Unit 12 - Tales from the Crypto

1. Sentiment Analysis

Use the newsapi 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 [2]:
```python
# Initial imports
import os
import pandas as pd
from dotenv import load_dotenv
import nltk as nltk
nltk.download('vader_lexicon')
from nltk.sentiment.vader import SentimentIntensityAnalyzer
analyzer = SentimentIntensityAnalyzer()

%matplotlib inline
```

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

In [3]:
```python
# Read your api key environment variable
load_dotenv('api.env')
api_key = os.getenv("news_api")
```

In [4]:
```python
# Create a newsapi client
from newsapi import NewsApiClient
newsapi = NewsApiClient(api_key=api_key)
```

In [5]:
```python
# Fetch the Bitcoin news articles
btc_news = newsapi.get_everything(q="bitcoin", language="en", sort_by ="relevanc
print(f"Total Articles about Bitcoin;{btc_news['totalResults']}")
```

```
Total Articles about Bitcoin;7522
```

In [6]:
```python
# Fetch the Ethereum news articles
eth_news = newsapi.get_everything(q="ethereum", language="en", sort_by ="relevan
print(f"Total Articles about Ethereum;{eth_news['totalResults']}")
```

```
Total Articles about Ethereum;2387
```

In [7]:

```python
# Create the Bitcoin sentiment scores DataFrame
btc_sentiment = []

for articles in btc_news["articles"]:
    try:
        text = articles["content"]
        date = articles["publishedAt"][:10]
        sentiment = analyzer.polarity_scores(text)
        compound = sentiment["compound"]
        pos = sentiment["pos"]
        neu = sentiment["neu"]
        neg = sentiment["neg"]

        btc_sentiment.append({
            "text": text,
            "date": date,
            "compound": compound,
            "positive": pos,
            "negative": neg,
            "neutral": neu

        })

    except AttributeError:
        pass


    #BTC Sentiment Dataframe
    btc_df = pd.DataFrame(btc_sentiment)
    columns = ["text", "compound","negative", "neutral", "positive","date"]
    btc_df = btc_df[columns]
```

In [8]:
```python
# Create the Ethereum sentiment scores DataFrame
eth_sentiment = []

for articles in eth_news["articles"]:
    try:
        text = articles["content"]
        date = articles["publishedAt"][:10]
        sentiment = analyzer.polarity_scores(text)
        compound = sentiment["compound"]
        pos = sentiment["pos"]
        neu = sentiment["neu"]
        neg = sentiment["neg"]

        eth_sentiment.append({
            "text": text,
            "compound": compound,
            "positive": pos,
            "negative": neg,
            "neutral": neu

        })

    except AttributeError:
        pass

    #ETH semtiment Dataframe
```

```
        eth_df = pd.DataFrame(eth_sentiment)
        columns = ["text", "compound","negative", "neutral", "positive",]
        eth_df = eth_df[columns]
```

In [9]:
```
# Describe the Bitcoin Sentiment
btc_df.describe()
```

Out[9]:

	compound	negative	neutral	positive
count	20.000000	20.000000	20.000000	20.000000
mean	-0.019345	0.059750	0.881750	0.058500
std	0.484055	0.090311	0.101771	0.058633
min	-0.827100	0.000000	0.653000	0.000000
25%	-0.405525	0.000000	0.836000	0.000000
50%	0.000000	0.000000	0.906000	0.056000
75%	0.315000	0.088250	0.940000	0.092500
max	0.726400	0.287000	1.000000	0.178000

In [10]:
```
# Describe the Ethereum Sentiment
eth_df.describe()
```

Out[10]:

	compound	negative	neutral	positive
count	20.000000	20.00000	20.000000	20.000000
mean	0.209565	0.01345	0.922800	0.063750
std	0.331383	0.02766	0.081637	0.075861
min	-0.340000	0.00000	0.782000	0.000000
25%	0.000000	0.00000	0.842750	0.000000
50%	0.000000	0.00000	0.933500	0.000000
75%	0.528675	0.00000	1.000000	0.149250
max	0.771700	0.07200	1.000000	0.194000

Questions:

Q: Which coin had the highest mean positive score?

A: Ethereum (0.63)

Q: Which coin had the highest compound score?

