In [77]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import os

from sklearn.preprocessing import LabelEncoder
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn import feature_extraction
from sklearn.svm import SVC
from sklearn.pipeline import make_pipeline
from sklearn.preprocessing import StandardScaler
import string
import nltk
from nltk.corpus import stopwords
from sklearn.preprocessing import OneHotEncoder
from nltk.tokenize import word_tokenize
from nltk.stem import WordNetLemmatizer
from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator
from sklearn.model_selection import train_test_split
from sklearn.model_selection import cross_val_score
from transformers import BertForSequenceClassification, AdamW, BertConfig


import re
import emoji
from spellchecker import SpellChecker
```

In [78]:
```python
train = pd.read_csv('train.csv')
test = pd.read_csv('test.csv')

test_ids = test['id']
y_train = train['target']
```

In [79]:
```python
train = train.drop(['id'], axis=1)
train = train.drop(['target'], axis=1)
test = test.drop(['id'], axis=1)
```

In [80]:
```python
train.shape
```

Out[80]:
```
(7613, 3)
```

In [81]:
```python
test.shape
```

Out[81]:
```
(3263, 3)
```

In [82]:
```python
train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7613 entries, 0 to 7612
Data columns (total 3 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   keyword   7552 non-null   object
 1   location  5080 non-null   object
 2   text      7613 non-null   object
dtypes: object(3)
memory usage: 178.6+ KB
```

In [83]:
```python
test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3263 entries, 0 to 3262
Data columns (total 3 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   keyword   3237 non-null   object
 1   location  2158 non-null   object
 2   text      3263 non-null   object
dtypes: object(3)
memory usage: 76.6+ KB
```

In [84]:
```python
train = train.fillna('None')
test = test.fillna('None')
```

In [85]:
```python
stopwords= nltk.corpus.stopwords.words('english')

def remove_URL(text):
    url = re.compile(r'https?://\S+|www\.\S+')
    return url.sub(r'URL',text)

def remove_HTML(text):
    html=re.compile(r'<.*?>')
    return html.sub(r'',text)


def remove_not_ASCII(text):
    text = ''.join([word for word in text if word in string.printable])
    return text

def remove_number(text):
    num = re.compile(r'[-+]?[.\d]*[\d]+[:,.\d]*')
    return num.sub(r'NUMBER', text)


def remove_stopwords(text):
    text_tokens = word_tokenize(text)
    tokens_without_sw = [word for word in text_tokens if not word in stopwords]
    text = ' '.join([str(elem) for elem in tokens_without_sw])
    return text

def lemma(text):
    tokens = word_tokenize(text)
    wnl = WordNetLemmatizer()
    text = ' '.join([wnl.lemmatize(words) for words in tokens])
    return text



def cleanTweet(txt):
    txt = txt.lower()

    txt = re.sub(r'@[A-Za-z0-9_]+','',txt)
    txt = re.sub(r'#','',txt)
    txt = re.sub(r'RT : ','',txt)
    txt = re.sub(r'\n','',txt)
    # to remove emojis
    txt = re.sub(emoji.get_emoji_regexp(), r"", txt)
    txt = re.sub(r'https?:\/\/[A-Za-z0-9\.\/]+','',txt)
    txt = re.sub(r"https?://\S+|www\.\S+","",txt)
    txt = re.sub(r"<.*?>","",txt)

    txt = remove_URL(txt)
    txt = remove_HTML(txt)
    txt = remove_not_ASCII(txt)

    txt = txt.lower()

    txt = remove_number(txt)

