SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

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DEPARTMENT OF AIML

AI IN WEB TECHNOLOGY

III YEAR - VI SEM

UNIT 4 – Tensor Flow

TensorFlow

TensorFlow

- TensorFlow is a leading open-source library designed for developing and deploying state-of-the-art machine learning applications.

What Is Tensorflow

- Heavily used by data scientists, software developers, and educators, TensorFlow is an open-source platform for machine learning using data flow graphs.
- Nodes in the graph represent mathematical operations, while the graph edges represent the multidimensional data arrays (tensors) that flow between them.
- This flexible architecture allows machine learning algorithms to be described as a graph of connected operations.
- They can be trained and executed on GPUs, CPUs, and TPUs across various platforms without rewriting code, ranging from portable devices to desktops to high-end servers.
- This means programmers of all backgrounds can use the same toolsets to collaborate, significantly boosting their efficiency.
- Developed initially by the Google Brain Team for the purposes of conducting machine learning and deep neural networks (DNNs) research, the system is general enough to be applicable in a wide variety of other domains as well.

How TensorFlow Works

- There are three distinct parts that define the TensorFlow workflow, namely preprocessing of data, building the model, and training the model to make predictions.
- The framework inputs data as a multidimensional array called tensors and executes in two different fashions.
- The primary method is by building a computational graph that defines a dataflow for training the model.
- The second, and often more intuitive method, is using eager execution, which follows imperative programming principles and evaluates operations immediately.

How TensorFlow Works

- Using the TensorFlow architecture, training is generally done on a desktop or in a data center.
- In both cases, the process is sped up by placing tensors on the GPU.
- Trained models can then run on a range of platforms, from desktop to mobile and all the way to cloud.
- TensorFlow also contains many supporting features.
- For example, TensorBoard, which allows users to visually monitor the training process, underlying computational graphs, and metrics for purposes of debugging runs and evaluating model performance.

How TensorFlow Works

- Tensor board is the unified visualization framework for Tensorflow and Keras.
- Keras is a high-level API that runs on top of TensorFlow.
- Keras furthers the abstractions of TensorFlow by providing a simplified API intended for building models for common use cases.
- The driving idea behind the API is being able to translate from idea to a result in as little time as possible.

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Benefits of TensorFlow

- TensorFlow can be used to develop models for various tasks, including natural language processing, image recognition, handwriting recognition, and different computational-based simulations such as partial differential equations.
- The key benefits of TensorFlow are in its ability to execute low-level operations across many acceleration platforms, automatic computation of gradients, production-level scalability, and interoperable graph exportation.

Benefits of TensorFlow

- By providing Keras as a high-level API and eager execution as an alternative to the dataflow paradigm on TensorFlow, it's always easy to write code comfortably.
- As the original developer of TensorFlow, Google still strongly backs the library and has catalyzed the rapid pace of its development.
- For example Google has created an online hub for sharing the many different models created by users.

TensorFlow Specific Business Use Cases

- **Image processing and video detection.** Airplane manufacturing giant Airbus is using TensorFlow to extract and analyze information from satellite images to deliver valuable real-time information to clients.
- **Time series algorithms.** Kakao uses TensorFlow to predict the completion rate of ride-hailing requests.
- **Tremendous scale capabilities.** NERSC scaled a scientific deep learning application to more than 27,000 NVIDIA V100 Tensor Core GPUs using TensorFlow.

TensorFlow Specific Business Use Cases

- **Modeling.** Using TensorFlow for deep transfer learning and generative modeling, PayPal has been able to recognize complex, temporarily varying fraud patterns while improving the experience of legitimate customers through expedited customer identification.
- **Text recognition.** SwissCom's custom-built TensorFlow model improved business by classifying text, determining the intent of customers upon receiving calls.
- **Tweet prioritization.** Twitter used TensorFlow to build its Ranked Timeline, ensuring that users don't miss their most important tweets, even when following thousands of users.

Why TensorFlow Matters to You

- **Data scientists**
  The many different available routes to develop models with TensorFlow means that the right tool for the job is always available, expressing innovative ideas and novel algorithms as quickly as possible.
- As one of the most common libraries for developing machine learning models, it’s typically easy to find TensorFlow code from previous researchers when trying to replicate their work, preventing the loss of time to boilerplate and redundant code.