A: Ethereum (.7717)

Q. Which coin had the highest positive score?

A: Ethereum (0.19)

---

2. Natural Language Processing

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 [11]:
```python
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
```

In [90]:
```python
# Instantiate the lemmatizer:

lemmatizer = WordNetLemmatizer()

# Create a list of stopwords
sw= stopwords.words('english')
words = []
# Expand the default stopwords list if necessary
print(sw)
```

```
['i', 'me', 'my', 'myself', 'we', 'our', 'ours', 'ourselves', 'you', "you're",
"you've", "you'll", "you'd", 'your', 'yours', 'yourself', 'yourselves', 'he', 'h
im', 'his', 'himself', 'she', "she's", 'her', 'hers', 'herself', 'it', "it's",
'its', 'itself', 'they', 'them', 'their', 'theirs', 'themselves', 'what', 'whic
h', 'who', 'whom', 'this', 'that', "that'll", 'these', 'those', 'am', 'is', 'ar
e', 'was', 'were', 'be', 'been', 'being', 'have', 'has', 'had', 'having', 'do',
'does', 'did', 'doing', 'a', 'an', 'the', 'and', 'but', 'if', 'or', 'because',
'as', 'until', 'while', 'of', 'at', 'by', 'for', 'with', 'about', 'against', 'be
tween', 'into', 'through', 'during', 'before', 'after', 'above', 'below', 'to',
'from', 'up', 'down', 'in', 'out', 'on', 'off', 'over', 'under', 'again', 'furth
er', 'then', 'once', 'here', 'there', 'when', 'where', 'why', 'how', 'all', 'an
y', 'both', 'each', 'few', 'more', 'most', 'other', 'some', 'such', 'no', 'nor',
'not', 'only', 'own', 'same', 'so', 'than', 'too', 'very', 's', 't', 'can', 'wil
l', 'just', 'don', "don't", 'should', "should've", 'now', 'd', 'll', 'm', 'o',
're', 've', 'y', 'ain', 'aren', "aren't", 'couldn', "couldn't", 'didn', "did
n't", 'doesn', "doesn't", 'hadn', "hadn't", 'hasn', "hasn't", 'haven', "have
n't", 'isn', "isn't", 'ma', 'mightn', "mightn't", 'mustn', "mustn't", 'needn',
"needn't", 'shan', "shan't", 'shouldn', "shouldn't", 'wasn', "wasn't", 'weren',
"weren't", 'won', "won't", 'wouldn', "wouldn't"]
```

In [93]:
```python
# Complete the tokenizer function

def tokenizer(text):
    """Tokenizes text."""
    sw = set(stopwords.words('english'))
```

```python
    # Remove the punctuation from text
    regex = re.compile("[^a-zA-Z]")
    re_clean = regex.sub('', text)

    # Create a tokenized list of the words
    words = word_tokenize(re_clean)

    # Lemmatize words into root words
    lem = [lemmatizer.lemmatize(word) for word in words]

    # Convert the words to lowercase
    # Remove the stop words
    words = [word.lower() for word in lem if word.lower() not in sw]

    return tokens
```

In [82]:
```python
# Create a new tokens column for Bitcoin
btc_df["tokens"] = btc_df.text.apply(tokenizer)
btc_df.head()
```

Out[82]:

	text	compound	negative	neutral	positive	date	
0	Like Dogecoin devotees, the mayor of Reno, and...	0.6908	0.000	0.822	0.178	2021-07-19	[likedogecoindevoteesthemayorofrer
1	Filed under:\r\nThe supply chain attack has re...	-0.5719	0.184	0.705	0.111	2021-07-05	[filedunderthesupplychainattackha
2	image copyrightGetty Images\r\nThe gang behind...	-0.6124	0.143	0.857	0.000	2021-07-05	[imagecopyrightgettyimagesthegang
3	To get a roundup of TechCrunchs biggest and mo...	0.6240	0.000	0.873	0.127	2021-07-23	[togetaroundupoftechcrunchsbiggest
4	While retail investors grew more comfortable b...	0.7264	0.000	0.836	0.164	2021-07-14	[whileretailinvestorsgrewmorecom

In [65]:
```python
# Create a new tokens column for Ethereum
eth_df["tokens"] = eth_df.text.apply(tokenizer)
eth_df.head()
```

