Labeling Disaster-Related Messages

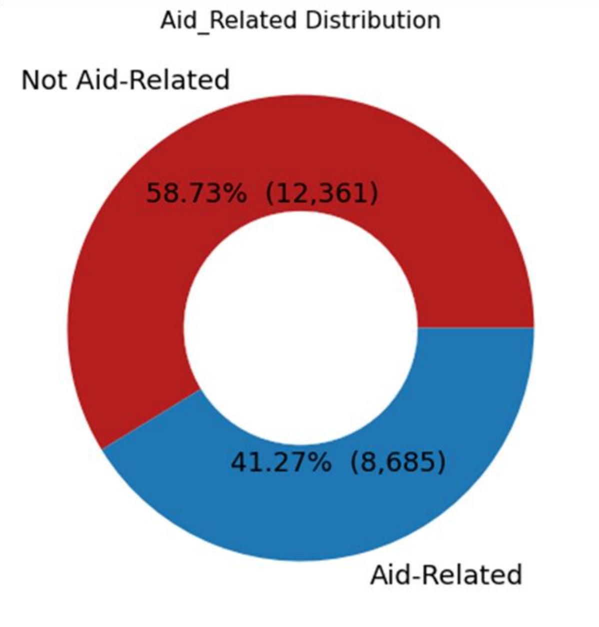
Using Natural Language Processing

Business Understanding

- **Objective:**
  - Our goal is to **create a model** that can interpret and label a message using **Natural Language Processing**. A message can have up to **37 labels** (for example if the message is *requesting medical help* or *offering aid*).
  - In order to simplify the given dataset, I will be working only with **a single label – *“aid_related”.***
- **Success criteria:**
  - How well the model finds all the *aid_related* messages *(Recall).*
  - How accurate the model is when it predicts an *aid_related* message *(Precision).*
  - How accurate the model is overall *(Accuracy).*

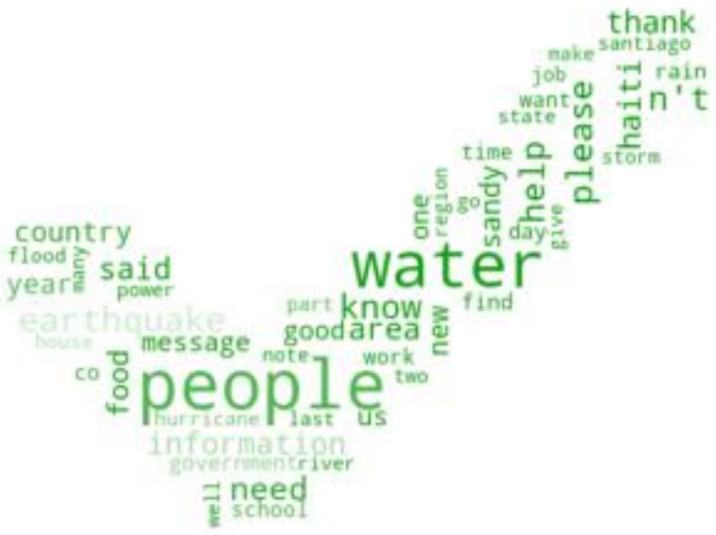
Data Understanding

- The relevant columns of the dataset are ***message*** and ***aid_related***.
  - ***message*** *(our predictive data) is a string of text, e.g.:*
    - *"Weather update – a cold front from Cuba that could pass over Haiti"*
    - *"There's nothing to eat and water, we starving and thirsty."*
  - ***aid_related*** *(our target) is a binary column, i.e.:*
    - *Is the message aid related? 1=yes, 0=no.*