Why TensorFlow Matters to You

- **Software developers**
  TensorFlow can run on a wide variety of common hardware platforms and operating environments.
- With the release of TensorFlow 2.0 in late 2019, it's even easier to deploy TensorFlow models on a greater variety of platforms.
- The interoperability of models created with TensorFlow means that deployment is never a difficult task.

TensorFlow and NVIDIA

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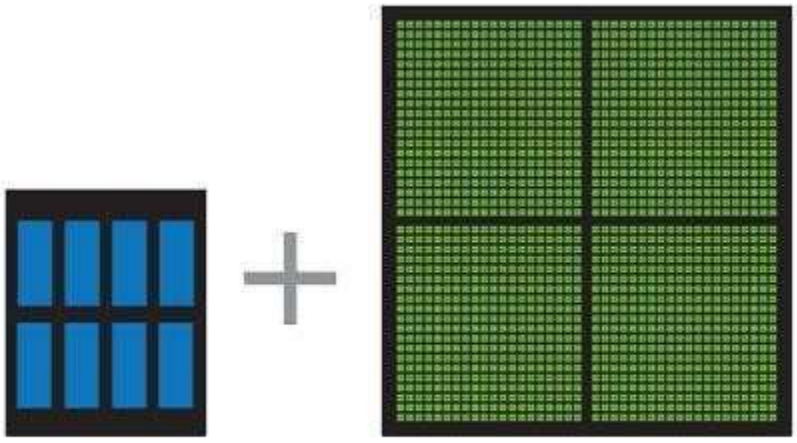


TensorFlow and NVIDIA

- A decade ago, researchers discovered that GPUs are very adept at matrix operations, as well as algebraic calculations, and deep learning relies heavily on both of them.
- TensorFlow runs up to 50% faster on the latest NVIDIA Pascal GPUs and scales well across GPUs.
- Now you can train the models in hours instead of days.

