

News Headlines Sentiment

Use the news api to pull the latest news articles for bitcoin and ethereum and create a DataFrame of sentiment scores for each coin.

Use descriptive statistics to answer the following questions:

1. Which coin had the highest mean positive score?
2. Which coin had the highest negative score?
3. Which coin had the highest positive score?

```
In [5]: # Initial imports
import os
from pathlib import Path
import pandas as pd
from newsapi import NewsApiClient
import nltk
from dotenv import load_dotenv
from nltk.sentiment.vader import SentimentIntensityAnalyzer
from dotenv import load_dotenv
load_dotenv()
analyzer = SentimentIntensityAnalyzer()

%matplotlib inline
```

```
In [6]: # Download/Update the VADER Lexicon
nltk.download('vader_lexicon')

# Initialize the VADER sentiment analyzer
analyzer = SentimentIntensityAnalyzer()

[nltk_data] Downloading package vader_lexicon to
[nltk_data] /Users/travis/nltk_data...
[nltk_data] Package vader_lexicon is already up-to-date!
```

```
In [7]: # Read your api key environment variable
api_key = os.getenv("NEWS_API_KEY")
api_key
```

```
Out[7]: '885cf26469d2453fa3c0b6c1dc852480'
```

```
In [8]: # Create a newsapi client
from newsapi import NewsApiClient
newsapi = NewsApiClient(api_key=api_key)
print(newsapi)

<newsapi.newsapi_client.NewsApiClient object at 0x7fe858866a90>
```

```
In [9]: # Fetch the Bitcoin news articles
Bitcoin_headlines = newsapi.get_everything(
    q="Bitcoin",
    language="en",
```

```

)
# Print total articles
print(f"Total articles about Bitcoin: {Bitcoin_headlines['totalResults']}")

# Show sample article
Bitcoin_headlines["articles"][0]

```

Total articles about Bitcoin: 5125

```

Out[9]: {'source': {'id': None, 'name': 'Lifehacker.com'},
        'author': 'Mike Winters on Two Cents, shared by Mike Winters to Lifehacker',
        'title': 'Is the New Visa Bitcoin Rewards Card Worth It?',
        'description': 'Visa has partnered with cryptocurrency startup BlockFi to offer the first rewards credit card that pays out in Bitcoin rather than cash, but is it worth applying for? Unless you're extremely bullish on cryptocurrency and don't mind getting seriously dinged for...',
        'url': 'https://twocents.lifehacker.com/is-the-new-visa-bitcoin-rewards-card-worth-it-1845803159',
        'urlToImage': 'https://i.kinja-img.com/gawker-media/image/upload/c_fill,f_auto,fl_progressive,g_center,h_675,pg_1,q_80,w_1200/a2650t4nr8r2uyujbnfu.png',
        'publishedAt': '2020-12-03T22:00:00Z',
        'content': 'Visa has partnered with cryptocurrency startup BlockFi to offer the first rewards credit card that pays out in Bitcoin rather than cash, but is it worth applying for? Unless you're extremely bullish on... [+2239 chars]'}

```

```

In [10]: # Fetch the Ethereum news articles
Ethereum_headlines = newsapi.get_everything(
    q="Ethereum",
    language="en",
)
# Print total articles
print(f"Total articles about Ethereum: {Ethereum_headlines['totalResults']}")

# Show sample article
Ethereum_headlines["articles"][0]

```

Total articles about Ethereum: 1318

```

Out[10]: {'source': {'id': 'reuters', 'name': 'Reuters'},
        'author': 'Tom Wilson',
        'title': 'Smaller digital coins soar as bitcoin powers on towards record high - Reuters UK',
        'description': 'Digital currencies Ethereum and XRP soared on Monday, gaining momentum as bitcoin powered on towards its all-time high.',
        'url': 'https://in.reuters.com/article/us-crypto-currencies-idUKKBN2831RI',
        'urlToImage': 'https://static.reuters.com/resources/r/?m=02&d=20201123&t=2&i=1542157677&r=LYNXMPEGAM0XD&w=800',
        'publishedAt': '2020-11-23T14:16:00Z',
        'content': 'FILE PHOTO: Representation of the Ethereum virtual currency standing on the PC motherboard is seen in this illustration'}

```

picture, February 3, 2018. REUTERS/Dado Ruvic/Illustration\r\nLONDON (Reuters) - ... [+1237 chars]'}
 ON (Reuters) - ... [+1237 chars]'

```
In [11]: # Create the Bitcoin sentiment scores DataFrame
Bitcoin_sentiments = []

for article in Bitcoin_headlines["articles"]:
    try:
        text = article["content"]

        sentiment = analyzer.polarity_scores(text)
        compound = sentiment["compound"]
        pos = sentiment["pos"]
        neu = sentiment["neu"]
        neg = sentiment["neg"]

        Bitcoin_sentiments.append({

            "Compound": compound,
            "Positive": pos,
            "Negative": neg,
            "Neutral": neu,
            "Text": text

        })

    except AttributeError:
        pass

# Create DataFrame
Bitcoin_df = pd.DataFrame(Bitcoin_sentiments)

# Reorder DataFrame columns
cols = ["Compound", "Positive", "Negative", "Neutral", "Text"]
Bitcoin_df = Bitcoin_df[cols]

Bitcoin_df.head()
```

Out[11]:

	Compound	Positive	Negative	Neutral	Text
0	0.6369	0.162	0.000	0.838	Visa has partnered with cryptocurrency startup...
1	0.6486	0.174	0.000	0.826	After reaching a previous all-time high on Nov...
2	0.4019	0.072	0.000	0.928	Its been almost three years to the day since t...
3	0.2732	0.136	0.083	0.781	Everything is dumb until it works.\r\nAs 2020 ...
4	0.2023	0.050	0.000	0.950	In November 2017, after an absolutely massive,...

```
In [12]: # Create the ethereum sentiment scores DataFrame
```

```

# Create the Ethereum Sentiment Score DataFrame
Ethereum_sentiments = []

for article in Ethereum_headlines["articles"]:
    try:
        text = article["content"]

        sentiment = analyzer.polarity_scores(text)
        compound = sentiment["compound"]
        pos = sentiment["pos"]
        neu = sentiment["neu"]
        neg = sentiment["neg"]

        Ethereum_sentiments.append({

            "Compound": compound,
            "Positive": pos,
            "Negative": neg,
            "Neutral": neu,
            "Text": text

        })

    except AttributeError:
        pass

# Create DataFrame
Ethereum_df = pd.DataFrame(Ethereum_sentiments)

# Reorder DataFrame columns
cols = ["Compound", "Positive", "Negative", "Neutral", "Text"]
Ethereum_df = Ethereum_df[cols]

Ethereum_df.head()

```

Out[12]:

	Compound	Positive	Negative	Neutral	Text
0	0.0000	0.000	0.000	1.000	FILE PHOTO: Representation of the Ethereum vir...
1	0.0000	0.000	0.000	1.000	FILE PHOTO: Representation of the Ethereum vir...
2	0.4215	0.088	0.000	0.912	LONDON (Reuters) - Digital currencies Ethereum...
3	0.0772	0.066	0.085	0.849	Bitcoin was once derided by serious investors ...
4	0.0000	0.000	0.000	1.000	FILE PHOTO: A representation of virtual curren...

