TEAM SUPREME (PIZZA)

PREDICTING THE SUCCESS OF REQUESTS FOR FREE PIZZA

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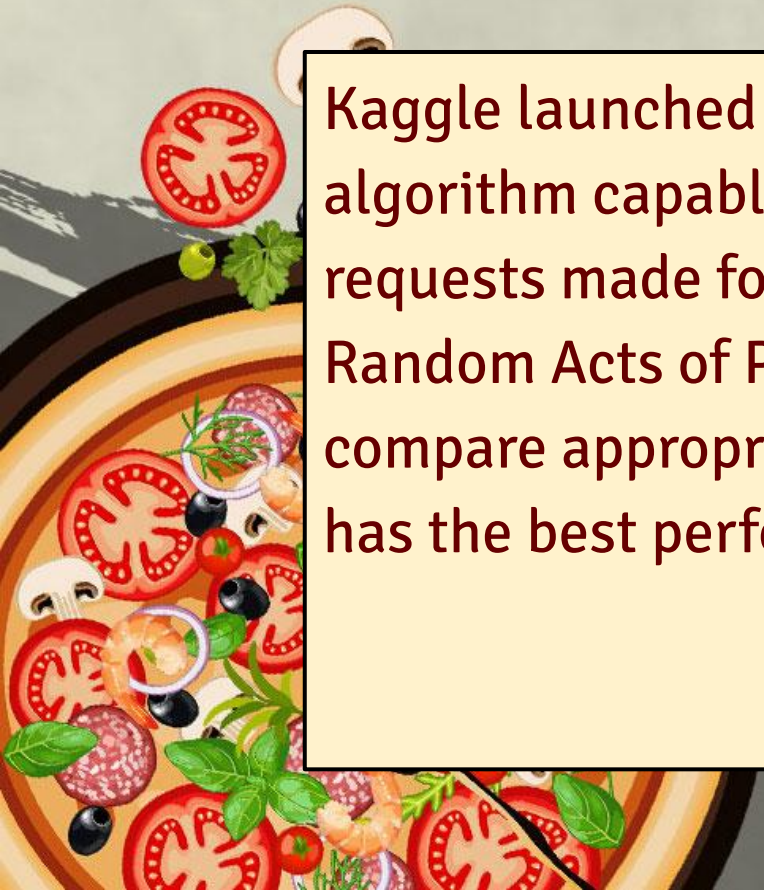
INTRODUCTION

PROBLEM STATEMENT



Kaggle launched a competition to create an algorithm capable of predicting the outcomes of requests made for pizza from the Reddit community Random Acts of Pizza. The group aspires to compare appropriate algorithms and identify which has the best performance in terms of accuracy.