    txt = remove_stopwords(txt)
    txt = lemma(txt)
    return txt
```

In [86]:
```python
train["clean_text"] = train["text"].apply(cleanTweet)
test["clean_text"] = test["text"].apply(cleanTweet)
```

In [87]:
```python
train.head()
```

Out[87]:

	keyword	location	text	clean_text
0	None	None	Our Deeds are the Reason of this #earthquake M...	deed reason earthquake may allah forgive u
1	None	None	Forest fire near La Ronge Sask. Canada	forest fire near la ronge sask . canada
2	None	None	All residents asked to 'shelter in place' are ...	resident asked 'shelter place ' notified offic...
3	None	None	13,000 people receive #wildfires evacuation or...	NUMBER people receive wildfire evacuation orde...
4	None	None	Just got sent this photo from Ruby #Alaska as ...	got sent photo ruby alaska smoke wildfire pour...

In [88]:
```python
train =  train.drop(['text','keyword','location'], axis=1)
train.head()
```

Out[88]:

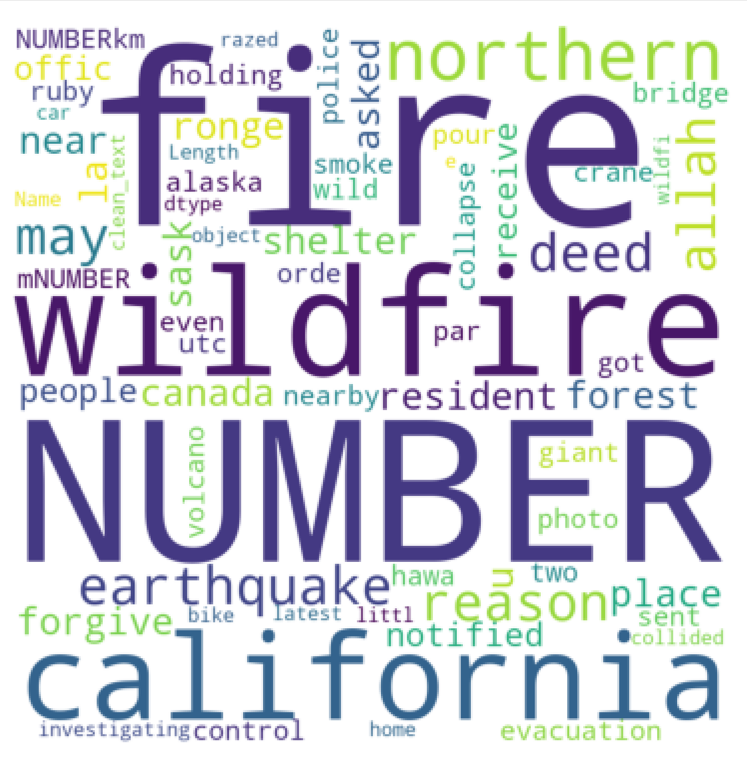
	clean_text
0	deed reason earthquake may allah forgive u
1	forest fire near la ronge sask . canada
2	resident asked 'shelter place ' notified offic...
3	NUMBER people receive wildfire evacuation orde...
4	got sent photo ruby alaska smoke wildfire pour...

In [89]:
```python
test = test.drop(['text','keyword','location'],axis=1)
```

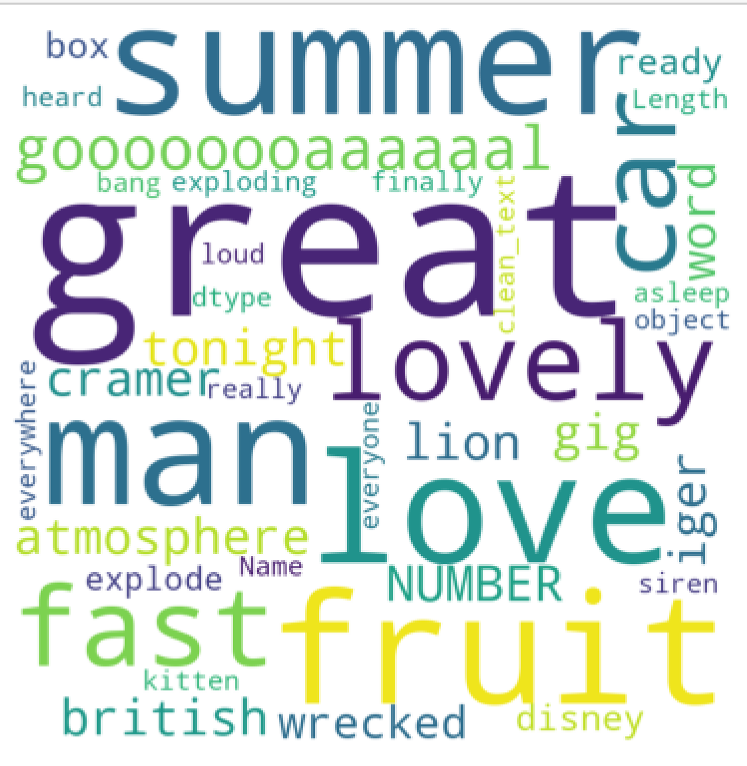
In [90]:
```python
train['target'] = y_train

data_disaster = train[train['target'] == 1]
data_non_disaster = train[train['target'] == 0]
```

In [91]:
```python
wordcloud_1 = WordCloud(width = 800, height = 800,
                background_color ='white',
                stopwords = stopwords,
                min_font_size = 10).generate(str(data_disaster['clean_text']))

wordcloud_0 = WordCloud(width = 800, height = 800,
                background_color ='white',
                stopwords = stopwords,
                min_font_size = 10).generate(str(data_non_disaster['clean_text']))
```

In [92]:
```python
plt.figure(figsize = (5, 5), facecolor = None)
plt.imshow(wordcloud_1)
plt.axis("off")
plt.tight_layout(pad = 0)

plt.show()
```



In [93]:
```python
plt.figure(figsize = (5, 5), facecolor = None)
plt.imshow(wordcloud_0)
plt.axis("off")
plt.tight_layout(pad = 0)

plt.show()
```



In [94]:
```python
X_train, X_valid, y_training, y_valid = train_test_split(train, y_train, test_size=0.2, random_state=1)
```

Neural Network Models

In [95]:
```python
import tensorflow as tf
import keras
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import LSTM
from keras.preprocessing.text import Tokenizer
from keras.preprocessing.sequence import pad_sequences
from keras.layers.embeddings import Embedding
```

In [96]:
```python
sentences = train['clean_text'].tolist()