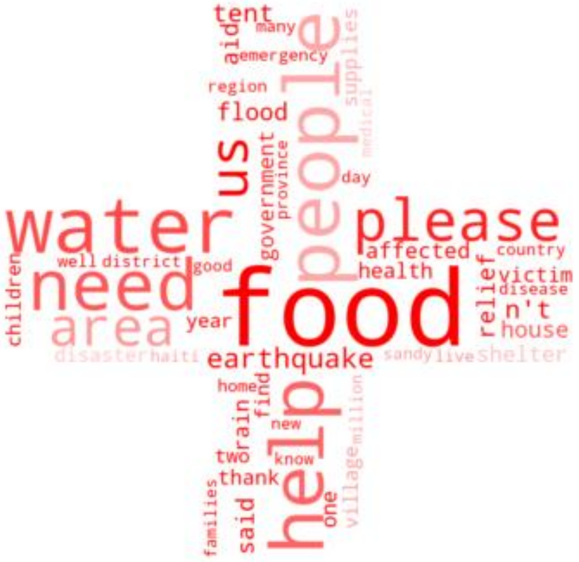


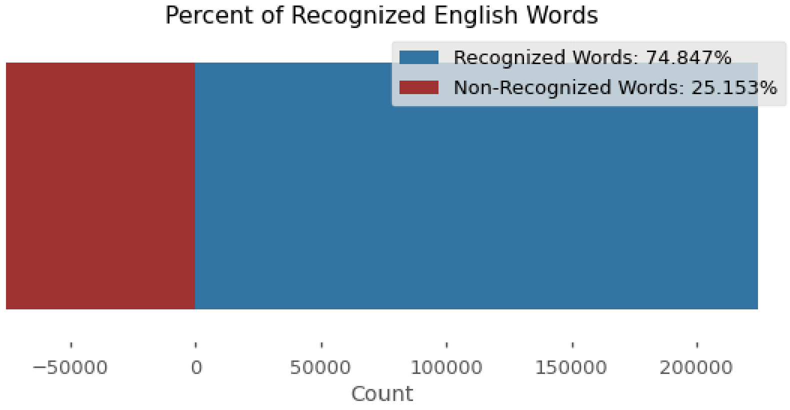
Data Understanding

Non-Aid-Related

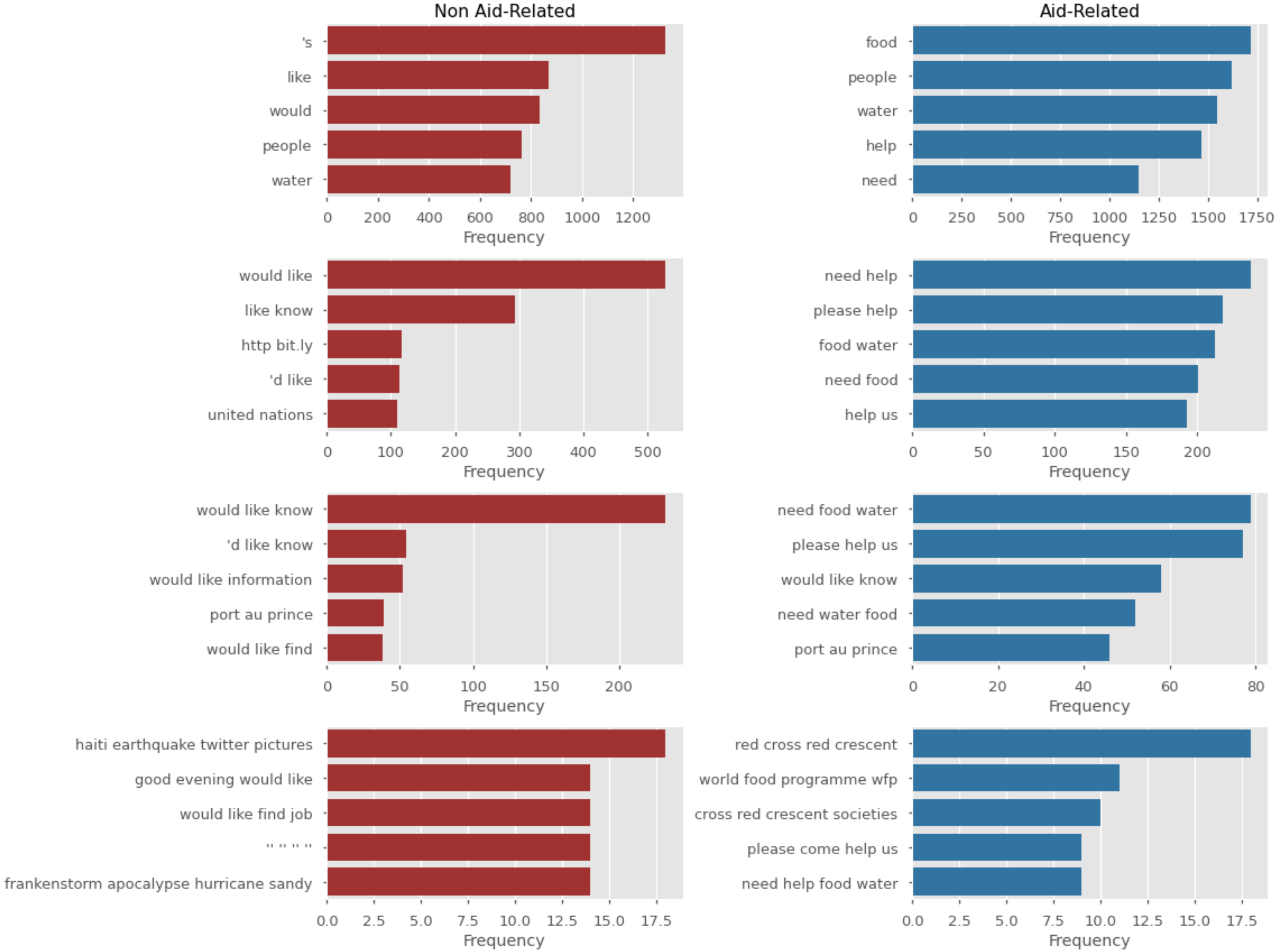


Aid-Related




Percent of Recognized English Words

Data Understanding

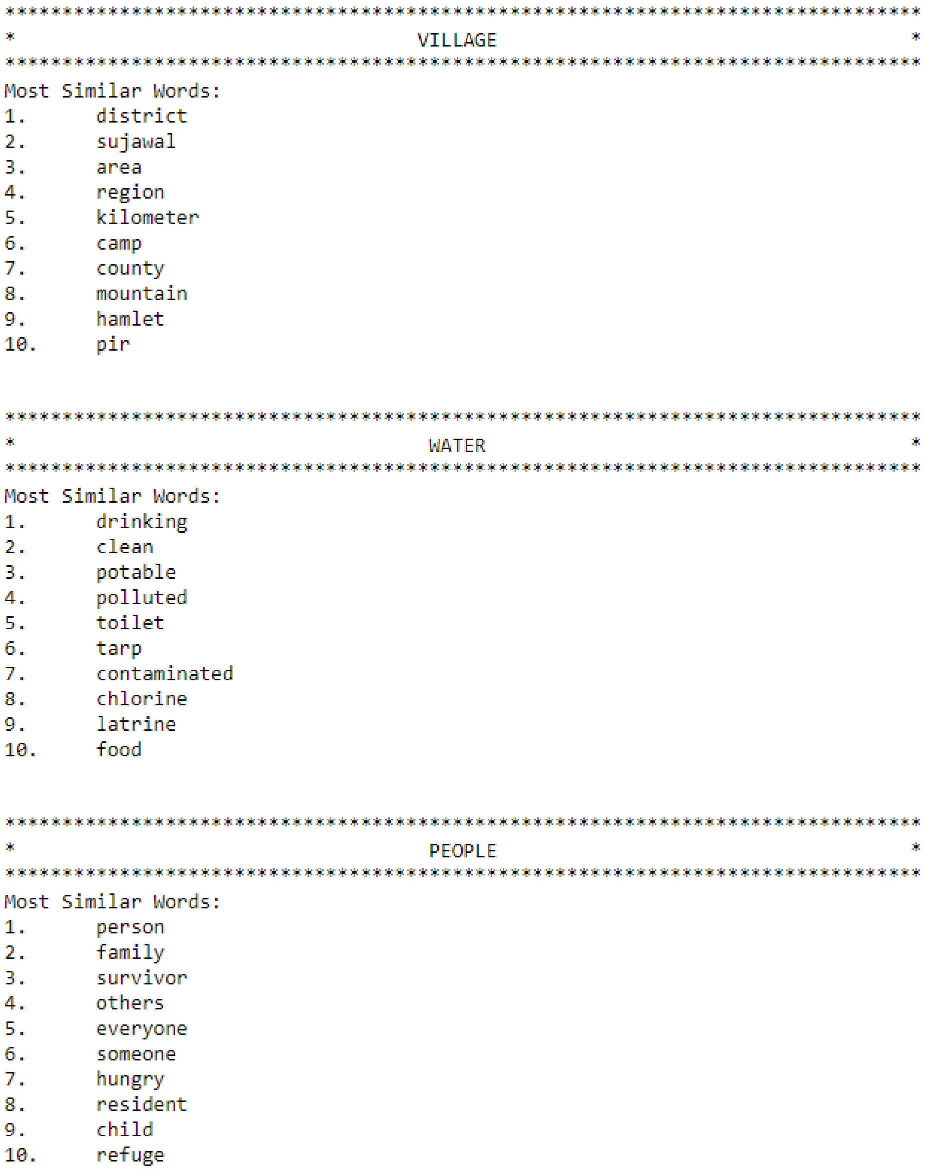


Data Preparation

- Text preparation
  - Cleaning abnormalities (unusual html characters),
  - Removing *stop words ("the", "is", "and") & punctuation,*
  - Lemmatizing *(feet -> foot; running -> run)*
- *Vectorizing*
  - Premade Vectorizer - GloVe model *(Global Vectors for Word Representation)*