Out[65]:

	text	compound	negative	neutral	positive	
0	There are many blockchain platforms competing ...	0.3612	0.000	0.925	0.075	[therearemanyblockchainplatformscompeti

	text	compound	negative	neutral	positive	
1	Blockchain infrastructure startups are heating...	-0.2411	0.061	0.939	0.000	[blockchaininfrastructurestartupsareheat
2	While retail investors grew more comfortable b...	0.7264	0.000	0.836	0.164	[whileretailinvestorsgrewmorecomfortable
3	Representations of cryptocurrencies Bitcoin an...	0.0000	0.000	1.000	0.000	[representationsofcryptocurrenciesbitcoi
4	Cryptocurrencies spiked Monday after Amazon li...	0.3400	0.000	0.895	0.105	[cryptocurrenciesspikedmondayafteramazo

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 [61]:
```python
from collections import Counter
from nltk import ngrams
```

In [66]:
```python
N = 2
grams = ngrams(tokenizer(btc_df.text.str.cat()), N)
Counter(grams).most_common(20)
```

Out[66]: []

In [67]:
```python
# Generate the Ethereum N-grams where N=2
N = 2
grams = ngrams(tokenizer(eth_df.text.str.cat()), N)
Counter(grams).most_common(20)
```

Out[67]: []

In [68]:
```python
# Function token_count generates the top 10 words for a given coin
def token_count(tokens, N=3):
    """Returns the top N tokens from the frequency count"""
    return Counter(tokens).most_common(N)
```

In [69]:
```python
# Use token_count to get the top 10 words for Bitcoin
top_10_btc = tokenizer(btc_df.text.str.cat())
token_count(top_10_btc)
```

Out[69]: [('likedogecoindevoteesthemayorofrenoandtheleadersofelsalvadoraldobaoicchiisconv
incedcryptocurrencyisthefuturetheceoandfounderofcanadianscootermakerdaymakbeliev
esthischarsfiledunderthesupplychainattackhasreachedoverathousandorganizationsill
ustrationbyalexcastrothevergethreedaysafterransomwareattackersstartedtheholidayw
eekendbycompromcharsimagecopyrightgettyimagesthegangbehindacolossalransomwareatt
ackhasdemandedmmpaidinbitcoininreturnforauniversaldecryptorthatitsayswillunlockt
hefilesofallcharstogetaroundupoftechcrunchsbiggestandmostimportantstoriesdeliver
edtoyourinboxeverydayatpmpdtsubscribeherehelloandwelcometodailycrunchforjulyitsb
eenanicharswhileretailinvestorsgrewmorecomfortablebuyingcryptocurrencieslikebitc
oinandethereuminthedecentralizedapplicationworldstillhasalotofworktodowhenitcome
stoonboardingacharsaslongtimetechcrunchreadersknowwellmichaelarringtoncofoundedt
echcrunchandcrunchbaseaswellastheventurefundcrunchfundwhichwaslaterrenamedtuesda
ycapitalbutinarringtocharssingaporejulyreutersbitcoinbrokeaboveonwednesdayandhea
dedforanotherattemptatbreakingfromitsmonthslongrangeasshortsellersbailedoutandtr
adersdrewconfidencefrcharsjamesmartincnetaukmanwasarrestedinspainforhisallegedro
leinamassivehackofhighprofiletwitteraccountsthattargetedpoliticiansandcelebritie
sintheusdepartmentofjusticharsarepresentationofvirtualcurrencybitcoinisseeninfro
ntofastockgraphinthisillustrationtakennovemberreutersdadoruvicillustrationsingap
orejulyreutersbitcoinrecocharsbyreutersstafffilephotoarepresentationofvirtualcur
rencybitcoinisseeninfrontofastockgraphinthisillustrationtakennovemberreutersdado
ruvicillustrationsingaporecharsrepresentationsofcryptocurrenciesbitcoinethereumd
ogecoinripplelitecoinareplacedonpcmotherboardinthisillustrationtakenjunereutersd
adoruvicillustrationwashingtonjucharsreutersdadoruvicillustrationwelcometothings
beforetheopeningbellifthiswasforwardedtoyousignupheremarketsinsidersellingitsf
irstnftsgetthedetailshereletsgetcharsopinionsexpressedbyentrepreneurcontributors
aretheirownilaunchedmyfirstbusinessmorethanthreedecadesagoilaunchedmymostrecentb
usinesssixmonthsagoiveinvestedindozenssicharsrepresentationsofvirtualcurrencybit
coinareseeninfrontofteslalogoointhisillustrationtakenfebruaryreutersdadoruvicjuly
reuterselectriccarmakerteslainctslaowcharsransomwareattacksfueledbycovidpandemic
turbulencehavebecomeamajormoneyearnerforcybercriminalswiththenumberofattacksrisi
nginthesefileencryptingattackshavecontinucharsimagecaptionthegrouprecentlydemand
edahugebitcoinransomforanattacktargetingitfirmkaseyawebsitesforarussianlinkedran
somwaregangblamedforattacksonhundredsofbusinessesworldcharscirclehasannouncedtha
titplanstobecomeapubliccompanythecryptocurrencycompanywillmergewithconcordacquis
itioncorpaspaccircleisbetterknownasoneofthefoundingmembersofthcharstheworldhaskn
ownformonthsthatmorethanhalftheworldsbitcoinminerswouldbegoingdarkaschinacracked
downonminingnowthatitshappenedthebitcoinalgorithmhasadjustedaccordingcharslondon
julyreutersbitcoinfellontuesdaytoitslowestinalmostamonthslumpingbelowasregulator
scontinuedcallsfortighterchecksoncryptocurrenciestheworldslargestcharsbyreuterss
taffamazonappisseenonasmartphoneinthisillustrationtakenjulyreutersdadoruvicillus
trationreutersamazoncominconmondaydeniedamediareportsayingthechars',
  1)]

