HO-1 Services as a unit of construction

Functional architecture diagrams

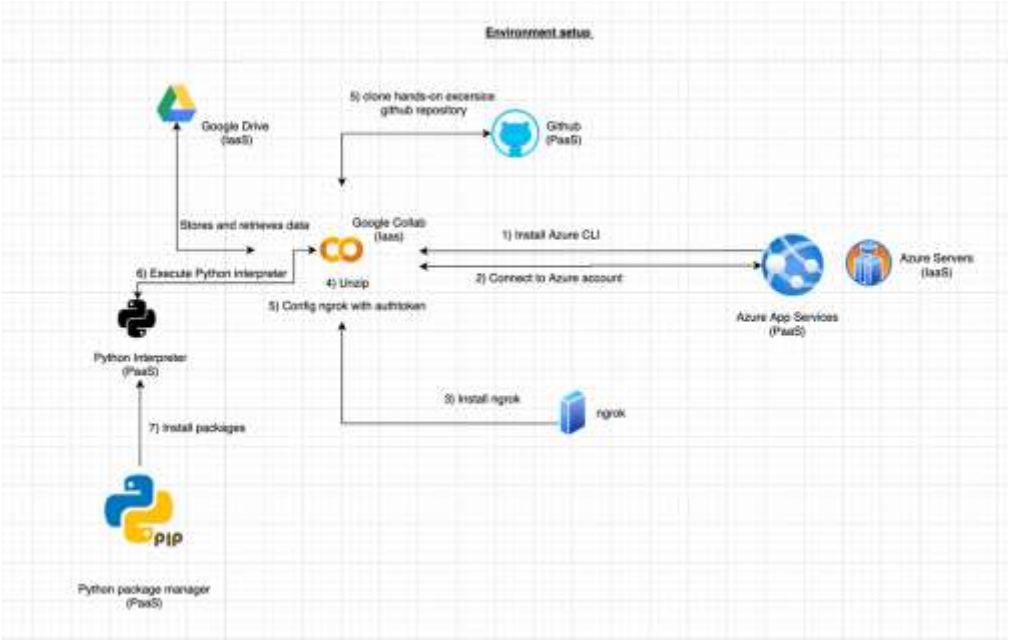

Figure 1: Functional architecture of environment setup.

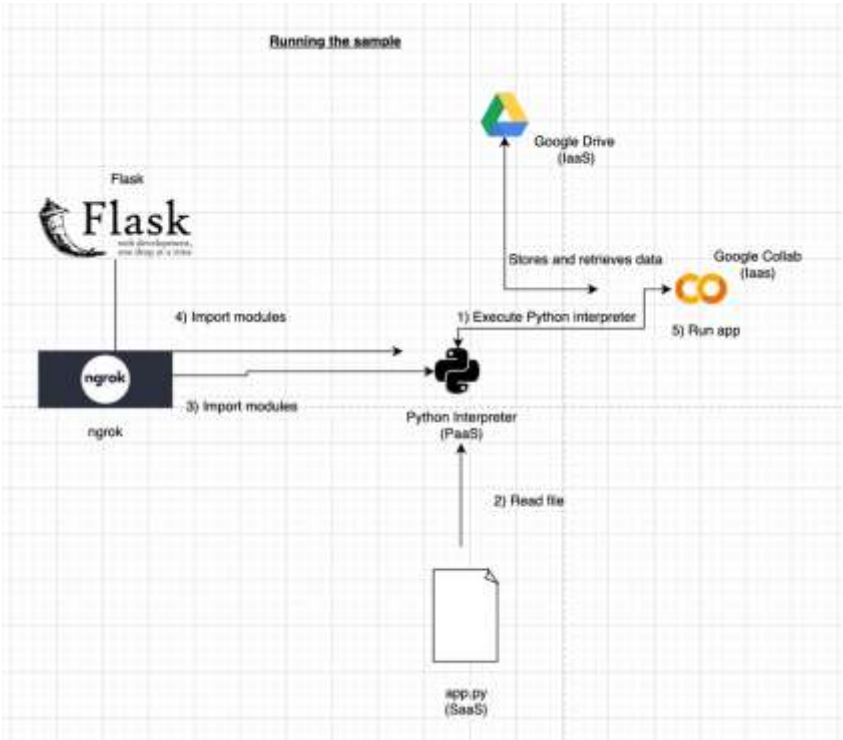

Figure 2: Functional architecture of running the sample.