    - https://nlp.stanford.edu/projects/glove/
  - Homemade Vectorizer - Gensim Word2Vec model

Data Preparation

Homemade Word Vectors – Trained on Training Data



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********************************************************************************
*                                   VILLAGE                                    *
********************************************************************************
Most Similar Words:
1.      district
2.      sujawal
3.      area
4.      region
5.      kilometer
6.      camp
7.      county
8.      mountain
9.      hamlet
10.     pir

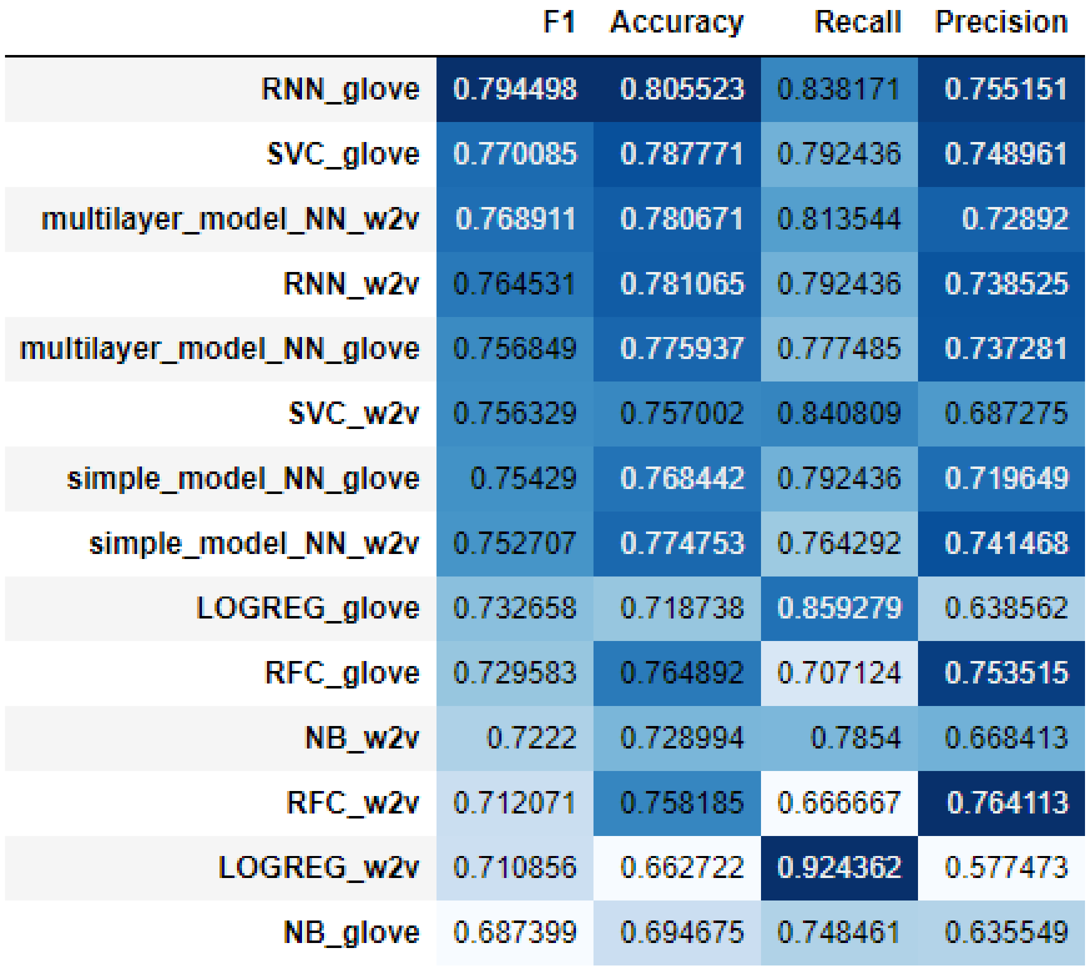
********************************************************************************
*                                    WATER                                     *
********************************************************************************
Most Similar Words:
1.      drinking
2.      clean
3.      potable
4.      polluted
5.      toilet
6.      tarp
7.      contaminated
8.      chlorine
9.      latrine
10.     food

