**Report on CUDA Libraries**

**CS17B023**

**Nitesh Kumar**

NVIDIA CUDA-X is a collection of libraries and tools that provides very high performance when compared to CPU-only alternatives. They provide the easiest way to get started with GPU Acceleration.

Let’s see the various components in the library:

**Math Libraries-** used for compute intensive applications

* cuBLAS – basic linear algebra library
* CUDA Math library – for standard mathematical functions
* cuFFT – for Fast Fourier Transforms
* cuTensor – Tensor linear algebra library
* cuRAND – for generating random number
* cuSPARSE – for handling sparse matrices

**Parallel Algorithm Libraries –**

Thrust – this is a library of C++ for running parallel algorithms. It contains GPU accelerated sort, scan, transform and reduction operations.

**Image and video Libraries:** used for image and video decoding, encoding.

* nvJPEG – library for JPEG decoding
* Performance Primitives – contains audio, video and signal processing functions.
* Video Codec SDK – video encoding and decoding
* Optical Flow SDK – compute relative motion of pixels between images.

**Deep Learning Libraries –** libraries for deep learning applications

* cuDNN – primitive library for Deep neural networks
* TensorRT – runtime for production deployment
* Jarvis – used for developing engaging AI powered conversation apps.
* DeepStream SDK – toolkit for AI-based video understanding and multi-sensor processing
* DALI – decoding and augmenting images and videos to accelerate deep learning applications

**Communication Libraries –**

Multi node communication primitives.

* NVSHMEM – OPenSHMEM standard for GPU memory, with extensions for improved performance.
* NCCL – fast multi-GPU, multi-node communications that maximises bandwidth while maintaining low latency.

**Partner Libraries:**

* OpenCV – computer vision, image processing, machine learning.
* FFmpeg – multimedia framework with plugins for audio and video processing.
* ArrayFire – matrix, signal and image processing
* IMSL Fortran Numerical Library
* Gunrock – Graph processing in GPU
* CUVllib – image applications from medical, industrial and defence domains.