In [70]:
```
# Use token_count to get the top 10 words for Ethereum
top_10_eth = tokenizer(btc_df.text.str.cat())
token_count(top_10_eth)
```

Out[70]: [('likedogecoindevoteesthemayorofrenoandtheleadersofelsalvadoraldobaoicchiisconv
incedcryptocurrencyisthefuturetheceoandfounderofcanadianscootermakerdaymakbeliev
esthischarsfiledunderthesupplychainattackhasreachedoverathousandorganizationsill
ustrationbyalexcastrothevergethreedaysafterransomwareattackersstartedtheholidayw
eekendbycompromcharsimagecopyrightgettyimagesthegangbehindacolossalransomwareatt
ackhasdemandedmmpaidinbitcoininreturnforauniversaldecryptorthatitsayswillunlockt
hefilesofallcharstogetaroundupoftechcrunchsbiggestandmostimportantstoriesdeliver
edtoyourinboxeverydayatpmpdtsubscribeherehelloandwelcometodailycrunchforjulyitsb
eenanicharswhileretailinvestorsgrewmorecomfortablebuyingcryptocurrencieslikebitc
oinandethereuminthedecentralizedapplicationworldstillhasalotofworktodowhenitcome
stoonboardingacharsaslongtimetechcrunchreadersknowwellmichaelarringtoncofoundedt
echcrunchandcrunchbaseaswellastheventurefundcrunchfundwhichwaslaterrenamedtuesda
ycapitalbutinarringtocharssingaporejulyreutersbitcoinbrokeaboveonwednesdayandhea
dedforanotherattemptatbreakingfromitsmonthslongrangeasshortsellersbailedoutandtr
adersdrewconfidencefrcharsjamesmartincnetaukmanwasarrestedinspainforhisallegedro
leinamassivehackofhighprofiletwitteraccountsthattargetedpoliticiansandcelebritie

```
sintheusdepartmentofjusticharsarepresentationofvirtualcurrencybitcoinisseeninfro
ntofastockgraphinthisillustrationtakennovemberreutersdadoruvicillustrationsingap
orejulyreutersbitcoinrecocharsbyreutersstafffilephotoarepresentationofvirtualcur
rencybitcoinisseeninfrontofastockgraphinthisillustrationtakennovemberreutersdado
ruvicillustrationsingaporecharsrepresentationsofcryptocurrenciesbitcoinethereumd
ogecoinripplelitecoinareplacedonpcmotherboardinthisillustrationtakenjunereutersd
adoruvicillustrationwashingtonjucharsreutersdadoruvicillustrationwelcometothings
beforetheopeningbellifthiswasforwardedtoyousignupheremarketsinsiderissellingitsf
irstnftsgetthedetailshereletsgetcharsopinionsexpressedbyentrepreneurcontributors
aretheirownilaunchedmyfirstbusinessmorethanthreedecadesagoilaunchedmymostrecentb
usinesssixmonthsagoiveinvestedindozenssicharsrepresentationsofvirtualcurrencybit
coinareseeninfrontofteslalogointhisillustrationtakenfebruaryreutersdadoruvicjuly
reuterselectriccarmakerteslainctslaowcharsransomwareattacksfueledbycovidpandemic
turbulencehavebecomeamajormoneyearnerforcybercriminalswiththenumberofattacksrisi
nginthesefileencryptingattackshavecontinucharsimagecaptionthegrouprecentlydemand
edahugebitcoinransomforanattacktargetingitfirmkaseyawebsitesforarussianlinkedran
somwaregangblamedforattacksonhundredsofbusinessesworldcharscirclehasannouncedtha
titplanstobecomeapubliccompanythecryptocurrencycompanywillmergewithconcordacquis
itioncorpaspaccircleisbetterknownasoneofthefoundingmembersofthcharstheworldhaskn
ownformonthsthatmorethanhalftheworldsbitcoinminerswouldbegoingdarkaschinacracked
downonminingnowthatitshappenedthebitcoinalgorithmhasadjustedaccordingcharslondon
julyreutersbitcoinfellontuesdaytoitslowestinalmostamonthslumpingbelowasregulator
scontinuedcallsfortighterchecksoncryptocurrenciestheworldslargestcharsbyreuterss
taffamazonappisseenonasmartphoneinthisillustrationtakenjulyreutersdadoruvicillus
trationreutersamazoncominconmondaydeniedamediareportsayingthechars',
   1)]
```