In [13]: *# Describe the Bitcoin Sentiment*
 Bitcoin_df.describe()

Out[13]:

	Compound	Positive	Negative	Neutral
--	----------	----------	----------	---------

count	19.000000	19.000000	19.000000	19.000000
mean	0.288200	0.089000	0.017579	0.893368
std	0.356648	0.075414	0.035419	0.082347
min	-0.585900	0.000000	0.000000	0.773000
25%	0.000000	0.000000	0.000000	0.827500
50%	0.273200	0.076000	0.000000	0.883000
75%	0.630900	0.157000	0.000000	0.975000
max	0.801600	0.209000	0.103000	1.000000

```
In [14]: # Describe the Ethereum Sentiment
Ethereum_df.describe()
```

```
Out[14]:
```

	Compound	Positive	Negative	Neutral
count	20.000000	20.000000	20.000000	20.000000
mean	0.112815	0.041250	0.008500	0.950250
std	0.229816	0.075056	0.026162	0.082441
min	-0.128000	0.000000	0.000000	0.682000
25%	0.000000	0.000000	0.000000	0.931500
50%	0.000000	0.000000	0.000000	1.000000
75%	0.177900	0.063000	0.000000	1.000000
max	0.877900	0.318000	0.085000	1.000000

Questions:

Q: Which coin had the highest mean positive score?

A: Bitcoin has the higher mean positive score (0.089) compared to Bitcoin (0.041).

Q: Which coin had the highest compound score?

A: Based on the descriptive statistics, Ethereum has the highest compound score at 0.87 vs. the maximum compound score of 0.81 from Bitcoin.

Q: Which coin had the highest positive score?

A: Ethereum has the highest positive score at 0.31 maximum compared to 0.20 maximum received by Bitcoin.

Images/btc-sent.jpg Images/eth-sent.jpg

Tokenizer

In this section, you will use NLTK and Python to tokenize the text for each coin. Be sure to:

1. Lowercase each word
2. Remove Punctuation
3. Remove Stopwords

```
In [15]: from nltk.tokenize import word_tokenize, sent_tokenize
from nltk.corpus import stopwords
from nltk.stem import WordNetLemmatizer, PorterStemmer
from string import punctuation
import re
import nltk
nltk.download('stopwords')
```

```
[nltk_data] Downloading package stopwords to
[nltk_data]      /Users/travis/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
```

Out[15]: True

```
In [16]: lemmatizer = WordNetLemmatizer()
```

```
In [17]: # Complete the tokenizer function- stopwords, punctuations, lower-
case
def tokenizer(text):
    sw= set(stopwords.words('english'))
    regex= re.compile("[^a-zA-Z ]")

    re_clean = regex.sub('', str(text))
    words= word_tokenize(re_clean)
    lem=[lemmatizer.lemmatize(word) for word in words]
    tokens= [word.lower() for word in lem if word.lower() not in s
w ]

    return tokens
```

```
In [18]: # Create a new tokens column for bitcoin
Bitcoin_df["tokens"] = Bitcoin_df.Text.apply(tokenizer)
Bitcoin_df.head()
```

Out[18]:

	Compound	Positive	Negative	Neutral	Text	tokens
0	0.6369	0.162	0.000	0.838	Visa has partnered with cryptocurrency startup...	[visahas, partnered, cryptocurrency, startup, ...
1	0.6486	0.174	0.000	0.826	After reaching a previous all-time high on Nov...	[reaching, previous, alltime, high, november, ...
					Its been almost	[almost, three, year,

2	0.4019	0.072	0.000	0.928	three years to the day since t...	day, since, price, bitco...
3	0.2732	0.136	0.083	0.781	Everything is dumb until it works.\r\nAs 2020 ...	[everything, dumb, worksas, come, close, crypt...
4	0.2023	0.050	0.000	0.950	In November 2017, after an absolutely massive,...	[november, absolutely, massive, twomonth, rall...

```
In [19]: # Create a new tokens column for ethereum
Ethereum_df["tokens"] = Ethereum_df.Text.apply(tokenizer)
Ethereum_df.head()
```

Out[19]:

	Compound	Positive	Negative	Neutral	Text	tokens
0	0.0000	0.000	0.000	1.000	FILE PHOTO: Representation of the Ethereum vir...	[file, photo, representation, ethereum, virtua...
1	0.0000	0.000	0.000	1.000	FILE PHOTO: Representation of the Ethereum vir...	[file, photo, representation, ethereum, virtua...
2	0.4215	0.088	0.000	0.912	LONDON (Reuters) - Digital currencies Ethereum...	[london, reuters, digital, currency, ethereum,...
3	0.0772	0.066	0.085	0.849	Bitcoin was once derided by serious investors ...	[bitcoin, wa, derided, serious, investor, bubb...
4	0.0000	0.000	0.000	1.000	FILE PHOTO: A representation of virtual curren...	[file, photo, representation, virtual, currenc...

NGrams and Frequency Analysis

In this section you will look at the ngrams and word frequency for each coin.