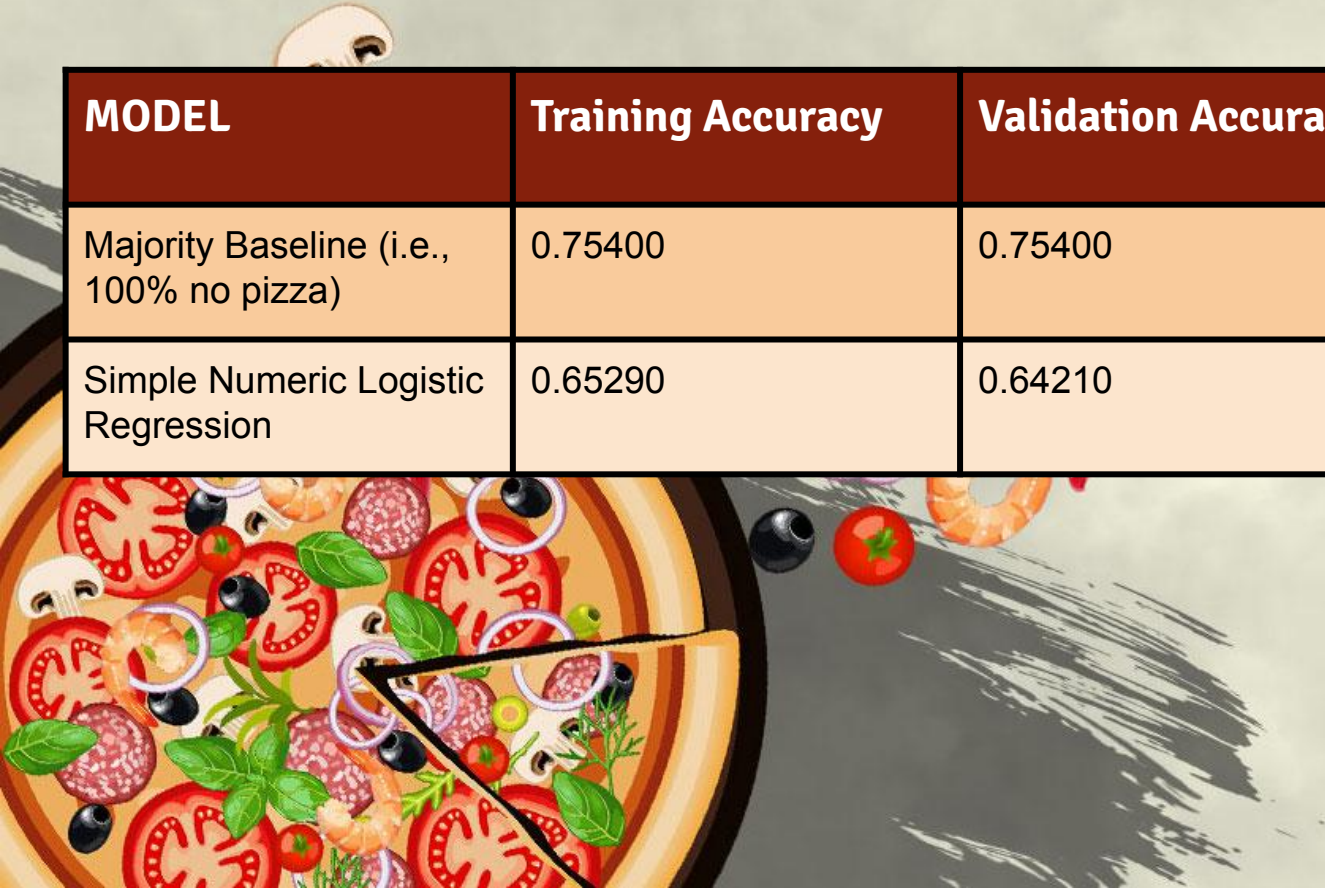
KAGGLE LEADERBOARD (TOP 10, EXCLUDING 100% ACCURACY)

Rank	Test Accuracy
1	0.99627
2	0.99007
3	0.97908
4	0.94295
5	0.89342
6	0.88567
7	0.87304
8	0.86828
9	0.86184
10	0.84202

MODELS

BASELINE MODELS

MODEL	Training Accuracy	Validation Accuracy	Test Accuracy
Majority Baseline (i.e., 100% no pizza)	0.75400	0.75400	0.50000
Simple Numeric Logistic Regression	0.65290	0.64210	0.34340



ACCURACY COMPARISON

MODEL	Training Accuracy	Validation Accuracy	Test Accuracy
Logistic Regression (embeddings)	0.75280	0.73630	0.50000
Convolutional Neural Network (CNN) (embeddings)	0.97070	0.55000	0.50331
Logistic Regression (one-hot encoding)	0.9877	0.9950	0.5453
Random Forest	0.9352	0.5980	0.5651

LOGISTIC REGRESSION WITH EMBEDDINGS - MODEL PARAMETERS

Data preparation needed:

- Vectorize text
- Embeddings

Parameters:

- Vocabulary length
- Sequence length
- Flatten feature by concatenating

LOGISTIC REGRESSION WITH EMBEDDINGS - RESULTS

Logistic Regression (Embeddings) Accuracy

(train | validation | test)

- Full training dataset: 75.3% | 73.6% | 50.0%

Model limitations

- No additional model parameters/layers
- Text data only

LOGISTIC REGRESSION WITH EMBEDDINGS - RESULTS

Confusion Matrix		Predicted	
		No Pizza	Pizza
True	No Pizza	68	0
	Pizza	72	0

Classification	Precision	Recall
No Pizza	**0.49**	**1.00**
Pizza	**0.00**	**0.00**

CNN WITH EMBEDDINGS - MODEL PARAMETERS

Data preparation needed:

- Balance data
- Text standardization
- Vectorize text

Parameters:

- Vocabulary length
- Sequence length
- Embedding output dimensions
- 1-dimensional convoluted layer
- Dense layer units