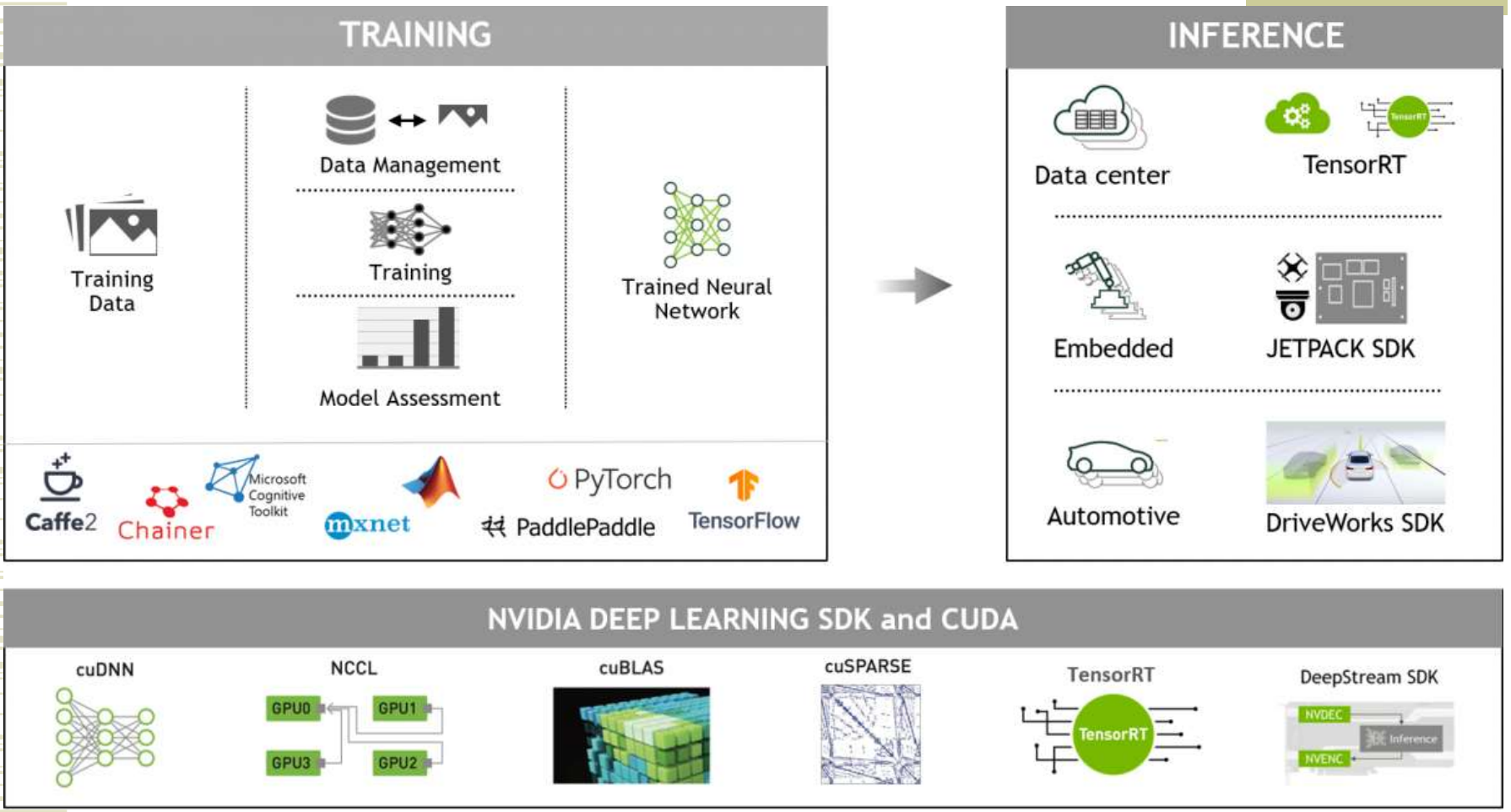
TensorFlow and NVIDIA

- TensorFlow is written both in optimized C++ and the NVIDIA® CUDA® Toolkit, enabling models to run on GPU at training and inference time for massive speedups.
- TensorFlow GPU support requires several drivers and libraries.
- To simplify installation and to avoid library conflicts, it's recommended to leverage a TensorFlow Docker image with GPU support.
- This set-up only requires the NVIDIA GPU drivers and the installation of NVIDIA-docker.
- Users can pull containers from NGC (NVIDIA GPU Cloud) preconfigured with pretrained models and TensorFlow library support.

NVIDIA Deep Learning for Developers

- GPU-accelerated deep learning frameworks offer flexibility to design and train custom deep neural networks and provide interfaces to commonly used programming languages such as Python and C/C++.
- Widely used deep learning frameworks such as MXNet, PyTorch, TensorFlow, and others rely on NVIDIA GPU-accelerated libraries to deliver high-performance, multi-GPU accelerated training.