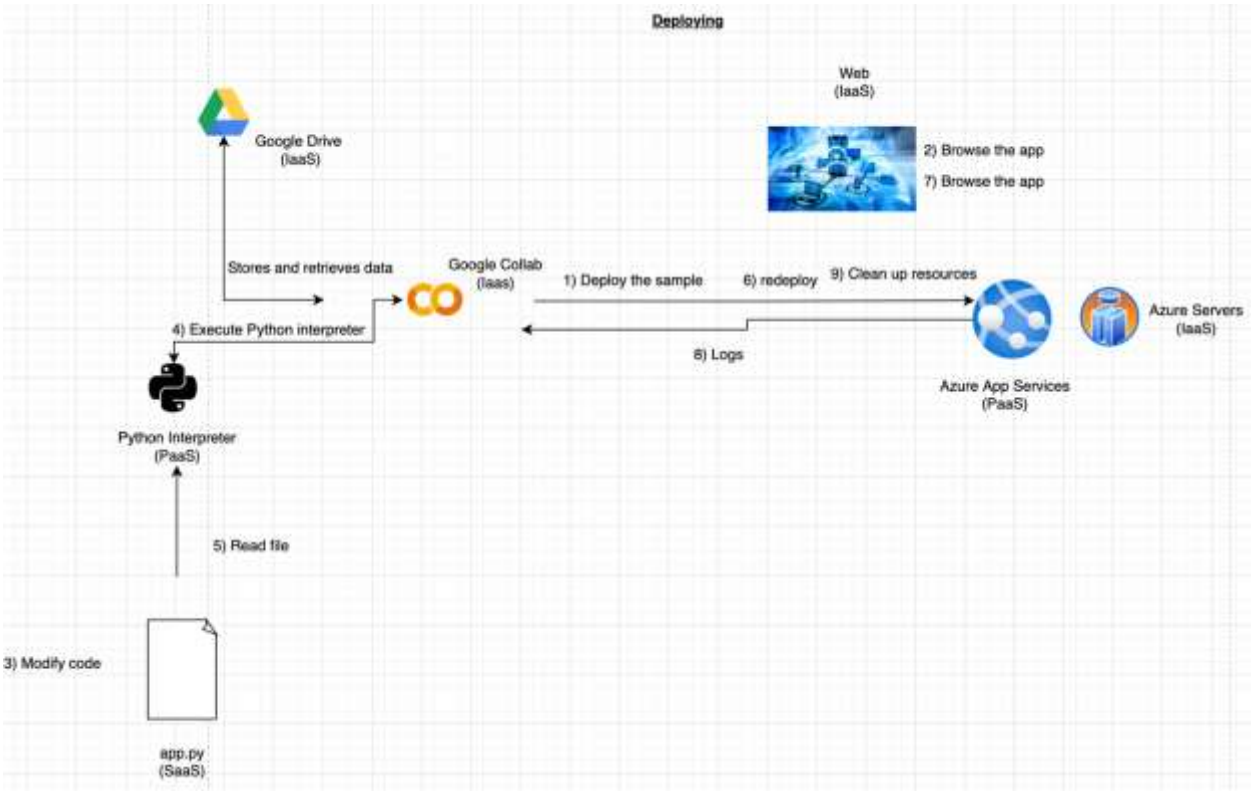

Figure 3: Functional architecture of deploying the sample.