CNN WITH EMBEDDINGS - PARAMETER ADJUSTMENTS

max_features	sequence_length	embedding_output_dim	conv1d_filters	conv1d_strides	conv1d_kernelsize	dense_units	training_accuracy	val_accuracy
15000	400	16	16	3	12	16	0.9873	0.7277
10000	400	16	16	3	12	16	0.9854	0.7277
15000	300	16	16	3	12	16	0.9816	0.7351
15000	500	16	16	3	12	16	0.9323	0.7302
15000	400	8	16	3	12	16	0.9156	0.7252
15000	400	32	16	3	12	16	0.8685	0.745
15000	400	16	8	3	12	16	0.8102	0.7153
15000	400	16	32	3	12	16	0.8793	0.7302
15000	400	16	16	2	12	16	0.9890	0.7228
15000	400	16	16	1	12	16	0.8034	0.7327
15000	400	16	16	3	8	16	0.8377	0.7351
15000	400	16	16	3	16	16	0.9769	0.7376
15000	400	16	16	3	12	8	0.9150	0.7351
15000	400	16	16	3	12	32	0.9714	0.7475
15000	400	16	16	3	12	64	0.9805	0.7252
15000	400	32	16	3	12	32	0.9334	0.7252

CNN WITH EMBEDDINGS - PARAMETER ADJUSTMENTS

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15000	400	16	16	3	12	64	0.9805	0.7252
15000	400	32	16	3	12	32	0.9334	0.7252

CNN WITH EMBEDDINGS - RESULTS

CNN with Embeddings Accuracy (train | validation | test)

- Full training dataset: 97.5% | 74.8% | 50.0%
- Balanced training dataset: 96.9% | 55.7% | 50.0331%

Model limitations

- Overfitting
- Computer limitations on how many words in a text can be used for each post
- Text data only

CNN WITH EMBEDDINGS - RESULTS

Confusion Matrix		Predicted	
		No Pizza	Pizza
True	No Pizza	71	0
	Pizza	69	0

Classification	Precision	Recall
No Pizza	0.51	1.00
Pizza	0.00	0.00

LOGISTIC REGRESSION WITH ONE-HOT ENCODING

Data preparation needed:

- Tokenize Data
- Padded All Inputs
- Reduced Length Of Vocabulary Size
- Converted To One Hot Encoded Representation

Model Description:

- Flatten feature by concatenating
- Adam Optimizer with 0.01 learning rate

LOGISTIC REGRESSION WITH ONE-HOT ENCODING

One-Hot Encoding Accuracy (train | validation | test)

- Full training dataset: 99.4% | 72.52% | 51.281%
- Balanced training dataset: 98.77% | 99.50% | 54.53%

Model limitations

- Less data for training due to Balanced training dataset
- Vocab was very limited for balanced dataset
- Text data only

LOGISTIC REGRESSION WITH ONE-HOT ENCODING

Confusion Matrix		Predicted	
		No Pizza	Pizza
True	No Pizza	97	1
	Pizza	0	101

Classification	Precision	Recall
No Pizza	**1.00**	**0.99**
Pizza	**0.99**	**1.00**

RANDOM FOREST - MODEL PARAMETERS

Data preparation needed:

- Feature engineering: which features are most important for making binary decisions
- Transforming data: adding binary features

Parameters:

- Features for bag of words and numeric
- Number of estimators (Random Forest)

FEATURES

- Account age
- Number of RAOP comments
- Upvotes + downvotes
- Request length
- Title length
- Requests contain words related to money, hunger, gratitude, unemployment

RANDOM FOREST - RESULTS

RF Accuracy (train | validation | test), 50 estimators:

- Full training dataset: 96% | 72.62% | 52.6%
- Balanced training dataset: 93.52% | 59.80% | 56.51%

Model limitations

- Overfitting
- Less data for training when using balanced dataset, though narrower gap between validation and test

RANDOM FOREST - VALIDATION RESULTS

Confusion Matrix		Predicted	
		No Pizza	Pizza
True	No Pizza	68	40
	Pizza	40	51

Classification	Precision	Recall
No Pizza	0.63	0.63
Pizza	0.56	0.56

Predict pizza, true no pizza:

"just passed the last check ride in order to get my license next week, big day! anyway it's all paid for through the military, so i don't have a job/money to by my own pizza. if your in bend or want to come to bend i will give you a ride in a helicopter, for free."

Predict no pizza, true pizza:

"i have a couple babysitting gigs lined up next week, but i won't have a single dollar until next week. i'm trying to figure something out until then, but a pizza would last me the rest of the week. i'm in missouri. please, for the love of pizza, show me the good side of reddit! you all have saved me in so many ways, but this is my first time asking for a real life helping hand. thank you!"