NVIDIA Deep Learning for Developers



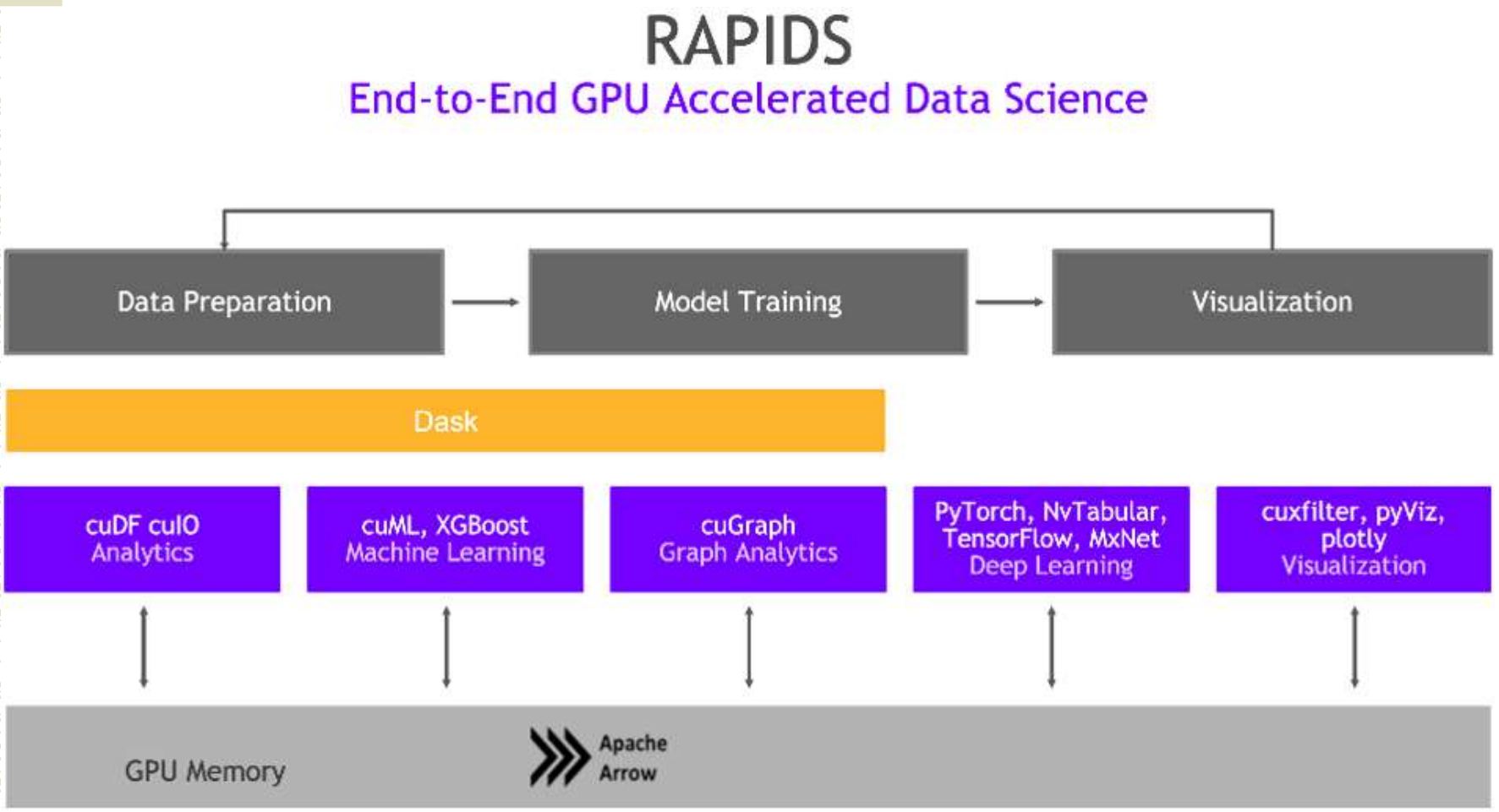
NVIDIA GPU-Accelerated End-to-End Data Science

- The NVIDIA RAPIDS™ suite of open-source software libraries, built on CUDA-X AI, gives you the ability to execute end-to-end data science and analytics pipelines entirely on GPUs.
- It relies on NVIDIA CUDA primitives for low-level compute optimization, but exposes that GPU parallelism and high-bandwidth memory speed through user-friendly Python interfaces.

NVIDIA GPU-Accelerated End-to-End Data Science

- With the RAPIDS GPU DataFrame, data can be loaded onto GPUs using a Pandas-like interface, and then used for various connected machine learning and graph analytics algorithms without ever leaving the GPU.
- This level of interoperability is made possible through libraries like Apache Arrow and allows acceleration for end-to-end pipelines—from data prep to machine learning to deep learning.