Word Clouds

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

In [96]:
```python
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]
```
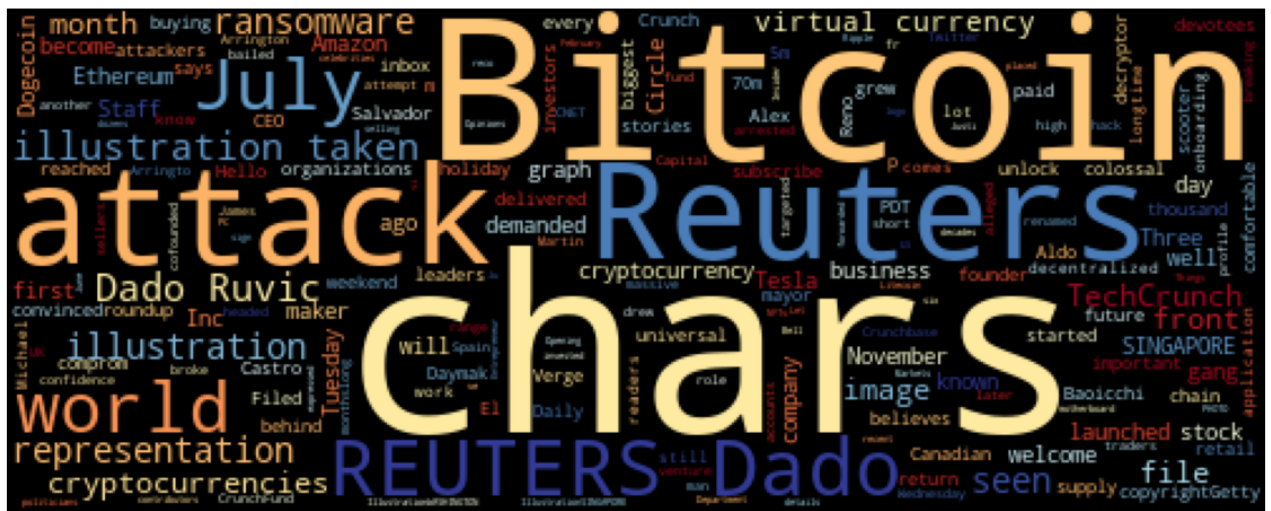
In [103…
```python
# Generate the Bitcoin word cloud

def wordcloud(text, title=""):
    df_cloud = WordCloud(width=500, colormap='RdYlBu').generate(text)
    plt.imshow(df_cloud)
    plt.axis("off")
    fontdict = {"fontsize": 48, "fontweight" : "bold"}
    plt.title(title, fontdict=fontdict)
    plt.show()
```