1. Use NLTK to produce the n-grams for N = 2.
2. List the top 10 words for each coin.

```
In [20]: from collections import Counter
from nltk import ngrams
```

```

In [21]: # Tokenized Bitcoin articles
bitcoin_p = tokenizer(Bitcoin_df.Text.str.cat())
bitcoin_p

```

```

Out[21]: ['visahas',
          'partnered',
          'cryptocurrency',
          'startup',
          'blockfi',
          'offer',
          'first',
          'reward',
          'credit',
          'card',
          'pay',
          'bitcoin',
          'rather',
          'cash',
          'worth',
          'applying',
          'unless',
          'youre',
          'extremely',
          'bullish',
          'charsafter',
          'reaching',
          'previous',
          'alltime',
          'high',
          'november',
          'th',
          'december',
          'st',
          'bitcoin',
          'trading',
          'well',
          'ha',
          'surpassed',
          'previous',
          'peak',
          'pricebitcoins',
          'value',
          'ha',
          'rapidly',
          'charsits',
          'almost',
          'three',
          'year',
          'day',
          'since',
          'price',
          'bitcoin',
          'wa',
          'close',
          'breaking',
          'ceiling',
          'came',
          'crashing',
          '-----']

```



```
'weenesday',  
'arbitrary',  
'milestone',  
'hodlers',  
'dream',  
'wa',  
'finally',  
'charseverything',  
'dumb',  
'worksas',  
'come',  
'close',  
'cryptocurrency',  
'world',  
'experiencing',  
'another',  
'lateyear',  
'surge',  
'consumer',  
'interest',  
'price',  
'climb',  
'value',  
'bitcoin',  
'charsin',  
'november',  
'absolutely',  
'massive',  
'twomonth',  
'rally',  
'bitcoin',  
'passed',  
'first',  
'time',  
'next',  
'day',  
'soared',  
'even',  
'higher',  
'reaching',  
'price',  
'roug',  
'charsunlike',  
'conventional',  
'cryptocurrencies',  
'central',  
'bank',  
'control',  
'digital',  
'yuan',  
'case',  
'peoples',  
'bank',  
'china',  
'move',  
'give',  
'country',  
'power',
```

```
'theory',
'stability',
'freq',
'charsif',
'youve',
'watching',
'crypto',
'market',
'past',
'week',
'youll',
'noticed',
'something',
'special',
'bitcoin',
'everyones',
'favorite',
'decentralized',
'digital',
'currency',
'based',
'hype',
'lie',
'general',
'mal',
'charsimage',
'copyrightgetty',
'imagesbitcoin',
'ha',
'hit',
'new',
'alltime',
'high',
'breaking',
'volatile',
'virtual',
'currency',
'ha',
'gained',
'year',
'amid',
'stock',
'market',
'turmoilon',
'charssix',
'year',
'launch',
'mexicobased',
'cryptocurrency',
'exchange',
'financial',
'service',
'platform',
'bitso',
'company',
'revealed',
'ha',
'closed',
```

```
'million',  
'financing',  
'capitalize',  
'crypto',  
'charsdecentralized',  
'exchange',  
'protocol',  
'allow',  
'crypto',  
'trader',  
'investor',  
'trade',  
'across',  
'different',  
'blockhains',  
'development',  
'significant',  
'new',  
'development',  
'come',  
'la',  
'char',  
'us',  
'market',  
'ended',  
'november',  
'large',  
'gain',  
'even',  
'small',  
'decline',  
'today',  
'sampp',  
'jumped',  
'percent',  
'november',  
'best',  
'monthly',  
'showing',  
'since',  
'april',  
'fourthbest',  
'month',  
'charsillustration',  
'grayson',  
'blackmon',  
'verge',  
'one',  
'wildest',  
'story',  
'year',  
'wa',  
'day',  
'mostfollowed',  
'twitter',  
'account',  
'planet',  
'posted'
```

```
posted ,
'cryptocurrency',
'scam',
'char',
'poster',
'participatingbitcoin',
'rose',
'tuesday',
'evening',
'reaching',
'highest',
'value',
'since',
'december',
'indeed',
'prior',
'week',
'bitcoin',
'ha',
'worth',
'char',
'poster',
'participatingthe',
'price',
'one',
'bitcoin',
'rose',
'wednesday',
'new',
'alltime',
'record',
'cap',
'year',
'gain',
'world',
'valuable',
'cryptocurrency',
'value',
'b',
'charsby',
'reuters',
'stafffile',
'photo',
'representations',
'bitcoin',
'us',
'dollar',
'banknote',
'seen',
'illustration',
'taken',
'january',
'reutersdado',
'ruvicfile',
'photolondon',
'reuters',
'bitcoin',
'smash',
.
```

```
'charsby',
'reuters',
'stafffile',
'photo',
'representation',
'virtual',
'currency',
'bitcoin',
'seen',
'front',
'stock',
'graph',
'illustration',
'taken',
'november',
'reutersdado',
'ruvicillustrationlondon',
'reu',
'charsposted',
'bitcoin',
'ha',
'grabbed',
'headline',
'week',
'ascent',
'alltime',
'high',
'yet',
'trend',
'ha',
'playing',
'could',
'change',
'face',
'cryptocurrency',
'market',
'massive',
'flow',
'coin',
'charsby',
'reuters',
'stafffile',
'photo',
'representation',
'virtual',
'currency',
'bitcoin',
'seen',
'illustration',
'taken',
'november',
'reutersdado',
'ruvicillustrationtokyo',
'reuters',
'bitcoin',
'dropped',
'charsposted',
'comprehensive',
```

```
'wealth',
'management',
'president',
'john',
'vento',
