the SYCL accelerated Eigen operations. There is also a **blog article** that explains how the SYCL implementation of Eigen was implemented.