NVIDIA GPU-Accelerated End-to-End Data Science



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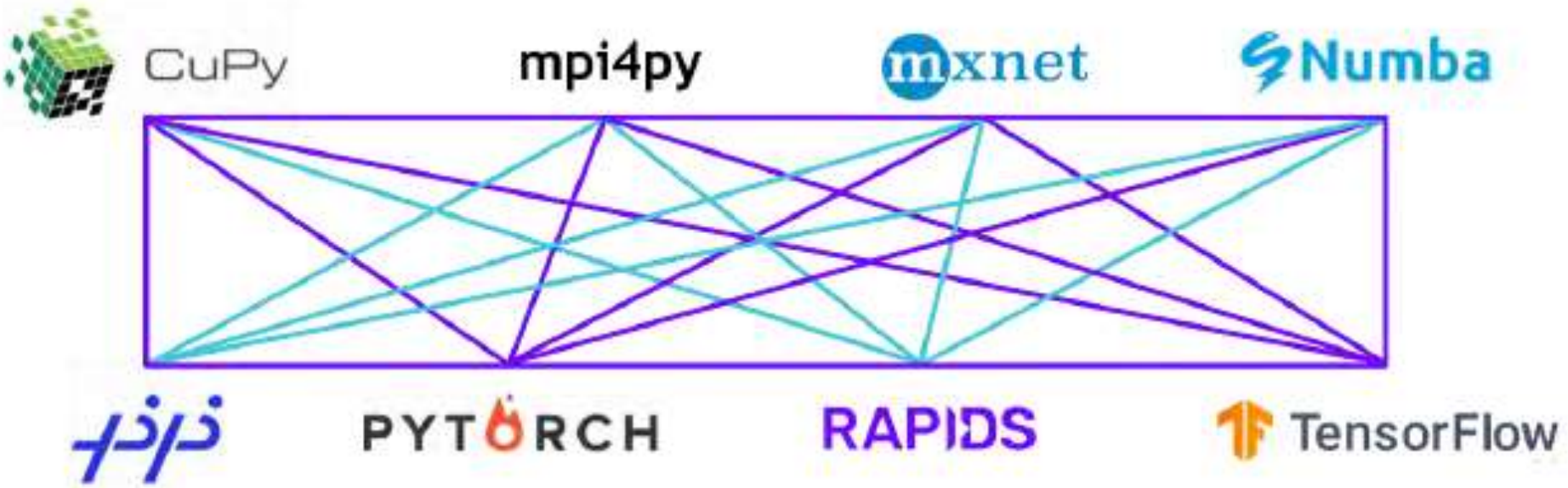

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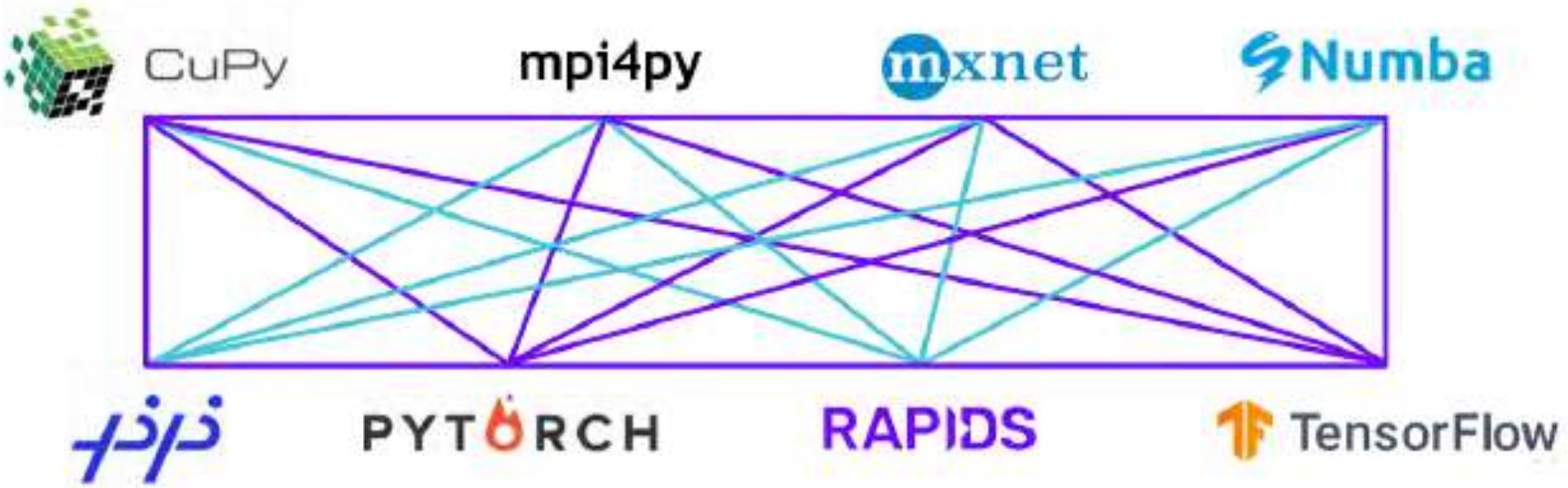

