National College of Ireland

Configuration Manual

MSc Research Project
MSc Data Analytics

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MSc Project Submission Sheet

School of Computing

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Programme: MSCDAD_B **Year:** 2023-2024

Module: MSC RESEARCH PROJECT

Lecturer: TEERATH KUMAR MENGHWAR

Submission Due Date: 16/09/2024

Project Title: PHISHING URL DETECTION USING DISTLBERT AND CAPSULE NEURAL NETWORKS

Word Count: **305 Page Count: 5**

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.
ALL internet material must be referenced in the bibliography section. Students are required to use the Referencing Standard specified in the report template. To use other author's written or electronic work is illegal (plagiarism) and may result in disciplinary action.

Signature: SAKETH REDDY ATLA

Date: 16/09/2024

PLEASE READ THE FOLLOWING INSTRUCTIONS AND CHECKLIST

Attach a completed copy of this sheet to each project (including multiple copies)	□
Attach a Moodle submission receipt of the online project submission, to each project (including multiple copies).	□
You must ensure that you retain a HARD COPY of the project, both for your own reference and in case a project is lost or mislaid. It is not sufficient to keep a copy on computer.	□

Assignments that are submitted to the Programme Coordinator Office must be placed into the assignment box located outside the office.

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Configuration Manual

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1 Step Google drive Directory

Follow these steps to create a simplified directory structure for your model in Google Drive:

1. Open Google Drive in your web browser.

- Create the main folder:
  - Click "New" > "Folder"
  - Name it "Hybrid_DistilBERT_Capsule_Network"
- Upload base model files to the main folder:
  - Upload "capsule_network.pt" ○ Upload "distilbert.pt"
- Create a subfolder for the hybrid model:
  - Inside "Hybrid_DistilBERT_Capsule_Network", click "New" > "Folder" ○ Name it "hybrid"
- Upload hybrid model files to the "hybrid" subfolder:
  - Upload your hybrid model file ○ Upload the tokenizer files Your final structure should look like this:

```
Hybrid_DistilBERT_Capsule_Network/
├— capsule_network.pt
├— distilbert.pt
└— hybrid/
   ├— [hybrid_model_file]
   ├— tokenizer.json
   └— vocab.txt
```

Figure 1 Sample Directory

Figure 2 Sample Directory

2 Setup Google colab

Follow these steps to upload your notebook to Google Colab, connect to Google Drive, and update the model paths:

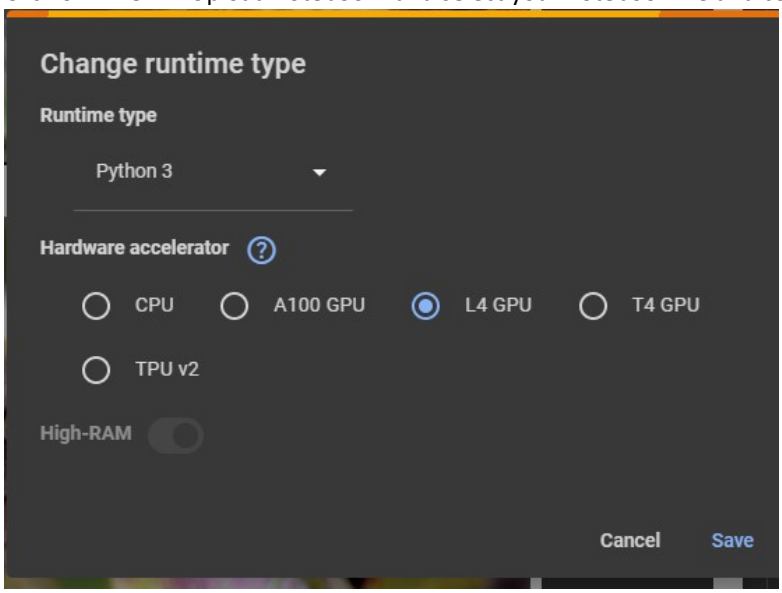
- Go to Google Colab.
- Click on "File" > "Upload notebook" and select your notebook file and connect to the session.
- 

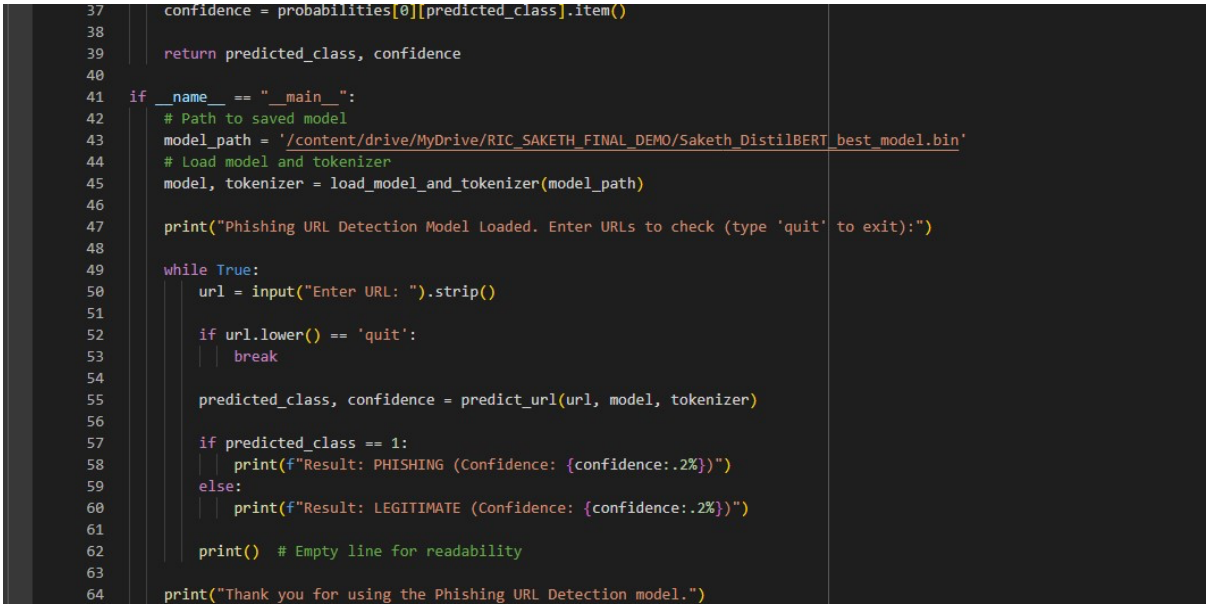
Figure 3 Connecting to the session after uploading the notebook