CONCLUSION

ACCURACY COMPARISON

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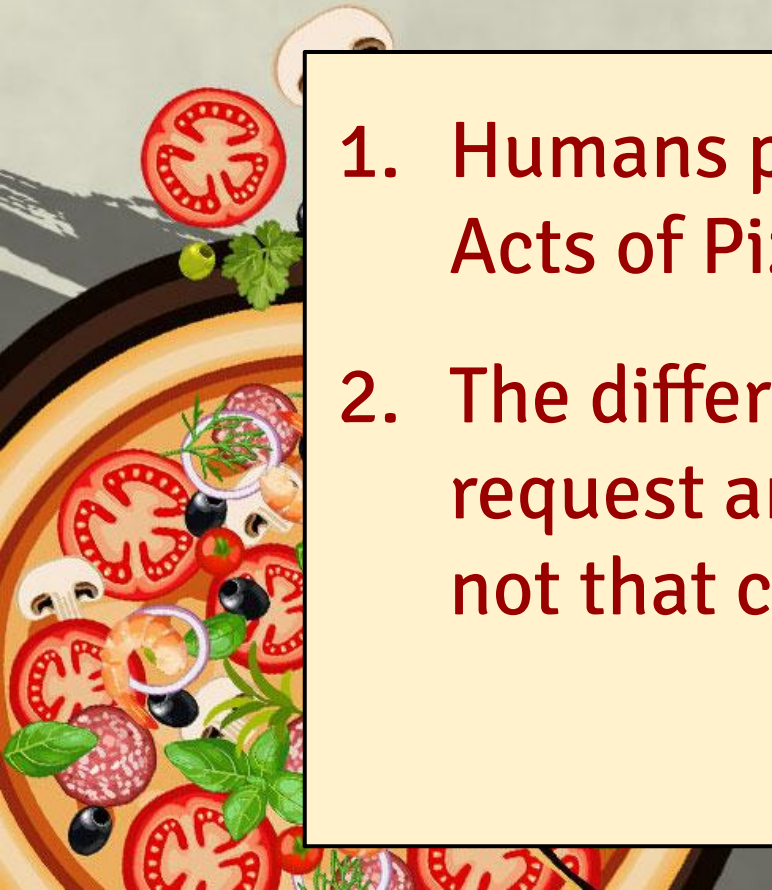
CHALLENGES



1. Humans put the “random” in Random Acts of Pizza
2. The difference between a successful request and an unsuccessful request is not that clear

REQUEST 1	REQUEST 2
my family wants a pizza. my husband, my 3 yr old daughter and i are really craving a pizza right now. we don't have the money to get it and we are living on low income. i'm not giving anyone here a sob story. there's no point. it's not going to help my situation anymore or less if people know my whole life story. like i said, i am just going to be completely honest. we are all craving a pizza :) we have a papa johns around here, we love pepperoni and their little cups of garlic sauce!!\n\n:) want something in return? a drawing, poem, song, ?!	i just have no money at all to help them but they could really use an unexpected happy moment! we have rice and beans and will not starve,but the kids honestly hate the same meal again and again. i will have the oppurtunity to pass the pizza along in a couple weeks when things have grown more stable here. not sure how exactly to verify as i have no camera but please feel free to message me!

SUCCESSFUL REQUEST	UNSUCCESSFUL REQUEST
my family wants a pizza. my husband, my 3 yr old daughter and i are really craving a pizza right now. we don't have the money to get it and we are living on low income. i'm not giving anyone here a sob story. there's no point. it's not going to help my situation anymore or less if people know my whole life story. like i said, i am just going to be completely honest. we are all craving a pizza :) we have a papa johns around here, we love pepperoni and their little cups of garlic sauce!!\n\n:) want something in return? a drawing, poem, song, ?!	i just have no money at all to help them but they could really use an unexpected happy moment! we have rice and beans and will not starve,but the kids honestly hate the same meal again and again. i will have the oppurtunity to pass the pizza along in a couple weeks when things have grown more stable here. not sure how exactly to verify as i have no camera but please feel free to message me!

POSSIBLE FOLLOW UP

- Standardize Text To Correct Text Errors
  - No spaces between words
  - Misspellings
  - Grammatical Errors
- Examine approaches to reduce overfitting
- Incorporate more data
  - 10 years since original data collection
  - Opportunity for Transfer Learning
- Explore other NLP tactics

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THANK YOU!