

Configuration Manual

MSc Research Project

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**National College of Ireland**

**MSc Project Submission Sheet**

**School of Computing**

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Configuration Manual

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# Introduction

This manual provides detailed explanation and instructions for setting up, configuring, and running Q learning and Deep Q-learning agents to support serverless function configuration. It is intended to ensure the reproducibility of the work and for researchers and developers interested in similar applications. The manual covers the installation of necessary software, configuration of learning parameters, execution of the agents in AWS lambda, and evaluation of results.

# System Requirements

## Hardware Requirements

 CPU: AMD Ryzen 7 or equivalent.

 Memory: Minimum 16 GB RAM.

 Storage: At least 10 GB of available space.

## Software Requirements

|  |  |
| --- | --- |
| Operating System | Windows 11 or similar |
| Serverless Environment | AWS Lambda |
| Programming Language | Python 3.11 or later |
| Logging & Monitoring Service | AWS CloudWatch |
| Python libraries | Boto3, Numpy, Pandas, TensorFlow 2.x |
| Object Storage | AWS S3 |

Table 1: Components and corresponding software used in project

|  |  |
| --- | --- |
| qlearning\_agent.py | Python code for training the Q-learning agent |
| dqn.py | Python code for training the Deep Q-Learning agent |
| helper.py | Utility methods for invoking lambda functions and retrieving logs. |
| evaluate.py | Contains code for evaluating the results |
| image\_processing\_tasks/\* | Folder containing image processing tasks used for training the RL agents. |

Table 2: Details of artifacts

# Installation and Set Up

This section will guide you through the setting up the environment required for the training of Q-learning and Deep Q-learning agents. Also, instructions on how to install the software dependencies are included.

## AWS Resource Setup

This section assumes that the user has AWS account and appropriate permissions to create and manage AWS Lambda, S3, and CloudWatch resources.

### AWS S3 bucket

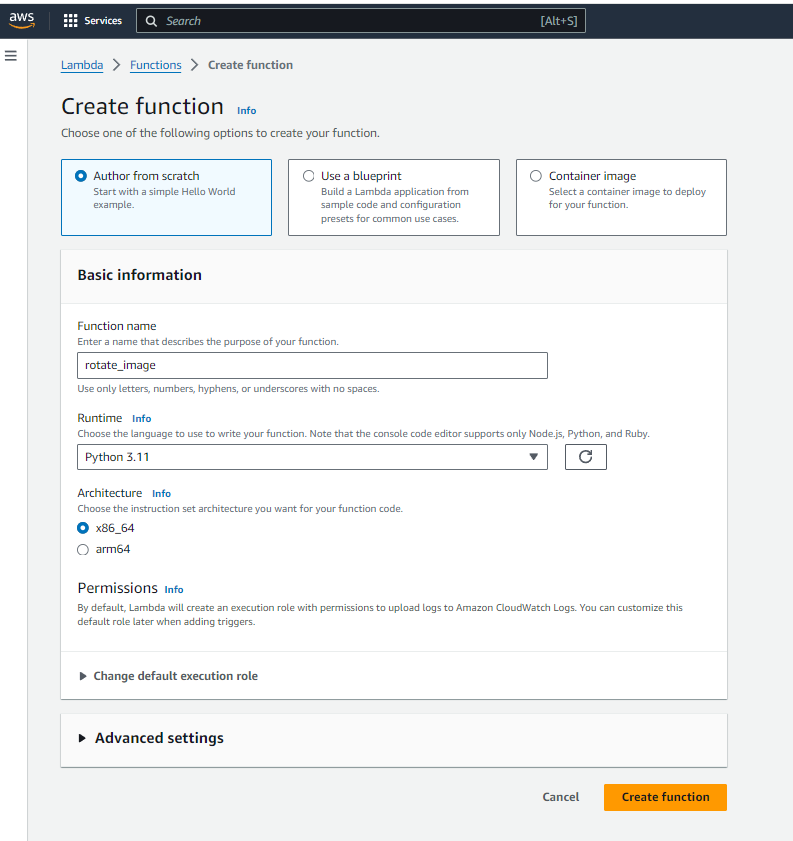
The purpose of the S3 bucket is to store the images required for processing by serverless functions.

1. Log in to the AWS Management Console.
2. Navigate to the S3 service and create a new bucket, say ‘my\_imagebucket’. The bucket name must be unique.
3. To my\_imagebucket’, upload images of different sizes from Flickr-Faces-HQ dataset.