********************************************************************************
*                                    PEOPLE                                    *
********************************************************************************
Most Similar Words:
1.      person
2.      family
3.      survivor
4.      others
5.      everyone
6.      someone
7.      hungry
8.      resident
9.      child
10.     refuge
```

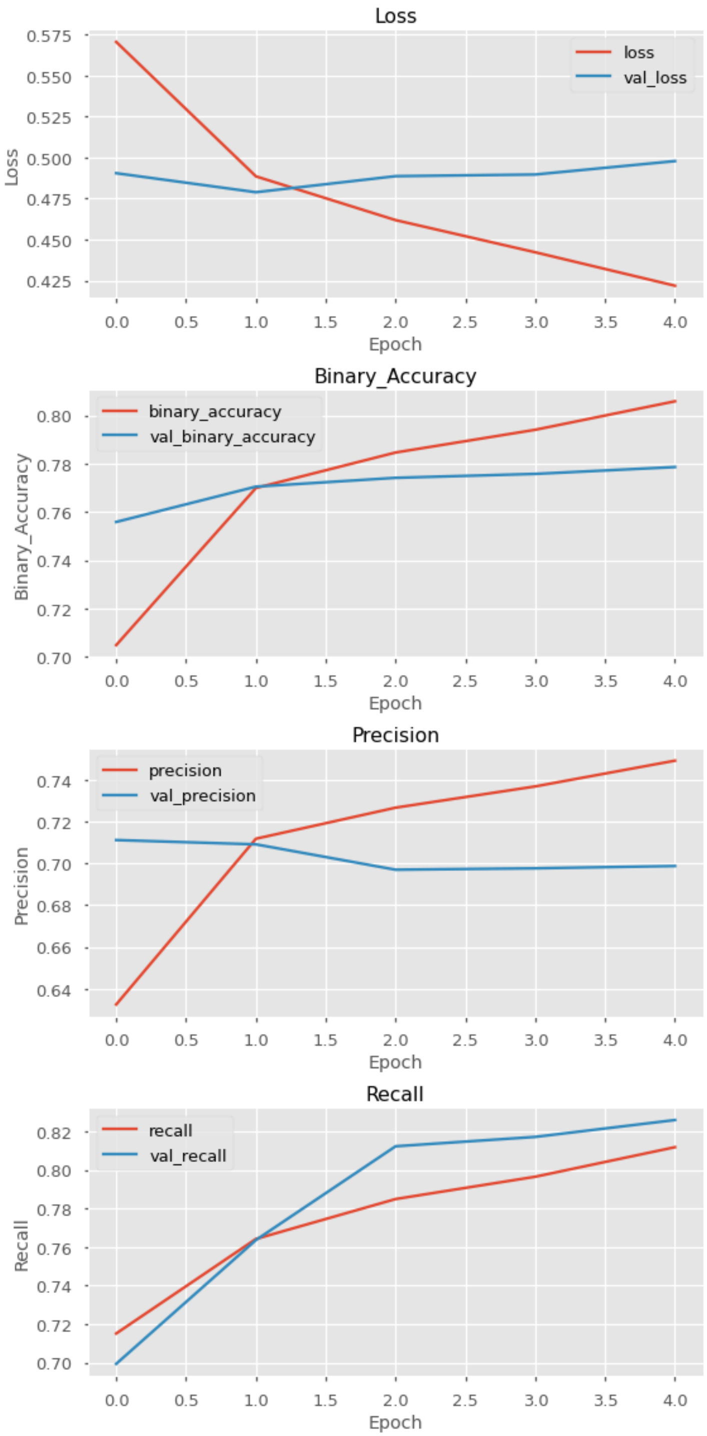
Modeling
Featured Model:
RNN - GloVe

Try the model on StreamLit here!

Modeling
Featured Model:
RNN - GloVe

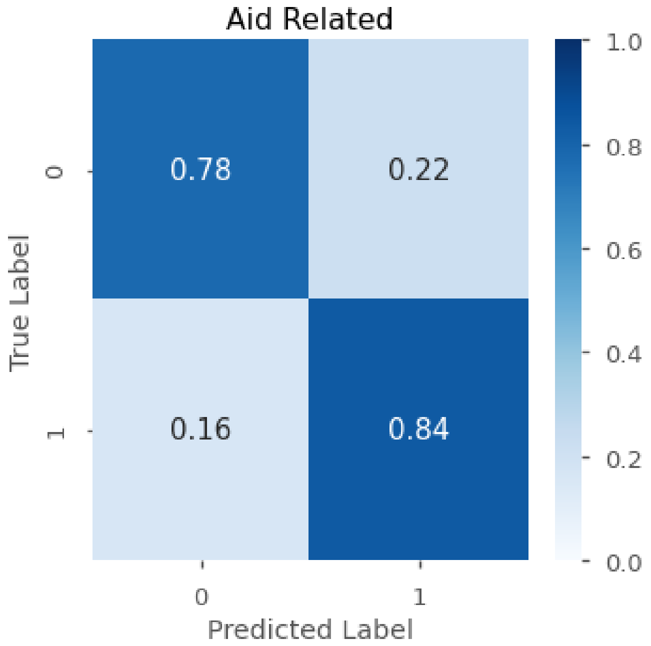


	F1	Accuracy	Recall	Precision
RNN_glove	0.794498	0.805523	0.838171	0.755151
SVC_glove	0.770085	0.787771	0.792436	0.748961
multilayer_model_NN_w2v	0.768911	0.780671	0.813544	0.72892