'tell',
'reuters',
'fred',
'katayama',
'onus',
'bitcoin',
'investor',
'keep',
'record',
'every',
'transaction',
'tax',
'reporting',
'purpose',
'also',
'pr',
'char']
```

```
In [22]: # Tokenized Ethereum articles
ethereum_p= tokenizer(Ethereum_df.Text.str.cat())
ethereum_p
```

```
Out[22]: ['file',
'photo',
'representation',
'ethereum',
'virtual',
'currency',
'standing',
'pc',
'motherboard',
'seen',
'illustration',
'picture',
'february',
'reutersdado',
'ruvicillustrationlondon',
'reuters',
'charsfile',
'photo',
'representation',
'ethereum',
'virtual',
'currency',
'standing',
'pc',
'motherboard',
'seen',
'illustration',
'picture',
'february',
'reutersdado',
'ruvicillustrationlondon',
```

```
'reuters',
'charslondon',
'reuters',
'digital',
'currency',
'ethereum',
'xrp',
'soared',
'monday',
'gaining',
'momentum',
'bitcoin',
'powered',
'towards',
'alltime',
'highfile',
'photo',
'representation',
'ethereum',
'virtual',
'currency',
'charsbitcoin',
'wa',
'derided',
'serious',
'investor',
'bubble',
'ponzi',
'scheme',
'year',
'ha',
'become',
'irresistible',
'investment',
'many',
'themjust',
'wednesday',
'bitcoin',
'topped',
'fo',
'charsfile',
'photo',
'representation',
'virtual',
'currency',
'bitcoin',
'seen',
'front',
'stock',
'graph',
'illustration',
'taken',
'november',
'reutersdado',
'ruvicillustrationlondon',
'reuters',
'major',
'us'
```

```
us ,
'charsfile',
'photo',
'representations',
'virtual',
'currency',
'bitcoin',
'seen',
'picture',
'illustration',
'taken',
'taken',
'march',
'reutersdado',
'ruvicillustrationlondon',
'reuters',
'major',
'us',
'cryptocurrency',
'charsfile',
'photo',
'representations',
'virtual',
'currency',
'bitcoin',
'seen',
'picture',
'illustration',
'taken',
'taken',
'march',
'reutersdado',
'ruvicillustrationlondon',
'reuters',
'major',
'us',
'cryptocurrency',
'charsnew',
'york',
'reuters',
'institutional',
'investor',
'pumped',
'million',
'cryptocurrency',
'fund',
'product',
'week',
'ended',
'dec',
'second',
'highest',
'record',
'pushing',
'sector',
'asset',
'manag',
'charsnew',
```



```
'york',  
'reuters',  
'institutional',  
'investor',  
'pumped',  
'million',  
'cryptocurrency',  
'fund',  
'product',  
'week',  
'ended',  
'dec',  
'second',  
'highest',  
'record',  
'pushing',  
'sector',  
'asset',  
'manag',  
'charspaypal',  
'ha',  
'launched',  
'generosity',  
'network',  
'platform',  
'allows',  
'user',  
'create',  
'customized',  
'personal',  
'fundraising',  
'campaign',  
'yes',  
'like',  
'gofundmeyou',  
'raise',  
'maximum',  
'charsby',  
'reuters',  
'stafffile',  
'photo',  
'representation',  
'virtual',  
'currency',  
'bitcoin',  
'seen',  
'front',  
'stock',  
'graph',  
'illustration',  
'taken',  
'november',  
'reutersdado',  
'ruvicillustrationfile',  
'photo',  
'charsby',  
'reuters',  
'stafffile',
```

```
'photo',
'representation',
'virtual',
'currency',
'bitcoin',
'seen',
'front',
'stock',
'graph',
'illustration',
'taken',
'november',
'reutersdado',
'ruvicillustrationfile',
'photo',
'charsthe',
'new',
'york',
'times',
'probably',
'publish',
'story',
'cryptocurrency',
'exchange',
'coinbase',
'reading',
'news',
'outlet',
'website',
'coinbase',
'ha',
'taken',
'highly',
'un',
'charsdecember',
'min',
'readopinions',
'expressed',
'entrepreneur',
'contributor',
'owna',
'day',
'ago',
'newly',
'elected',
'us',
'senator',
'cynthia',
'lummis',
'endorsed',
'bitcoin',
'live',
'television',
'spoke',
'charsdecentralized',
'exchange',
'protocol',
'allow'.
```

```
allow',  
'crypto',  
'trader',  
'investor',  
'trade',  
'across',  
'different',  
'blockhains',  
'development',  
'significant',  
'new',  
'development',  
'come',  
'la',  
'charsby',  
'reuters',  
'staffa',  
'representation',  
'virtual',  
'currency',  
'bitcoin',  
'seen',  
'illustration',  
'taken',  
'november',  
'reutersdado',  
'ruvicillustrationnew',  
'york',  
'reuters',  
'bitcoin',  
'btcbtsp',  
'rose',  
'n',  
'charsby',  
'reuters',  
'staffa',  
'representation',  
'virtual',  
'currency',  
'bitcoin',  
'seen',  
'illustration',  
'taken',  
'november',  
'reutersdado',  
'ruvicillustrationnew',  
'york',  
'reuters',  
'bitcoin',  
'btcbtsp',  
'rose',  
'n',  
'charsby',  
'reuters',  
'stafffile',  
'photo',  
'representations',  
'virtual',  
,
```

```
'currency',
'bitcoin',
'placed',
'us',
'dollar',
'banknote',
'illustration',
'taken',
'may',
'reutersdado',
'ruvicillustrationlondon',
'reuters',
'charsby',
'reuters',
'stafffile',
'photo',
'representation',
'virtual',
'currency',
'bitcoin',
'seen',
'illustration',
'taken',
'november',
'reutersdado',
'ruvicillustrationfile',
'photolondon',
'reuters',
'bitcoin',
'charsa',
'chain',
'block',
'erupters',
'used',
'bitcoin',
'mining',
'pictured',
'plug',
'play',
'tech',
'center',
'sunnyvale',
'california',
'october',
'reutersstephen',
'lamullibitcoin',
'slumped',
'throug',
'char']
```

