Deep Learning: Assignment-2

Task Description:

Given a sentence, our objective is to identify all the named entities present in that sentence and predict their correct type (tag) from a predefined tag set.

Model Description:

The model used is Bidirectional LSTM The model is called Named Entity Recognition

Hyperparameters:

Batch Size : Number of samples processed before the model is updated. Value = 25

Number of Epochs : Training the neural network with all the training data for one cycle. Value = 10

Hidden Dimensions : The number of Hidden dimensions in the model. Value = 500

Embedding Dimensions : Low-dimensional, learned continuous vector representations of tokens. Value = 300

Number of Layers : The number of LSTM units for each RNN unit. Value = 1

Sequence Length: The length of each sequence. If the length of the sequence is more than this value, then it is chopped off else it is given required padding. Value = 25

Patience: Number of epochs with no improvement after which training will be stopped. Value = 2

Dataset Description:

MultiCoNER 1 is a large multilingual dataset (11 languages) for Named Entity Recognition. It is designed to represent some of the contemporary challenges in NER, including low-context scenarios (short and uncased text), syntactically complex entities such as movie titles, and long-tail entity distributions.

MultiCoNER 2 is a large multilingual dataset (12 languages) for fine grained Named Entity Recognition. Its fine-grained taxonomy contains 36 NE classes, representing real-world challenges for NER, where named entities, apart from the surface form, context represents a critical role in distinguishing between the different fine-grained types (e.g. Scientist vs. Athlete). Furthermore, the test data of MultiCoNER 2 contains noisy instances, where the noise has been applied to both context tokens as well as the entity tokens. The noise includes typing errors at character level based on keyboard layouts in the the different languages. Here we are applying our model only on 3 languages English, Hindi and Bangla

Tagset :

The tagset of MultiCoNER is a fine-grained tagset. The fine to coarse level mapping of the tags are as follows: Location (LOC) : Facility, OtherLOC, HumanSettlement, Station Creative Work (CW) : VisualWork, MusicalWork, WrittenWork, ArtWork, Software Group (GRP) : MusicalGRP, PublicCORP, PrivateCORP, AerospaceManufacturer, SportsGRP, CarManufacturer, ORG Person (PER) : Scientist, Artist, Athlete, Politician, Cleric, SportsManager, OtherPER Product (PROD) : Clothing, Vehicle, Food, Drink, OtherPROD Medical (MED) : Medication/Vaccine, MedicalProcedure, AnatomicalStructure, Symptom, Disease

Statistics :

English:

Training Set : 16,778

Validation Set : 871

Test Set : 249, 890

Hindi:

Training Set : 9,632

Validation Set : 514

Test Set : 18,399

Bangla:

Training Set : 9,708

Validation Set : 507

Test Set : 19,859

Results and Performance:

Model for English:

Fine Grained

- accuracy: f1 score → 94%
- macro avg: precision: → 58%, recall → 35%, f1 score → 40%
- weighted avg: precision: → 92%, recall → 92%, f1 score → 91%

Coarse Grained

- accuracy: f1 score → 93%
- macro avg: precision: → 72%, recall → 53%, f1 score → 59%
- weighted avg: precision: → 90%, recall → 93%, f1 score → 93%

Model for Hindi:

Fine Grained

- accuracy: f1 score → 92%
- macro avg: precision: → 56%, recall → 35%, f1 score → 40%
- weighted avg: precision: → 90%, recall → 92%, f1 score → 91%

Coarse Grained

- accuracy: f1 score → 93%
- macro avg: precision: → 74%, recall → 53%, f1 score → 59%
- weighted avg: precision: → 90%, recall → 93%, f1 score → 93%

Model for Bangla:

Fine Grained

- accuracy: f1 score → 92%
- macro avg: precision: → 52%, recall → 35%, f1 score → 40%

- weighted avg: precision: → 90%, recall → 92%, f1 score → 91%

Coarse Grained

- accuracy: f1 score → 93%
- macro avg: precision: → 69%, recall → 53%, f1 score → 59%
- weighted avg: precision: → 90%, recall → 93%, f1 score → 93%

Analysis:

Increasing the value of Embedding Dimension by keeping others constant increased the Macro Average. Increasing the value of Hidden Dimension by keeping others constant increased the Macro Average. Increasing the Batch Size increased the Macro Average upto a limit then it started decreasing it. Increasing the number of epochs increased the Macro Average. Increasing the number of layers decreased the Macro Average Increasing the Patience increased the Macro average

The link to the model files:

https://drive.google.com/drive/folders/1sGb4TiU92XM_72XugpYL-cOHfTctr3ow?usp=share_link