- Once the notebook is uploaded, you'll need to mount your Google Drive. Add and run the following code at the beginning of your notebook:
- 

Figure 4 Google Mount

3 Changing the paths

- Change path at 43 line for the Distilbert according to the models uploaded.



```
    confidence = probabilities[0][predicted_class].item()

    return predicted_class, confidence

if __name__ == "__main__":
    # Path to saved model
    model_path = '/content/drive/MyDrive/RIC_SAKETH_FINAL_DEMO/Saketh_DistilBERT_best_model.bin'
    # Load model and tokenizer
    model, tokenizer = load_model_and_tokenizer(model_path)

    print("Phishing URL Detection Model Loaded. Enter URLs to check (type 'quit' to exit):")

    while True:
        url = input("Enter URL: ").strip()

        if url.lower() == 'quit':
            break

        predicted_class, confidence = predict_url(url, model, tokenizer)

        if predicted_class == 1:
            print(f"Result: PHISHING (Confidence: {confidence:.2%})")
        else:
            print(f"Result: LEGITIMATE (Confidence: {confidence:.2%})")

        print()  # Empty line for readability

    print("Thank you for using the Phishing URL Detection model.")
```

Figure 5 Path change for DistilBERT

- Change path for Capusel_model.pth as per the directory it was stored

```
    return predicted_class, confidence

if __name__ == "__main__":
    # Path to saved model
    model_path = '/content/drive/MyDrive/RIC_SAKETH_FINAL_DEMO/capsule_model.pth'

    # Load model and get vocabulary size
    model, vocab_size = load_model(model_path)
    print(f"Model loaded with vocabulary size: {vocab_size}")

    # Create character dictionary
    char_dict = create_char_dict()

    print("Phishing URL Detection Model Loaded. Enter URLs to check (type 'quit' to exit):")

    while True:
        url = input("Enter URL: ").strip()

        if url.lower() == 'quit':
            break

        predicted_class, confidence = predict_url(url, model, char_dict, vocab_size)

        if predicted_class == 0:
```

- Change the model path and tokenizer saved path for Hybrid model i.e. DistilBERT-capsule network

```
    return predicted_class, confidence

if __name__ == "__main__":
    # Paths to saved model and tokenizer
    model_path = '/content/drive/MyDrive/RIC_SAKETH_FINAL_DEMO/Hybrid/Hybrid_saketh_model.pth'
    tokenizer_path = '/content/drive/MyDrive/RIC_SAKETH_FINAL_DEMO/Hybrid'

    # Load model and tokenizer
    model, tokenizer = load_model_and_tokenizer(model_path, tokenizer_path)

    while True:
        # Get URL input from user
        url = input("Enter a URL to check (or 'quit' to exit): ")

        if url.lower() == 'quit':
            break

        # Make prediction
```

4 SAMPLE OUTPUTS

```
        print()  # Empty line for readability

Enter a URL to check (or 'quit' to exit): www.google.com
The URL is classified as LEGITIMATE with 99.50% confidence.

Enter a URL to check (or 'quit' to exit): https://chamakhman.wixsite.com/my-site-4
The URL is classified as PHISHING with 99.66% confidence.
```

```
Model loaded with vocabulary size: 92034
Phishing URL Detection Model Loaded. Enter URLs to check (type 'quit' to exit):
Enter URL: www.goog.ecom
Result: PHISHING (Confidence: 60.57%)

Enter URL: quit
Thank you for using the Phishing URL Detection model.
```

```
Some weights of DistilBertForSequenceClassification were not initialized from the model checkpoint at distilbert-base-uncased and are ne
You should probably TRAIN this model on a down-stream task to be able to use it for predictions and inference.
Phishing URL Detection Model Loaded. Enter URLs to check (type 'quit' to exit):
Enter URL: www.goog.ecom
Result: PHISHING (Confidence: 71.69%)

Enter URL: quit
Thank you for using the Phishing URL Detection model.
```

5 REFERENCES

Sanh, V., Debut, L., Chaumond, J., & Wolf, T. (2019). DistilBERT, a distilled version of BERT: smaller, faster, cheaper and lighter. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.1910.01108 *colab.google*. (n.d.). colab.google. https://colab.google/

Sabour, S., Frosst, N., & Hinton, G. E. (2017). Dynamic Routing Between Capsules. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.1710.09829