In [23]: *# Generate the Bitcoin N-grams where N=2*

N=2

```
bigram_counts_B = Counter(ngrams(bitcoin_p, N))
```

```
print(dict(bigram_counts_B))
```

```
{('visahas', 'partnered'): 1, ('partnered', 'cryptocurrency'): 1,
('cryptocurrency', 'startup'): 1, ('startup', 'blockfi'): 1, ('blo
ckfi', 'offer'): 1, ('offer', 'first'): 1, ('first', 'reward'): 1,
```

```
(
    'reward', 'credit': 1, ('credit', 'card'): 1, ('card', 'pay'): 1, ('pay', 'bitcoin'): 1, ('bitcoin', 'rather'): 1, ('rather', 'cash'): 1, ('cash', 'worth'): 1, ('worth', 'applying'): 1, ('applying', 'unless'): 1, ('unless', 'youre'): 1, ('youre', 'extremely'): 1, ('extremely', 'bullish'): 1, ('bullish', 'charsafter'): 1, ('charsafter', 'reaching'): 1, ('reaching', 'previous'): 1, ('previous', 'alltime'): 1, ('alltime', 'high'): 3, ('high', 'november'): 1, ('november', 'th'): 1, ('th', 'december'): 1, ('december', 'st'): 1, ('st', 'bitcoin'): 1, ('bitcoin', 'trading'): 1, ('trading', 'well'): 1, ('well', 'ha'): 1, ('ha', 'surpassed'): 1, ('surpassed', 'previous'): 1, ('previous', 'peak'): 1, ('peak', 'pricebitcoins'): 1, ('pricebitcoins', 'value'): 1, ('value', 'ha'): 1, ('ha', 'rapidly'): 1, ('rapidly', 'charsits'): 1, ('charsits', 'almost'): 1, ('almost', 'three'): 1, ('three', 'year'): 1, ('year', 'day'): 1, ('day', 'since'): 1, ('since', 'price'): 1, ('price', 'bitcoin'): 1, ('bitcoin', 'wa'): 1, ('wa', 'close'): 1, ('close', 'breaking'): 1, ('breaking', 'ceiling'): 1, ('ceiling', 'came'): 1, ('came', 'crashing'): 1, ('crashing', 'wednesday'): 1, ('wednesday', 'arbitrary'): 1, ('arbitrary', 'milestone'): 1, ('milestone', 'hodlers'): 1, ('hodlers', 'dream'): 1, ('dream', 'wa'): 1, ('wa', 'finally'): 1, ('finally', 'charseverything'): 1, ('charseverything', 'dumb'): 1, ('dumb', 'worksas'): 1, ('worksas', 'come'): 1, ('come', 'close'): 1, ('close', 'cryptocurrency'): 1, ('cryptocurrency', 'world'): 1, ('world', 'experiencing'): 1, ('experiencing', 'another'): 1, ('another', 'lateyear'): 1, ('lateyear', 'surge'): 1, ('surge', 'consumer'): 1, ('consumer', 'interest'): 1, ('interest', 'price'): 1, ('price', 'climb'): 1, ('climb', 'value'): 1, ('value', 'bitcoin'): 1, ('bitcoin', 'charsin'): 1, ('charsin', 'november'): 1, ('november', 'absolutely'): 1, ('absolutely', 'massive'): 1, ('massive', 'twomonth'): 1, ('twomonth', 'rally'): 1, ('rally', 'bitcoin'): 1, ('bitcoin', 'passed'): 1, ('passed', 'first'): 1, ('first', 'time'): 1, ('time', 'next'): 1, ('next', 'day'): 1, ('day', 'soared'): 1, ('soared', 'even'): 1, ('even', 'higher'): 1, ('higher', 'reaching'): 1, ('reaching', 'price'): 1, ('price', 'roug'): 1, ('roug', 'charsunlike'): 1, ('charsunlike', 'conventional'): 1, ('conventional', 'cryptocurrencies'): 1, ('cryptocurrencies', 'central'): 1, ('central', 'bank'): 1, ('bank', 'control'): 1, ('control', 'digital'): 1, ('digital', 'yuan'): 1, ('yuan', 'case'): 1, ('case', 'peoples'): 1, ('peoples', 'bank'): 1, ('bank', 'china'): 1, ('china', 'move'): 1, ('move', 'give'): 1, ('give', 'country'): 1, ('country', 'power'): 1, ('power', 'theory'): 1, ('theory', 'stability'): 1, ('stability', 'freq'): 1, ('freq', 'charsif'): 1, ('charsif', 'youve'): 1, ('youve', 'watching'): 1, ('watching', 'crypto'): 1, ('crypto', 'market'): 1, ('market', 'past'): 1, ('past', 'week'): 1, ('week', 'youll'): 1, ('youll', 'noticed'): 1, ('noticed', 'something'): 1, ('something', 'special'): 1, ('special', 'bitcoin'): 1, ('bitcoin', 'everyones'): 1, ('everyones', 'favorite'): 1, ('favorite', 'decentralized'): 1, ('decentralized', 'digital'): 1, ('digital', 'currency'): 1, ('currency', 'based'): 1, ('based', 'hype'): 1, ('hype', 'lie'): 1, ('lie', 'general'): 1, ('general', 'mal'): 1, ('mal', 'charsimage'): 1, ('charsimage', 'copyrightgetty'): 1, ('copyrightgetty', 'imagesbitcoin'): 1, ('imagesbitcoin', 'ha'): 1, ('ha', 'hit'): 1, ('hit', 'new'): 1, ('new', 'alltime'): 2, ('high', 'breaking'): 1, ('breaking', 'volatile'): 1, ('volatile', 'virtual'): 1, ('virtual', 'currency'): 3, ('currency', 'ha'): 1, ('ha', 'gained'): 1, ('gained', 'year'): 1, ('year', 'amid'): 1, ('amid', 'stock'): 1, ('stock', 'market'): 1, ('market', 'turmoilon'): 1, ('turmoilon', 'chars
```

```

six'): 1, ('charssix', 'year'): 1, ('year', 'launch'): 1, ('launch', 'mexicobased'): 1, ('mexicobased', 'cryptocurrency'): 1, ('cryptocurrency', 'exchange'): 1, ('exchange', 'financial'): 1, ('financial', 'service'): 1, ('service', 'platform'): 1, ('platform', 'bitso'): 1, ('bitso', 'company'): 1, ('company', 'revealed'): 1, ('revealed', 'ha'): 1, ('ha', 'closed'): 1, ('closed', 'million'): 1, ('million', 'financing'): 1, ('financing', 'capitalize'): 1, ('capitalize', 'crypto'): 1, ('crypto', 'charsdecentralized'): 1, ('charsdecentralized', 'exchange'): 1, ('exchange', 'protocol'): 1, ('protocol', 'allow'): 1, ('allow', 'crypto'): 1, ('crypto', 'trader'): 1, ('trader', 'investor'): 1, ('investor', 'trade'): 1, ('trade', 'across'): 1, ('across', 'different'): 1, ('different', 'blockhains'): 1, ('blockhains', 'development'): 1, ('development', 'significant'): 1, ('significant', 'new'): 1, ('new', 'development'): 1, ('development', 'come'): 1, ('come', 'la'): 1, ('la', 'char'): 1, ('char', 'us'): 1, ('us', 'market'): 1, ('market', 'ended'): 1, ('ended', 'november'): 1, ('november', 'large'): 1, ('large', 'gain'): 1, ('gain', 'even'): 1, ('even', 'small'): 1, ('small', 'decline'): 1, ('decline', 'today'): 1, ('today', 'sampp'): 1, ('sampp', 'jumped'): 1, ('jumped', 'percent'): 1, ('percent', 'november'): 1, ('november', 'best'): 1, ('best', 'monthly'): 1, ('monthly', 'showing'): 1, ('showing', 'since'): 1, ('since', 'april'): 1, ('april', 'fourthbest'): 1, ('fourthbest', 'month'): 1, ('month', 'charsillustration'): 1, ('charsillustration', 'grayson'): 1, ('grayson', 'blackmon'): 1, ('blackmon', 'verge'): 1, ('verge', 'one'): 1, ('one', 'wildest'): 1, ('wildest', 'story'): 1, ('story', 'year'): 1, ('year', 'wa'): 1, ('wa', 'day'): 1, ('day', 'mostfollowed'): 1, ('mostfollowed', 'twitter'): 1, ('twitter', 'account'): 1, ('account', 'planet'): 1, ('planet', 'posted'): 1, ('posted', 'cryptocurrency'): 1, ('cryptocurrency', 'scam'): 1, ('scam', 'char'): 1, ('char', 'poster'): 2, ('poster', 'participatingbitcoin'): 1, ('participatingbitcoin', 'rose'): 1, ('rose', 'tuesday'): 1, ('tuesday', 'evening'): 1, ('evening', 'reaching'): 1, ('reaching', 'highest'): 1, ('highest', 'value'): 1, ('value', 'since'): 1, ('since', 'december'): 1, ('december', 'indeed'): 1, ('indeed', 'prior'): 1, ('prior', 'week'): 1, ('week', 'bitcoin'): 1, ('bitcoin', 'ha'): 2, ('ha', 'worth'): 1, ('worth', 'char'): 1, ('poster', 'participatingthe'): 1, ('participatingthe', 'price'): 1, ('price', 'one'): 1, ('one', 'bitcoin'): 1, ('bitcoin', 'rose'): 1, ('rose', 'wednesday'): 1, ('wednesday', 'new'): 1, ('alltime', 'record'): 1, ('record', 'cap'): 1, ('cap', 'year'): 1, ('year', 'gain'): 1, ('gain', 'world'): 1, ('world', 'valuable'): 1, ('valuable', 'cryptocurrency'): 1, ('cryptocurrency', 'value'): 1, ('value', 'b'): 1, ('b', 'charsby'): 1, ('charsby', 'reuters'): 3, ('reuters', 'stafffile'): 3, ('stafffile', 'photo'): 3, ('photo', 'representations'): 1, ('representations', 'bitcoin'): 1, ('bitcoin', 'us'): 1, ('us', 'dollar'): 1, ('dollar', 'banknote'): 1, ('banknote', 'seen'): 1, ('seen', 'illustration'): 2, ('illustration', 'taken'): 3, ('taken', 'january'): 1, ('january', 'reutersdado'): 1, ('reutersdado', 'ruvicfile'): 1, ('ruvicfile', 'photolondon'): 1, ('photolondon', 'reuters'): 1, ('reuters', 'bitcoin'): 2, ('bitcoin', 'smash'): 1, ('smash', 'charsby'): 1, ('photo', 'representation'): 2, ('representation', 'virtual'): 2, ('currency', 'bitcoin'): 2, ('bitcoin', 'seen'): 2, ('seen', 'front'): 1, ('front', 'stock'): 1, ('stock', 'graph'): 1, ('graph', 'illustration'): 1, ('taken', 'november'): 2, ('november', 'reutersdado'): 2, ('reutersdado', 'ruvicillustrationlondon'): 1, ('ruvicillustrationlondon', 'ren'): 1, ('ren', 'charsposted'): 1, ('charsposted', 'bitcoin'):