Process diagrams

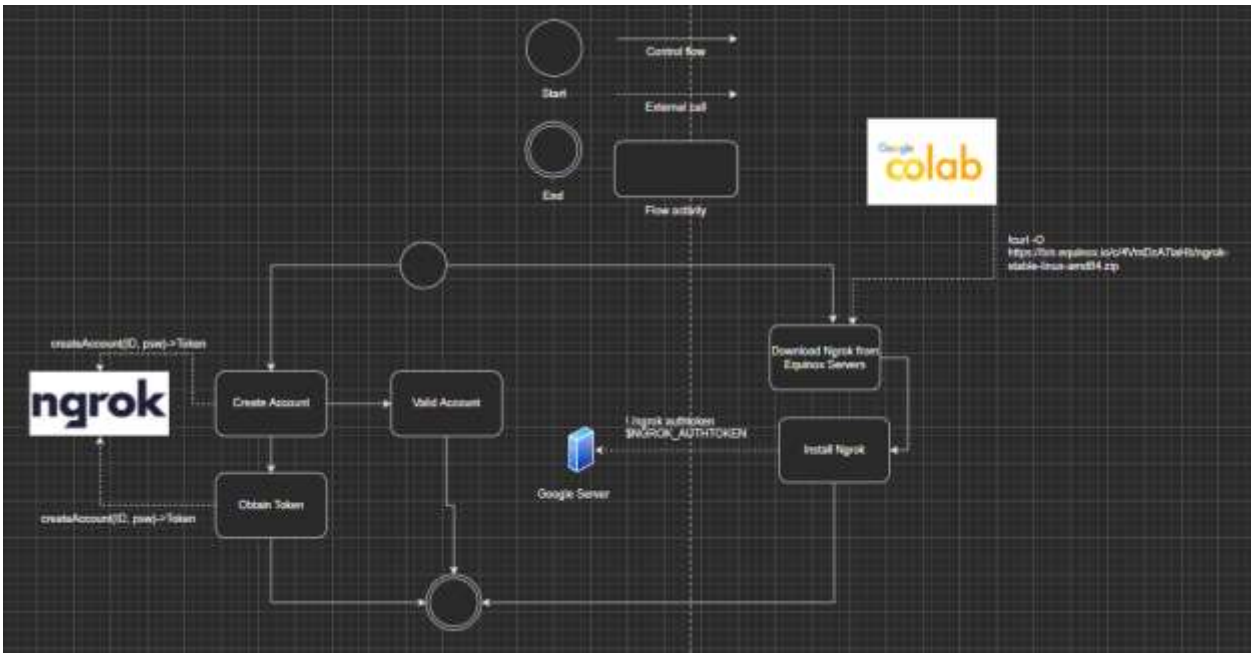

Figure 4: Process diagram of ngrok authenthication.