RNN_w2v	0.764531	0.781065	0.792436	0.738525
multilayer_model_NN_glove	0.756849	0.775937	0.777485	0.737281
SVC_w2v	0.756329	0.757002	0.840809	0.687275
simple_model_NN_glove	0.75429	0.768442	0.792436	0.719649
simple_model_NN_w2v	0.752707	0.774753	0.764292	0.741468
LOGREG_glove	0.732658	0.718738	0.859279	0.638562
RFC_glove	0.729583	0.764892	0.707124	0.753515
NB_w2v	0.7222	0.728994	0.7854	0.668413
RFC_w2v	0.712071	0.758185	0.666667	0.764113
LOGREG_w2v	0.710856	0.662722	0.924362	0.577473
NB_glove	0.687399	0.694675	0.748461	0.635549

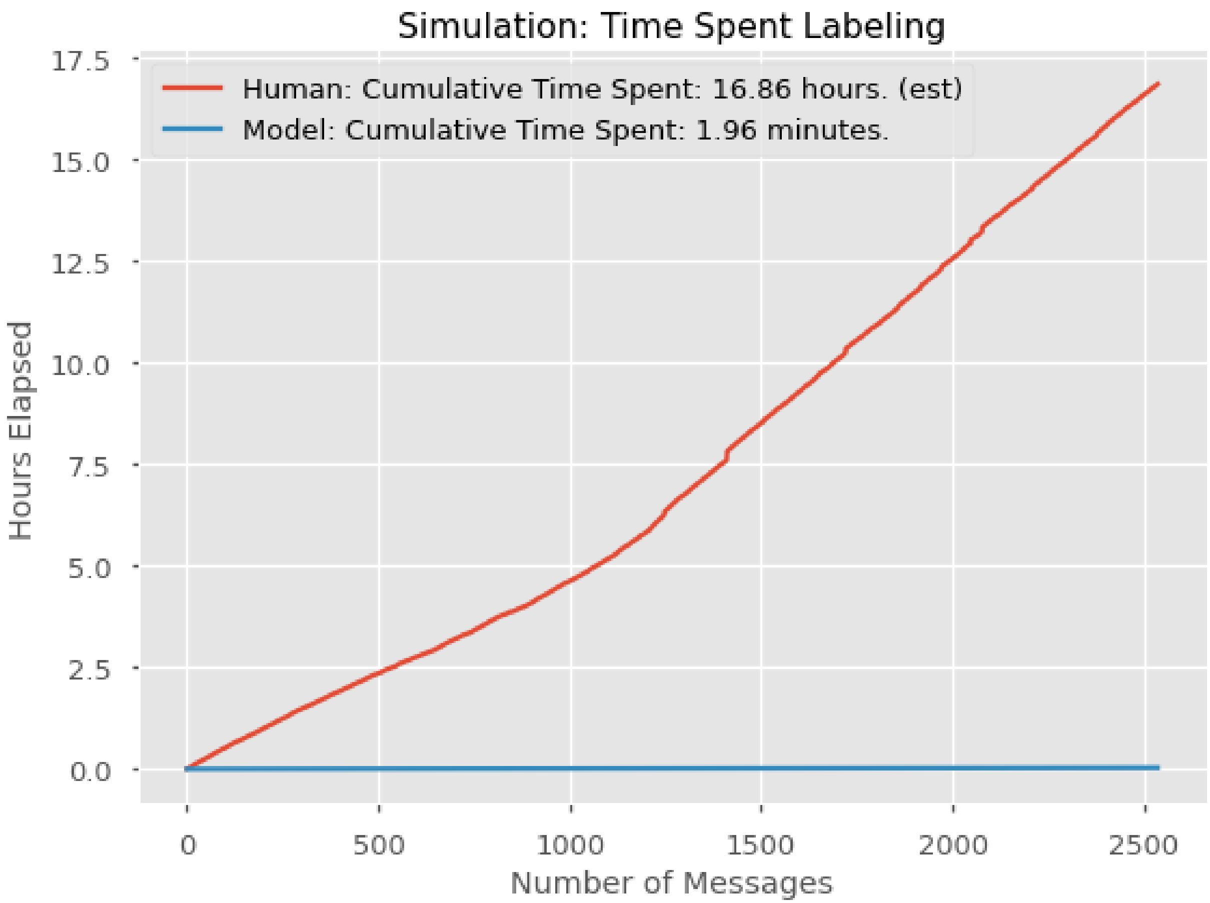


Evaluation

- Overall, RNN - GloVe (the RNN accompanied by the GloVe embeddings) performed clearly best overall.
  - On the test set:
    - 83.82% of *aid-related* messages were found.
    - 75.52% of *aid-related* predictions were correct.
    - 80.55% overall accuracy.



Evaluation



- This model, if used in the field, would save hours of man-power.
  - With approximately 2500 messages, the model would save approximately 15 hours of time that would have been spent with a human-labeler.

Future Work

- Include the other 36 target labels to further classify the messages.
    - (Multilabel Classification)
- Add other languages to the model rather than just English translation.
- Continue to explore the complexity of the neural network architecture and create a larger network.

Thank You!

- Data
  - **Appen Datasets**
    - https://appen.com/datasets/combined-disaster-response-data/
- Flatiron School
  - James Irving – DS Instructor