WIX website

- Wix.com is an Israeli software company, publicly listed in the US, that provides cloud-based web development services.
- It offers tools for creating HTML5 websites and mobile sites using online drag-and-drop editing.
- Along with its headquarters and other offices in Israel, Wix also has offices in Brazil, Canada, Germany, India, Ireland, Japan, Lithuania, Poland, the Netherlands, the United States, Ukraine, and Singapore.

WIX website

- Users can add applications for social media, e-commerce, online marketing, contact forms, e-mail marketing, and community forums to their web sites.
- The Wix website builder is built on a freemium business model, earning its revenues through premium upgrades.
- According to the W3Techs technology survey website, Wix is used by 2.5% of websites as of September 2023.

WIX- Product development

- Wix was founded in 2006 by Israeli developers Avishai Abrahami, Nadav Abrahami, and Giora Kaplan.
- With its main offices in Tel Aviv, Wix was backed by investors Insight Venture Partners, Mangrove Capital Partners, Bessemer Venture Partners, DAG Ventures, and Benchmark Capital.
- The company entered an open beta phase in 2007 using a platform based on Adobe Flash.

WIX- Product development

- By April 2010 Wix had 3.5 million users and raised US$10 million in Series C funding provided by Benchmark Capital and existing investors Bessemer Venture Partners and Mangrove Capital Partners.
- In March 2011, Wix had 8.5 million users and raised US$40 million in Series D funding, bringing its total funding to that date to US$61 million.

WIX- Product development

- In June 2011, Wix launched the Facebook store module, making its first step into the social commerce trend.
- In March 2012, Wix launched a new HTML5 site builder, replacing the Adobe Flash technology.
- In October 2012, Wix launched an app market for users to sell applications built with the company's automated web development technology.
- Wix's software development kit lets app developers create and offer web apps to Wix users.

WIX- Product development

- By August 2013, the Wix platform had more than 34 million registered users.
- In May 2014, Wix launched the WixHive API for websites to capture and share visitor data (such as contact information, messages, purchases and bookings) with other installed apps within the same web site.

WIX- Product development

- n August 2014, Wix launched Wix Hotels, a booking system for hotels, bed and breakfasts, and vacation rentals which use Wix websites.
- Wix Music was launched in 2015 as a platform for independent musicians to market and sell their music.
- Wix Restaurants was launched in 2016.

WIX- Product development

- In December 2017, Wix Code, an API for adding database collections and custom JavaScript scripting, was released.
- In March 2020, Wix Code was re-branded to Corvid API,and then in January 2021 re-branded from Corvid to Velo, to avoid resemblance to the ongoing COVID-19 pandemic.
- In December 2018, Wix launched Ascend by Wix,a suite of 20 products for business management and promotion using the Wix web development platform.

WIX- Product development

- In November 2019, Wix introduced Wix Fitness, a software package for fitness business promotion and customer relationship management.
- In February 2020, Wix unveiled Editor X, a new platform for designers and web agencies.
- As of June 2020, with the continuous improvement to its features updates and releases,Wix said it had more than 180 million registered users from 190 countries around the world.

WIX- Product development

- At the end of 2020, and as a result of Adobe's decision to end their support for the Flash Player, Wix stopped allowing their users to create websites in the Flash Editor as well as getting support for the Flash sites and deleting all the Flash sites, thus officially ending the life of Wix's first product.

- In 2021, Wix partnered with Vistaprint and then partnered with LegalZoom a year later to improve support for starting small businesses.

WIX- Product development

- By 2022, the Wix platform had more than 220 million registered users worldwide.
- In May 2023, Wix introduced Wix Headless, a package for integrating Wix's other software across various platforms using its APIs and SDKs. The launch of Wix Headless signifies a strategic shift by Wix to cater to professional web developers and larger businesses needing more customization and flexibility.

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