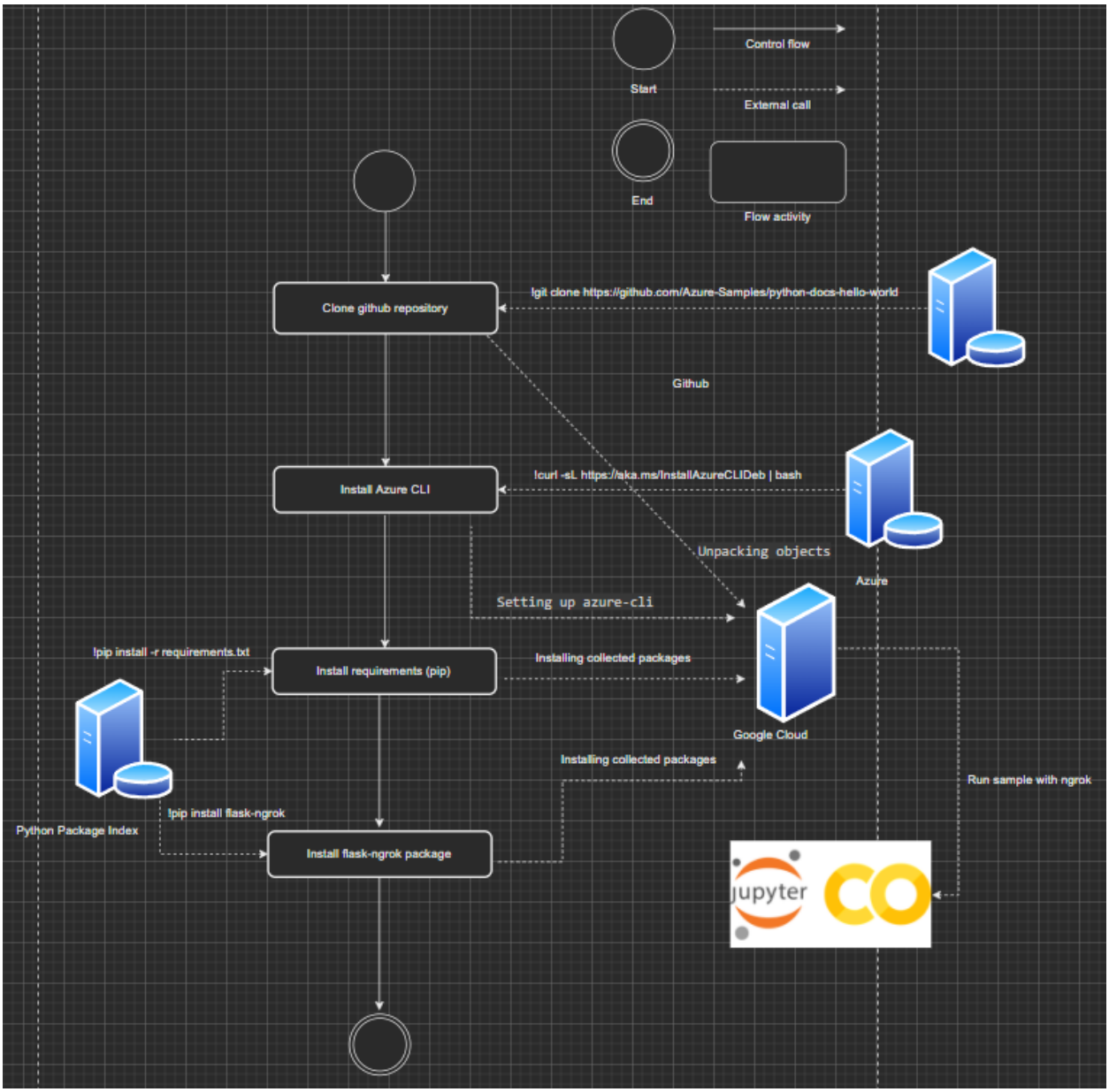

Figure 5: Process diagram of dependencies download.

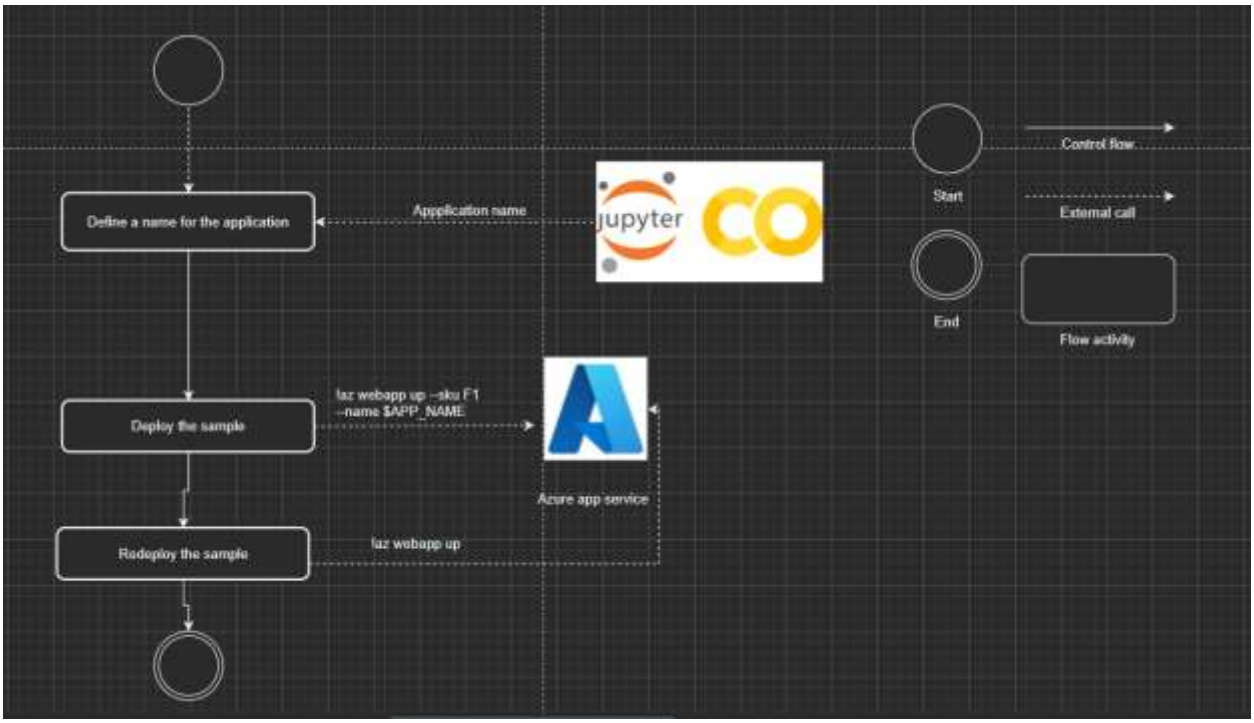

Figure 6: Process diagram of deploying app on Azure.

