National College of Ireland

Configuration Manual

MSc Research Project
Data Analytics

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MSc Project Submission Sheet

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Lecturer:	Mr. Vikas Tomer		
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Configuration Manual

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1 Introduction:

This configuration manual is divided into two phases for anomaly detection system on the processes of resource usage. By following this manual, users can ensure the system is configured correctly, facilitating smooth operations and reliable anomaly detection in diverse environments.

2 OFF-Device Configuration Manual:

By following the below steps, you will set up the development environment, prepare the project, and execute the implementation for data collection and model training:

1. **Development Environment Setup:**
    - **Required Software's:**
        - Python 3.12.4: Ensure python is installed on your system.
        - Visual Studio Code (VS Code): Install VS Code and add the following extensions for run time environments and follow the link How to Install Extensions on VS (Recommended for easy setup):
            - Python
            - Jupyter Notebook
        - Other IDE's can also be used for running the project like Anaconda, Jupyter Notebook, and PyCharm.

2. **Project Initialization:**
    - **Download Project Files:**
        - Obtain the project archive named: **Anomaly-Detection-in-IoT-Devices-Resource-Usage.**
        - Extract the contents to a preferred directory.
    - **Open Project in VS Code:**
        - Launch VS Code.

- Navigate to **File > Open Folder** and select the extracted project directory.

- **Verify Current Directory in Terminal:**
  - Open the integrated terminal in VS Code.
  - Ensure you're in the project directory by running:

```bash
pwd   # For macOS/Linux
echo %cd%   # For Windows
```

  - Confirm the output matches the project directory path.

3. **Setting Up a Python Virtual Environment:**
   - **Benefits of Using a Virtual Environment:**
     - Isolates project-specific dependencies, preventing conflicts between projects.
     - Facilitates reproducibility and simplifies dependency management.
   - **Creating the Virtual Environment:**
     - In the terminal, execute:

```bash
python –m venv venv
```

     - This command creates a directory named venv containing the isolated Python environment.
   - **Activating the Virtual Environment:**
     - For macOS/Linux:

```bash
source venv/bin/activate
```

     - For Windows:

```bash
.\venv\Scripts\activate
```

     - Upon activation, the terminal prompt will prefix with (venv), indicating the environment is active.

4. **Installing Project Dependencies:**
    - A **requirement.txt** file in the project's root directory lists all necessary packages.
    - To install these dependencies, run:

```bash
pip install -r requirements.txt
```

    - This command installs all packages specified in the requirements.txt file.

5. **Project Structure Overview:**
    - The project directory contains the following key components:
        - **Dataset/:** This directory contains all of the dataset collected for model.
        - **Src/data**: This directory contains the scripts of data collector and anomaly generator.
        - **Src/files:** This directory contains all of the model, and pre-processing pipeline files.
        - **Src/logs:** This directory contains the logs of data collection.
        - **Src/model:** This directory contains the files of model inference which can be run on any device as well as resource constrained device such as raspberry pi.
        - **Src/notebook:** This directory contains the notebook which contain all of the source code from loading data till model training, testing and evaluation.
        - **Src/results:** This directory contains the results in csv files.

6. **Running the Implementation:**
    - Navigate to the notebooks directory:

```bash
cd src/notebooks
```

        - Execute each cell sequentially to run the code and observe the results.

3 ON Device Configuration Manual:

By following the below steps, you will set up the development environment, prepare the project, and execute the implementation for model inference on Raspberry Pi:

1. **Device Requirements:**
    - Raspberry Pi Zero 2W or equivalent edge device.
    - Minimum storage: 16 GB microSD card.
    - Raspbian OS or similar Linux-based OS installed.

2. **SSH Configurations:**
    - There are two different ways to connect with raspberry pi, either use ssh by enabling it on the raspberry pi or use the GUI VNC Viewer, but make sure both devices are connected to the same WIFI connection.
    - To find the Ip address to connect with raspberry pi, read the docs for help and run the command on the terminal.
    - Run the command below to connect with pi, replace your device name with pi like ssh awais-pi@<raspberry-pi-ip-addeess>:

```bash
ssh pi@<raspberry-pi-ip-address>
```

3. **Copy & Move Project Files:**
    - I have used the SCP transfer protocol to copy and move the project files into raspberry pi for ease.
        - Read the Guide for use.
4. **Installing Project Dependencies:**
    - A **requirement.txt** file in the project's root directory lists all necessary packages.
    - To install these dependencies, run:

```bash
pip install -r requirements.txt
```

    - This command installs all packages specified in the requirements.txt file.

5. **Model Inference:**
    - Run all the below files and commands in parallel to successfully execute the live anomaly detection on raspberry-pi.
        - **Model_inference.py:** A script for running the live inference.
        - **Anomaly_generator:** A script for generating the anomalies.
        - **Top:** A command to view the live processes usage.