```

```
In [24]: # Generate the Ethereum N-grams where N=2
N= 2
bigram_counts_E = Counter(ngrams(ethereum_p, N))
print(dict(bigram_counts_E))
```

https://github.com/VRkaavar/boot-camp-homework12/blob/master/crypto_sentiment.ipynb

```

marshnew ): 1, ('marshnew', 'york'): 2, ('york', 'reuters'): 1, ('
euters', 'institutional'): 2, ('institutional', 'investor'): 2,
('investor', 'pumped'): 2, ('pumped', 'million'): 2, ('million',
'cryptocurrency'): 2, ('cryptocurrency', 'fund'): 2, ('fund', 'pro
duct'): 2, ('product', 'week'): 2, ('week', 'ended'): 2, ('ended',
'dec'): 2, ('dec', 'second'): 2, ('second', 'highest'): 2, ('highe
st', 'record'): 2, ('record', 'pushing'): 2, ('pushing', 'secto
r'): 2, ('sector', 'asset'): 2, ('asset', 'manag'): 2, ('manag',
'charsnew'): 1, ('manag', 'charspaypal'): 1, ('charspaypal', 'h
a'): 1, ('ha', 'launched'): 1, ('launched', 'generosity'): 1, ('ge
nerosity', 'network'): 1, ('network', 'platform'): 1, ('platform',
'allows'): 1, ('allows', 'user'): 1, ('user', 'create'): 1, ('crea
te', 'customized'): 1, ('customized', 'personal'): 1, ('personal',
'fundraising'): 1, ('fundraising', 'campaign'): 1, ('campaign', 'y
es'): 1, ('yes', 'like'): 1, ('like', 'gofundmeyou'): 1, ('gofundm
eyou', 'raise'): 1, ('raise', 'maximum'): 1, ('maximum', 'charsb
y'): 1, ('charsby', 'reuters'): 6, ('reuters', 'stafffile'): 4,
('stafffile', 'photo'): 4, ('reutersdado', 'ruvicillustrationfil
e'): 3, ('ruvicillustrationfile', 'photo'): 2, ('photo', 'charsb
y'): 1, ('photo', 'charsthe'): 1, ('charsthe', 'new'): 1, ('new',
'york'): 1, ('york', 'times'): 1, ('times', 'probably'): 1, ('prob
ably', 'publish'): 1, ('publish', 'story'): 1, ('story', 'cryptocu
rrency'): 1, ('cryptocurrency', 'exchange'): 1, ('exchange', 'coin
base'): 1, ('coinbase', 'reading'): 1, ('reading', 'news'): 1, ('n
ews', 'outlet'): 1, ('outlet', 'website'): 1, ('website', 'coinbas
e'): 1, ('coinbase', 'ha'): 1, ('ha', 'taken'): 1, ('taken', 'high
ly'): 1, ('highly', 'un'): 1, ('un', 'charsdecember'): 1, ('charsd
ecember', 'min'): 1, ('min', 'readopinions'): 1, ('readopinions',
'expressed'): 1, ('expressed', 'entrepreneur'): 1, ('entrepreneu
r', 'contributor'): 1, ('contributor', 'owna'): 1, ('owna', 'da
y'): 1, ('day', 'ago'): 1, ('ago', 'newly'): 1, ('newly', 'electe
d'): 1, ('elected', 'us'): 1, ('us', 'senator'): 1, ('senator', 'c
ynthia'): 1, ('cynthia', 'lummis'): 1, ('lummis', 'endorsed'): 1,
('endorsed', 'bitcoin'): 1, ('bitcoin', 'live'): 1, ('live', 'tele
vision'): 1, ('television', 'spoke'): 1, ('spoke', 'charsdecentral
ized'): 1, ('charsdecentralized', 'exchange'): 1, ('exchange', 'pr
otocol'): 1, ('protocol', 'allow'): 1, ('allow', 'crypto'): 1, ('c
rypto', 'trader'): 1, ('trader', 'investor'): 1, ('investor', 'tra
de'): 1, ('trade', 'across'): 1, ('across', 'different'): 1, ('dif
ferent', 'blockhains'): 1, ('blockhains', 'development'): 1, ('dev
elopment', 'significant'): 1, ('significant', 'new'): 1, ('new',
'development'): 1, ('development', 'come'): 1, ('come', 'la'): 1,
('la', 'charsby'): 1, ('reuters', 'staffa'): 2, ('staffa', 'repres
entation'): 2, ('reutersdado', 'ruvicillustrationnew'): 2, ('ruvic
illustrationnew', 'york'): 2, ('reuters', 'bitcoin'): 3, ('bitcoi
n', 'btcbtsp'): 2, ('btcbtsp', 'rose'): 2, ('rose', 'n'): 2, ('n',
'charsby'): 2, ('bitcoin', 'placed'): 1, ('placed', 'us'): 1, ('u
s', 'dollar'): 1, ('dollar', 'banknote'): 1, ('banknote', 'illustr
ation'): 1, ('taken', 'may'): 1, ('may', 'reutersdado'): 1, ('reut
ers', 'charsby'): 1, ('ruvicillustrationfile', 'photolondon'): 1,
('photolondon', 'reuters'): 1, ('bitcoin', 'charsa'): 1, ('chars
a', 'chain'): 1, ('chain', 'block'): 1, ('block', 'erupters'): 1,
('erupters', 'used'): 1, ('used', 'bitcoin'): 1, ('bitcoin', 'mini
ng'): 1, ('mining', 'pictured'): 1, ('pictured', 'plug'): 1, ('plu
g', 'play'): 1, ('play', 'tech'): 1, ('tech', 'center'): 1, ('cent
er', 'sunnyvale'): 1, ('sunnyvale', 'california'): 1, ('californi
a', 'october'): 1, ('october', 'reutersstephen'): 1, ('reutersstep
hen', 'lamullibitcoin'): 1, ('lamullibitcoin', 'slumped'): 1, ('sl