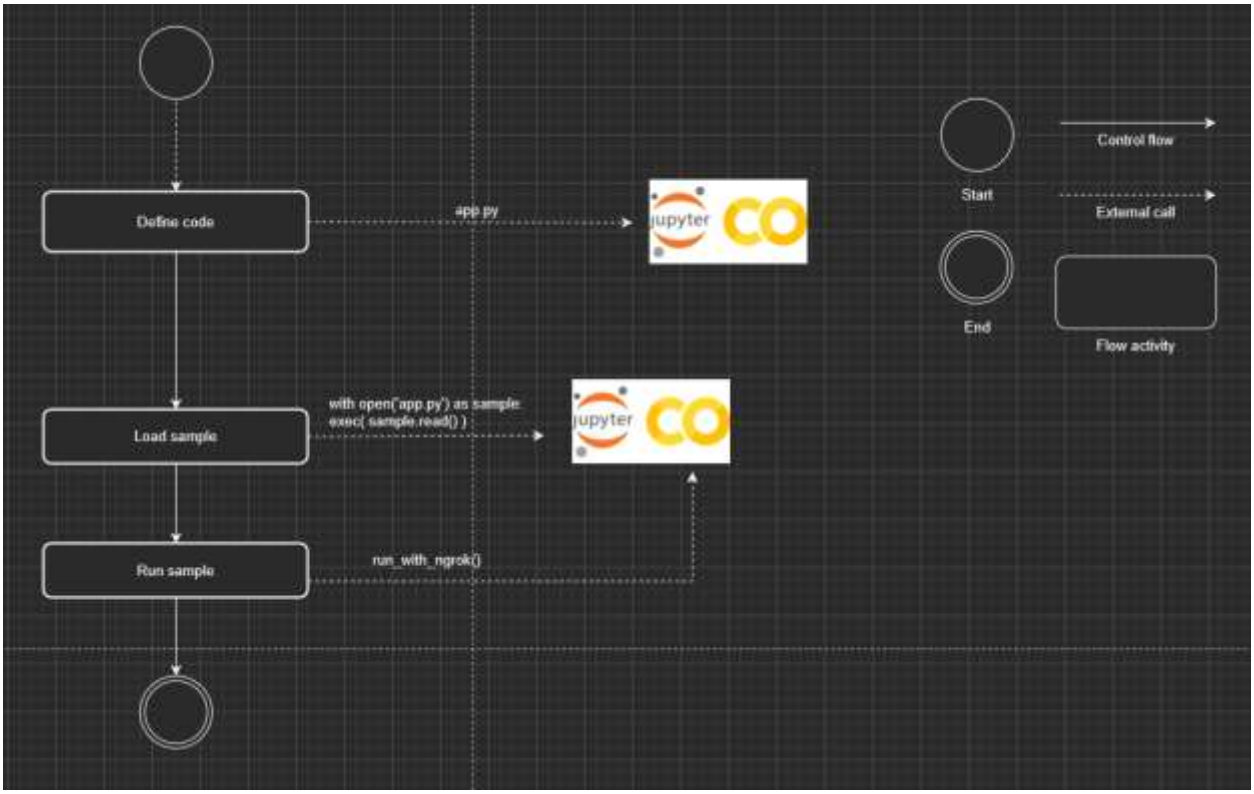

Figure 7: Process diagram of running app on google colab.

Comparison to the Azure tutorial

The main difference between the Azure tutorial and this one, is that Azure asks us to run the application locally in our machine, while we are externalizing it by running the code in Google Colab from the start, to do this we are using Ngrok so that we can expose our application from the Google server in which the code is running to the internet. Furthermore, we are using Azure CLI from Google Collab instead of installing it locally.

Preparation of the environment

Regarding the preparation of the environment, by running it locally we do not have to worry about installing or configuring Ngrok, however we need to worry about the file structure and the permissions that we may have in the local machine. In both cases we need to clone a project from github and install the requirements.

Testing the app in a local vs externalized setting

Testing the app in a local setting allow us to have access by simply browsing the sample application at the address http://localhost:5000, if we externalize the the setting then we need to use a tool such as Ngrok to access our app, although Ngrok provides security, it is certainly more secure to have the application running in a local setting.