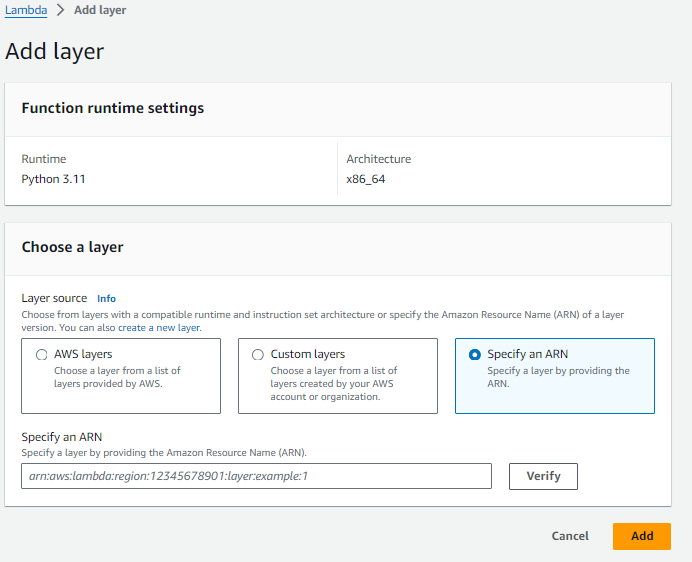
### AWS Lambda

In this research project, AWS lambda acts as the serverless environment for the Q learning and Deep Q-learning agent to interact with and learn. You must deploy the image processing functions given in the folder image\_processing\_tasks under github repository as AWS lambda functions. The following steps will walk you through the process.

1. Navigate to the AWS Lambda Console.
2. From console choose ‘Create function’:
   1. Select "Author from scratch".
   2. Enter a function name denoting the image processing function you are about to deploy.
   3. Choose Python 3.11 for the runtime.
   4. Set up the execution role with appropriate permissions (Lambda, S3, CloudWatch). You can choose ‘Create a new role with basic Lambda permissions’ and later add permissions for S3 and CloudWatch to this role.
   5. Click ‘Create function’
3. Copy the rotate\_image.py function from the folder image\_processing\_tasks under github repository and paste it into the Code source section of newly created lambda function.



Step 4: Now for the image processing tasks, python library has to be added as dependency. In AWS lambda, dependency libraries can be added using layers. Under layers section, choose ‘Add a Layer’.



Step 5: Choose option Specify an ARN and give the following ARN “arn:aws:lambda:ap-south-1:770693421928:layer:Klayers-p311-Pillow:4”

Step 6: Click verify. Once verified click Add. Now the lambda function is ready for execution and you view the layer in the layers section



Repeat the Steps for each of the image processing functions in the image\_processing\_tasks folder.

### AWS CloudWatch

The CloudWatch collects the logs of the execution of lambda function.

1. Navigate to CloudWatch console.
2. Go to Log groups
3. Create new log group with name /aws/lambda/<lambda funciton name>

Ensure that lambda function has proper rights to write to the CloudWatch log group created.

## Installation guide

1. Install Python from [python.org](https://www.python.org/downloads/).
2. Optional, Create and activate python virtual environment
3. Install TensorFlow using pip : **pip install tensorflow**
4. Install numpy, pandas and matpltlib : **pip install numpy pandas matplotlib**
5. Verify Tensorflow and other libraries are installed properly
6. Ensure that git is available in the system. Now clone the project artifact from Github repository by executing git clone <https://github.com/johns-thomas/ric_implementation.git>

# Configuration Settings

# References

**References should be formatted using APA or Harvard style as detailed in NCI Library Referencing Guide available at** [**https://libguides.ncirl.ie/referencing**](https://libguides.ncirl.ie/referencing)

**You can use a reference management system such as Zotero or Mendeley to cite in MS Word.**

Beloglazov, A. and Buyya, R. (2015). Openstack neat: a framework for dynamic and energy-eﬃcient consolidation of virtual machines in openstack clouds, *Concurrency and Computation: Practice and Experience* 27(5): 1310–1333.

Feng, G. and Buyya, R. (2016). Maximum revenue-oriented resource allocation in cloud, *IJGUC* 7(1): 12–21.

Gomes, D. G., Calheiros, R. N. and Tolosana-Calasanz, R. (2015). Introduction to the special issue on cloud computing: Recent developments and challenging issues, *Computers & Electrical Engineering* 42: 31–32.

Kune, R., Konugurthi, P., Agarwal, A., Rao, C. R. and Buyya, R. (2016). The anatomy of big data computing, *Softw., Pract. Exper.* 46(1): 79–105.