```



```
umped', 'throug'): 1, ('throug', 'char'): 1}
```

```
In [25]: # Use the token_count function to generate the top 10 words from e
         ach coin
         def token_count(tokens, N=10):
             """Returns the top N tokens from the frequency count"""
             return Counter(tokens).most_common(N)
```

```
In [26]: # Get the top 10 words for Bitcoin
         bitcoin_common= token_count(bitcoin_p, 10)
         bitcoin_common
```

```
Out[26]: [('bitcoin', 15),
          ('ha', 8),
          ('november', 6),
          ('reuters', 6),
          ('cryptocurrency', 5),
          ('year', 5),
          ('alltime', 4),
          ('value', 4),
          ('price', 4),
          ('market', 4)]
```

```
In [27]: # Get the top 10 words for Ethereum
         ethereum_common= token_count(ethereum_p,10)
         ethereum_common
```

```
Out[27]: [('reuters', 18),
          ('bitcoin', 16),
          ('currency', 13),
          ('photo', 12),
          ('virtual', 12),
          ('taken', 12),
          ('illustration', 11),
          ('reutersdado', 11),
          ('seen', 10),
          ('representation', 9)]
```

Word Clouds

In this section, you will generate word clouds for each coin to summarize the news for each coin

```
In [28]: !pip install wordcloud
         from wordcloud import WordCloud
         import matplotlib.pyplot as plt
         plt.style.use('seaborn-whitegrid')
         import matplotlib as mpl
         mpl.rcParams['figure.figsize'] = [20.0, 10.0]
```

```
Requirement already satisfied: wordcloud in /Users/travis/opt/anaconda3/lib/python3.8/site-packages (1.8.1)
Requirement already satisfied: pillow in /Users/travis/opt/anaconda3/lib/python3.8/site-packages (from wordcloud) (8.0.1)
Requirement already satisfied: matplotlib in /Users/travis/opt/anaconda3/lib/python3.8/site-packages (from wordcloud) (3.1.3)
Requirement already satisfied: numpy>=1.6.1 in /Users/travis/opt/a
```

```
In [29]: # Generate the Bitcoin word cloud
wordcloud = WordCloud(colormap="RdYlBu").generate(Bitcoin_df.Text.
str.cat())
plt.imshow(wordcloud)
plt.axis("off")
fontdict = {"fontsize": 50, "fontweight": "bold"}
plt.title("Bitcoin Word Cloud", fontdict=fontdict)
plt.show()
```

[illegible]

ETIENNE

of China. The move gives the country more power and, in theory, more stability than frequent... [366 chars] If you've been watching the crypto markets over the past few weeks you'll have noticed something special: bitcoin, everyone's favorite decentralized digital currency based on hype, lies, and general mal... [2490 chars] image copyright Getty Images

Bitcoin has hit a new all-time high breaking through \$20,000 (£14,800). The volatile virtual currency has gained more than 170% this year amid stock market turmoil. On ... [1999 chars] Six years after the launch of the Mexico-based cryptocurrency exchange and financial services platform Bitso the company revealed it has closed on \$62 million in financing to capitalize on the crypto... [4328 chars] Decentralized exchange protocols that allow crypto traders and investors to trade across different blockchains have been in development for a while. A significant new development now comes with the la... [3079 chars] 4. U.S. markets ended November with large gains. Even with a small decline today, the S&P 500 jumped by 10.8 percent in November, its best monthly showing since April and the fourth-best month ... [535 chars] Illustration by Grayson Blackmon / The Verge

One of the wildest stories of the year was the day some of the most-followed Twitter accounts on the planet posted cryptocurrency scams because of a... [4340 chars] 8 with 7 posters participating Bitcoin rose above \$18,000 on Tuesday evening, reaching its highest value since December 2017. Indeed, prior to this week bitcoin has only been worth more than \$18,000... [1796 chars] 6 with 6 posters participating The price of one bitcoin rose above \$20,000 on Wednesday. The new all-time record caps a year of gains for the world's most valuable cryptocurrency. The value of all b... [2429 chars] By Reuters Staff

FILE PHOTO: Representations of Bitcoin and U.S. dollar banknotes are seen in this illustration taken January 6, 2020. REUTERS/Dado Ruvic/File Photo

LONDON (Reuters) - Bitcoin smash... [875 chars] By Reuters Staff

FILE PHOTO: A representation of virtual currency Bitcoin is seen in front of a stock graph in this illustration taken November 19, 2020. REUTERS/Dado Ruvic/Illustration

LONDON (Reuters) - Bitcoin has grabbed headlines this week with its ascent to an all-time high. Yet, a trend has been playing out that could change the face of the cryptocurrency market: a massive flow of coin... [51 chars] By Reuters Staff

FILE PHOTO: A representation of virtual currency Bitcoin is seen in this illustration taken November 19, 2020. REUTERS/Dado Ruvic/Illustration

TOKYO (Reuters) - Bitcoin dropped to ... [219 chars] Posted Comprehensive Wealth Management president John Vento tells Reuters' Fred Katayama the onus is on Bitcoin investors to keep records of every transaction for tax reporting purposes. He also pr... [75 chars]

```
In [35]: # Run the NER processor on all of the text
btc_doc = nlp(all_concat_bitcoin)
btc_doc
# Add a title to the document
btc_doc.user_data["title"] = "Bitcoin NER"
```

```
In [36]: # Render the visualization
colors = {"ORG": "linear-gradient(90deg, #aa9cfc, #fc9ce7)"}
options = {"ents": ["ORG"], "colors": colors}
displacy.render(btc_doc, style='ent')
```

Bitcoin NER

has partnered with cryptocurrency startup BlockFi to offer the rewards credit card that pays out in rather than cash, but is it worth applying for? Unless youre extremely bullish o... [+2239 chars]After reaching a previous all-time high on and , , is now trading well and has surpassed its previous peak price. Bitcoins value has rapidly... [+1062 chars]Its been to since the price of was close to breaking the \$ ceiling and came crashing down. On , the arbitrary milestone of hodlers dreams was finally... [+1273 chars]Everything is dumb until it works. As comes to a close, the cryptocurrency world is experiencing another surge of consumer interest as prices climb in value. is a... [+1705 chars]In , after an absolutely massive, rally, passed \$ for the time. And then, over , it soared even higher, reaching a price of \$ and roug... [+6738 chars]Unlike 'conventional' cryptocurrencies, a central bank controls — in this case, . The move gives the country more power and, in theory, more stability than freq... [+366 chars]If youve been watching the crypto markets over youll have noticed something special: , everyones favorite decentralized currency based on , lies, and general mal... [+2490 chars]image copyrightGetty Images has hit a new all-time high breaking through \$ (£). The volatile virtual currency has gained amid stock market turmoil. On ... [+1999 after the launch of the -based cryptocurrency exchange and financial services platform Bitso the company revealed it has closed on in financing to capitalize on the crypto... [+4328 chars]Decentralized exchange protocols that allow crypto traders and investors to trade across different blockhains have been in development for a while. A significant new development now comes with the la... [+3079 . markets ended with large gains. Even with a small decline , the S&P jumped by in , its best showing since and the -best month ... [+535 chars]Illustration by The Verge of the wildest stories of was some of the most-followed accounts on the planet posted cryptocurrency scams because of a... [+4340 with posters participating rose on , reaching its highest value since . Indeed, prior to bitcoin has only been worth ... [+1796 with posters participating The price of bitcoin rose on . The new all-time record caps of gains for the world's most valuable cryptocurrency. The value of all b... [+2429 chars]By Staff FILE PHOTO: Representations of and dollar banknotes are seen in this illustration taken . () - smash... [+875 chars]By Staff FILE PHOTO: A representation of virtual currency is seen in front of a stock graph in this illustration taken . Dado Ruvic/Illustration LONDON (... [+925 chars]Posted has grabbed headlines with its ascent to an all-time high. Yet, a trend has been playing out that could change the face of the cryptocurrency market: a massive flow of coin... [+51 chars]By Staff FILE PHOTO: A representation of virtual currency is seen in this illustration taken . TOKYO () - dropped to ... [+219 chars]Posted president tells ' the onus is on investors to keep records of every transaction for tax reporting purposes. He also pr... [+75 chars]

```
In [37]: # List all Entities
for ent in btc_doc.ents:
    print(ent.text, ent.label_)
```

```
Visa ORG
first ORDINAL
Bitcoin GPE
November 30th, 2020 DATE
December 1st DATE
2020 DATE
bitcoin GPE
above $20,000 MONEY
almost three years DATE
```

the day DATE
Bitcoin GPE
20,000 MONEY
Wednesday DATE
2020 DATE
late-year DATE
Bitcoin GPE
over \$23,000 MONEY
November 2017 DATE
two-month DATE
Bitcoin GPE
10,000 MONEY
first ORDINAL
the next 20 days DATE
19,665 MONEY
digital yuan ORG
the People's Bank of China ORG
the past few weeks DATE
bitcoin GPE
digital ORG
hype GPE
Bitcoin GPE
20,000 MONEY
14,800 MONEY
more than 170% PERCENT
this year DATE
chars]Six years DATE
Mexico GPE
\$62 million MONEY
chars]4 CARDINAL
U.S. GPE
November DATE
today DATE
500 CARDINAL
10.8 percent PERCENT
November DATE
monthly DATE
April DATE
fourth ORDINAL
Grayson Blackmon / PERSON
One CARDINAL
the year DATE
the day DATE
Twitter ORG
chars]8 CARDINAL
7 CARDINAL
Bitcoin GPE
above \$18,000 MONEY
Tuesday DATE
evening TIME
December 2017 DATE
this week DATE
more than \$18,000 MONEY
chars]6 CARDINAL
6 CARDINAL
one CARDINAL
above \$20,000 MONEY
Wednesday DATE

```
wednesday DATE
a year DATE
Reuters ORG
Bitcoin GPE
U.S. GPE
January 6, 2020 DATE
REUTERS/ ORG
Dado Ruvic/File Photo ORG
```