Exposure on the internet

Exposing the app on the internet is a very similar process in the cloud as well as locally, we have the option to do it with the Azure portal, VS Code or Azure CLI. I find that the VS Code option is the most simple one, however there is the need to install the Azure Tools extension pack and login to azure from VS Code and of course is a visual solution rather than doing it with code, nonetheless, the result is the same. If we want to use Azure CLI, as we are doing in the colab environment, then we need to install the Azure Cloud Shell or have a workstation with the Azure CLI installed (DavidCBerry13, 2022).

Execution

Regarding the execution issues, first we have that if we do it in a local manner, then we are dependent on the resources that we may have at a given point, scalability and elasticity would be very expensive to produce and would give us overhead when maintaining them, however we would depend on a third party that would bill us according to the resources, such as the amount of RAM, GPU's or CPU's that we use in a determined space of time. Secondly, if we decide to run it from another machine, we may have problems depending on compatibility and lose time trying to

configure things like Azure CLI in another machine, in a cloud environment these issues are almost non-existent. Thirdly, security and privacy may have an increased risk if we use a third-party in our solution.

Glossary

- !: Used for executing commands that are not native to python.
- Vs Code: “Visual Studio Code is a lightweight but powerful source code editor which runs on your desktop and is available for Windows, macOS and Linux. It comes with built-in support for JavaScript, TypeScript and Node.js and has a rich ecosystem of extensions for other languages (such as C++, C#, Java, Python, PHP, Go) and runtimes (such as .NET and Unity)”. (Visual Studio Code, n.d.)
- Azure portal: “The Azure portal is a web-based, unified console that provides an alternative to command-line tools. With the Azure portal, you can manage your Azure subscription using a graphical user interface. You can build, manage, and monitor everything from simple web apps to complex cloud deployments”. (JnHs et al., n.d.)
- Azure: Cloud computing platform.
- cd: Change directory command to move between the file system.
- Curl: client URL, transfer data to and from a server. (Hostinger, 2019)
- Flask: Web application framework written in Python. It was developed by Armin Ronacher, who led a team of international Python enthusiasts called Poocco. (https://pythonbasics.org, n.d.)
- Github: “GitHub is a Git repository hosting service that provides a web-based graphical interface. It is the world’s largest coding community. Putting a code or a project into GitHub brings it increased, widespread exposure. Programmers can find source codes in many different languages and use the command-line interface, Git, to make and keep track of any changes”. (Gaba, 2022)
- Google Colab: Colaboratory, or 'Colab' for short, is a product from Google Research. Colab allows anybody to write and execute arbitrary Python code through the browser, and is especially well suited to machine learning, data analysis and education. More technically, Colab is a hosted Jupyter notebook service that requires no setup to use, while providing free access to computing resources including GPUs. (Google, n.d.)

- IaaS: “Infrastructure as a service (IaaS) is a type of cloud computing service that offers essential compute, storage, and networking resources on demand, on a pay-as-you-go basis”. (Azure, n.d.)
- Jupyter: JupyterLab is the latest web-based interactive development environment for notebooks, code, and data. Its flexible interface allows users to configure and arrange workflows in data science, scientific computing, computational journalism, and machine learning. A modular design invites extensions to expand and enrich functionality. (Jupyter, n.d.)
- Ngrok: Cross-platform application that exposes local server ports to the Internet. (Hammond, 2021)
- Notebook: Documents that contain code and rich text elements.
- PaaS: Platform as a Service is a “Cloud computing model where a third-party provider delivers hardware and software tools to users over the internet. A PaaS providers hosts the hardware and software on its own infrastructure”. (Chai, 2022)
- Pip: “Pip is the package installer for Python. You can use it to install packages from the Python Package Index and other indexes”. (The pip developers, n.d.)
- Python: Programming language used for machine learning, data analytics and web development.
- SaaS: Software as a Service is a “Software distribution model in which a cloud provider hosts applications and makes them available to end users over the internet”. (Chai, 2021)
- Service: “With computer software, a service is software that performs automated tasks, responds to hardware events, or listens for data requests from other software”. (Computer Hope, 2020)
- Web Application Framework: “Software framework that is designed to support the development of web applications, including web services, web resources and web API’s.” (Wikipedia, 2022)

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