labels = y_train.values.tolist()
```

In [97]:
```python
max = 0
for i in sentences:
    if len(i)>max:
        max = len(i)

print(max)
```

```
172
```

In [106]:
```python
vocab = 50000
oov = '<OOV>'
embedding = 32
padding = 'post'
truncate = 'post'
maxlength = 100
```

In [107]:
```python
ratio = 0.8*len(sentences)
ratio = int(ratio)
# print(ratio)
train = sentences[0:ratio]
train_label = labels[0:ratio]
val = sentences[ratio:]
val_labels = labels[ratio:]
```

In [108]:
```python
tokenizer =Tokenizer(num_words = vocab, oov_token=oov)
tokenizer.fit_on_texts(train)
word_index = tokenizer.word_index
training = tokenizer.texts_to_sequences(train)
training_pad = pad_sequences(training, maxlen=maxlength, padding=padding, truncating=truncate)

validation = tokenizer.texts_to_sequences(val)
validation_pad = pad_sequences(validation, maxlen=maxlength, padding=padding, truncating=truncate)
```

In [109]:
```python
test_sentences = test['clean_text'].tolist()
test_sen_token = tokenizer.texts_to_sequences(test_sentences)
test_pad = pad_sequences(test_sen_token, maxlen=maxlength, padding=padding, truncating=truncate)
```

In [110]:
```python
tf.keras.backend.clear_session()
model = tf.keras.Sequential([
    tf.keras.layers.Embedding(vocab, embedding, input_length=maxlength),
    tf.keras.layers.GlobalAveragePooling1D(),
    tf.keras.layers.Dense(200, activation='relu'),
    tf.keras.layers.Dense(1, activation='sigmoid'),
])
model.compile(loss='binary_crossentropy',optimizer='adam',metrics=['accuracy'])
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding (Embedding)        (None, 100, 32)           1600000
_________________________________________________________________
global_average_pooling1d (Gl (None, 32)                0
_________________________________________________________________
dense (Dense)                (None, 200)               6600
_________________________________________________________________
dense_1 (Dense)              (None, 1)                 201
=================================================================
Total params: 1,606,801
Trainable params: 1,606,801
Non-trainable params: 0
_________________________________________________________________
```

In [111]:
```python
val_labels = np.array(val_labels)
train_label = np.array(train_label)
```

In [112]:
```python
model_check = tf.keras.callbacks.ModelCheckpoint('model.h5',save_best_only = True)
```

In [113]:
```python
num_epochs = 7
history = model.fit(training_pad,
                    train_label,
                    epochs=num_epochs,
                    validation_data=(validation_pad, val_labels),
                    callbacks = [model_check])
```

```
Epoch 1/7
191/191 [==============================] - 6s 25ms/step - loss: 0.6824 - accuracy: 0.5662 - val_loss:
0.6872 - val_accuracy: 0.5345
Epoch 2/7
191/191 [==============================] - 5s 24ms/step - loss: 0.6480 - accuracy: 0.6135 - val_loss:
0.5488 - val_accuracy: 0.7951
Epoch 3/7
191/191 [==============================] - 4s 23ms/step - loss: 0.4316 - accuracy: 0.8369 - val_loss:
0.4555 - val_accuracy: 0.8037
Epoch 4/7
191/191 [==============================] - 4s 23ms/step - loss: 0.3123 - accuracy: 0.8754 - val_loss:
0.4486 - val_accuracy: 0.8043
Epoch 5/7
191/191 [==============================] - 5s 24ms/step - loss: 0.2566 - accuracy: 0.8981 - val_loss:
0.4676 - val_accuracy: 0.7794
Epoch 6/7
191/191 [==============================] - 4s 23ms/step - loss: 0.2037 - accuracy: 0.9245 - val_loss:
0.5512 - val_accuracy: 0.7262
Epoch 7/7
191/191 [==============================] - 4s 23ms/step - loss: 0.1984 - accuracy: 0.9262 - val_loss:
0.4937 - val_accuracy: 0.7886
```

In [ ]:
```python
tf.keras.backend.clear_session()
model_lstm2 = Sequential()
model_lstm2.add(Embedding(vocab, embedding, input_length=maxlength))
model_lstm2.add(LSTM(5))
model_lstm2.add(Dense(25, activation='relu'))
model_lstm2.add(Dense(1, activation='sigmoid'))
model_lstm2.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])

history_lstm2 = model_lstm2.fit(training_pad,
                                train_label,
                                epochs=15,
                                validation_data=(validation_pad, val_labels),
                                batch_size=32)
```

In [ ]:
```python
predictions = model.predict(test_pad)
```

In [ ]:
```python
pred = []
for i in range(0,len(predictions)):
    if predictions[i][0]>0.5:
        pred.append(1)
    else:
        pred.append(0)
```

In [ ]:
```python
df_results = pd.DataFrame({'id': test_ids, 'target': pred})
df_results.head()
```

In [ ]:
```python
df_results.to_csv('results9.csv', index=False)
```

In [ ]: