Group 3

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**A: Visual Studio Code (VS Code)**

*Description:*  
Visual Studio Code (VS Code) is a lightweight, open-source code editor from Microsoft, available on Windows, macOS, and Linux. It offers features like syntax highlighting, IntelliSense, debugging, and Git integration. VS Code supports multiple languages and frameworks, with a vast extension marketplace for customization.

*Purpose:*  
VS Code is a popular IDE for its ease of use, cross-platform compatibility, and fast performance. It allows developers to work efficiently across systems, with extensions tailored to various languages and frameworks.

*Typical Use Cases in Edge AI and IoT Development:*

- Developing and debugging embedded systems

*-* Deploying machine learning models to edge devices

- Managing IoT device firmware and configurations  
  
A screen shot of a computer program

Description automatically generated

**B: Node.js**

*Description:*  
Node.js is an open-source, cross-platform runtime environment for running JavaScript server-side. It uses an event-driven, non-blocking architecture, ideal for handling multiple concurrent connections with low latency.

*Purpose:*  
Node.js is used for building fast, scalable server-side applications, especially for real-time apps. Its event-driven model is perfect for applications requiring high performance, such as IoT systems and real-time data processing.

*Typical Use Cases in Edge AI and IoT Projects:*

- Real-time data processing

- Building RESTful APIs for IoT devices

- Managing and monitoring IoT device configurations and firmware updates  
  
A screenshot of a computer

Description automatically generated

**C: Edge Impulse CLI**

*Description:*  
The Edge Impulse CLI is a tool for developing and deploying machine learning models on edge devices. It simplifies tasks like data collection, training, and model export, interacting with the platform via the command line.

*Purpose:*  
The CLI automates key tasks in model development, targeting developers who prefer scripting and automation, offering flexibility for edge device deployment without a GUI.

*Typical Use Cases:*

- Predictive maintenance (analyzing sensor data for equipment failures)

- Wearable health tech (monitoring activity and heart rhythms)

- Smart agriculture (analyzing environmental data for crop management)  
  
  
A hand on a keyboard

Description automatically generated  
(example of edge impulse cli in action counting washers and screws.)

**D: TensorFlow and TensorFlow Lite**

*Description:*  
TensorFlow is an open-source machine learning framework by Google for model development, training, and deployment. TensorFlow Lite is optimized for resource-constrained devices, offering improved memory usage, inference speed, and lower latency.

*Purpose:*  
TensorFlow is used for building and refining models, while TensorFlow Lite enables efficient model deployment on mobile and edge devices, reducing cloud dependence.

*Typical Use Cases:*  
 -Computer vision (object detection)

-Voice commands in smart devices

-Real-time monitoring of vital signs in wearable health tech  
A screenshot of a computer

Description automatically generated

E: **Google Colab**

*Description:*  
Google Colab is a cloud-based Jupyter notebook environment that supports Python code execution, with free access to GPUs and TPUs for accelerated computing. It integrates with Google Drive for easy collaboration.

*Purpose:*  
Google Colab facilitates cloud-based development and collaboration, allowing users to run machine learning experiments and share projects without needing local hardware setups.

*Typical Use Cases:*  
 - Training machine learning models

-Running data analysis

-Prototyping AI applications

Collaborative research and education  
  
A screenshot of a computer

Description automatically generated

**F: Generative AI Coding Tools (e.g., GitHub Copilot, OpenAI Codex)**

*Description:*  
Generative AI tools like GitHub Copilot and OpenAI Codex assist developers by generating code based on natural language input. These tools offer autocomplete, code suggestions, and error fixes by leveraging AI models trained on extensive code datasets.

*Purpose:*  
Generative AI tools speed up coding by suggesting relevant code, fixing errors, and improving productivity. They're especially useful for automating repetitive tasks and solving complex coding problems.

*Typical Use Cases:*  
 -Writing and debugging code for embedded systems

-Building APIs

-Automating workflows for IoT protocols and edge device-specific logic

A screenshot of a computer program

Description automatically generated

Sources:

https://docs.edgeimpulse.com/docs/cli

<https://www.tensorflow.org/>

<https://www.tensorflow.org/lite>

<https://blog.tensorflow.org/2021/05/introducing-tensorflow-lite.html>

<https://code.visualstudio.com/docs>

<https://learn.microsoft.com/en-us/azure/iot-hub/>

<https://marketplace.visualstudio.com/>

<https://www.youtube.com/watch?v=D2cwvpJSBX4>   
  
<https://colab.research.google.com/>

<https://code.visualstudio.com/docs/copilot/overview>

images

<https://code.visualstudio.com/>

<https://stackoverflow.com/questions/57645375/how-to-run-a-file-javascript-and-get-the-output-in-node-js-console-in-visual-stu>  
<https://www.youtube.com/watch?v=ANIB8GGGy1E>  
<https://www.researchgate.net/figure/TensorFlow-Playground-16-a-web-based-visual-analytics-tool-for-exploring-simple-neural_fig3_322652524>  
<https://zohaib.me/debugging-in-google-collab-notebook/>  
<https://www.amitmerchant.com/github-copilot-chat/>