In [107…
```python
# Generate the Bitcoin word cloud
wordcloud(btc_df.text.str.cat(), title="Bitcoin Word Cloud")
```
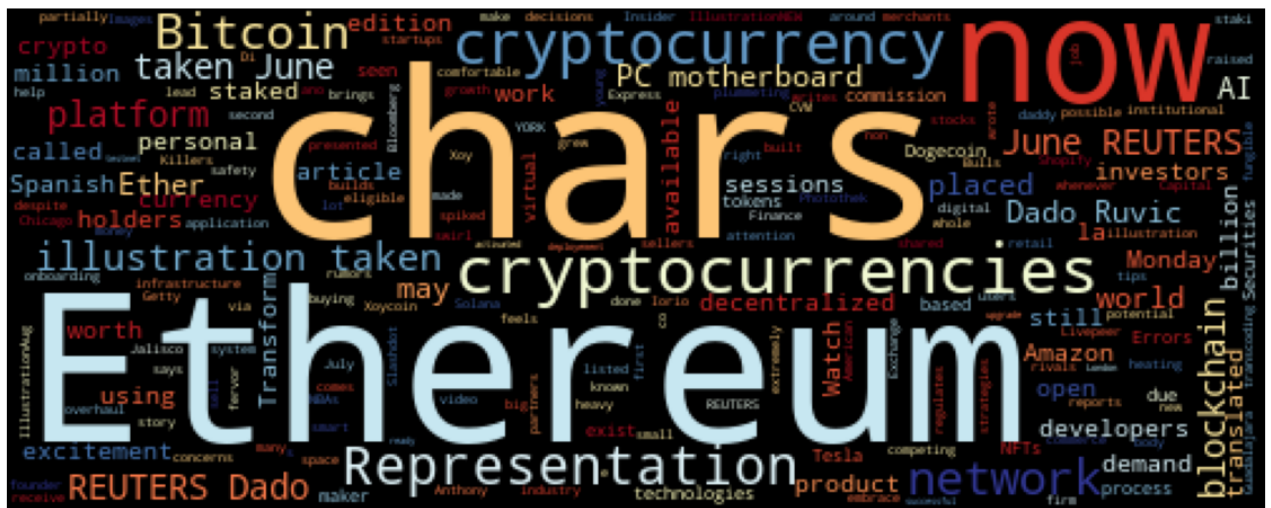
Bitcoin Word Cloud


```
In [109…    # Generate the Ethereum word cloud
            wordcloud(eth_df.text.str.cat(), title="Bitcoin Word Cloud")
```

Bitcoin Word Cloud

3. Named Entity Recognition

In this section, you will build a named entity recognition model for both Bitcoin and Ethereum, then visualize the tags using SpaCy.

```
In [110…    import spacy
            from spacy import displacy
```

```
In [112…    # Download the language model for SpaCy
            !python -m spacy download en_core_web_sm
```

```
Collecting en-core-web-sm==3.1.0
  Using cached https://github.com/explosion/spacy-models/releases/download/en_co
re_web_sm-3.1.0/en_core_web_sm-3.1.0-py3-none-any.whl (13.6 MB)
```

```
Requirement already satisfied: spacy<3.2.0,>=3.1.0 in /Users/imacbimperatori/op
t/anaconda3/lib/python3.8/site-packages (from en-core-web-sm==3.1.0) (3.1.1)
Requirement already satisfied: requests<3.0.0,>=2.13.0 in /Users/imacbimperator
i/opt/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-w
eb-sm==3.1.0) (2.21.0)
Requirement already satisfied: murmurhash<1.1.0,>=0.28.0 in /Users/imacbimperato
ri/opt/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-
web-sm==3.1.0) (1.0.5)
Requirement already satisfied: pathy>=0.3.5 in /Users/imacbimperatori/opt/anacon
da3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-sm==3.1.
0) (0.6.0)
Requirement already satisfied: srsly<3.0.0,>=2.4.1 in /Users/imacbimperatori/op
t/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-s
m==3.1.0) (2.4.1)
Requirement already satisfied: numpy>=1.15.0 in /Users/imacbimperatori/opt/anaco
nda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-sm==3.1.
0) (1.19.5)
Requirement already satisfied: preshed<3.1.0,>=3.0.2 in /Users/imacbimperatori/o
pt/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-
sm==3.1.0) (3.0.5)
Requirement already satisfied: cymem<2.1.0,>=2.0.2 in /Users/imacbimperatori/op
t/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-s
m==3.1.0) (2.0.5)
Requirement already satisfied: catalogue<2.1.0,>=2.0.4 in /Users/imacbimperator
i/opt/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-w
eb-sm==3.1.0) (2.0.4)
Requirement already satisfied: jinja2 in /Users/imacbimperatori/opt/anaconda3/li
b/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-sm==3.1.0) (2.1
1.3)
Requirement already satisfied: setuptools in /Users/imacbimperatori/opt/anaconda
3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-sm==3.1.0)
(57.4.0)
Requirement already satisfied: wasabi<1.1.0,>=0.8.1 in /Users/imacbimperatori/op
t/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-s
m==3.1.0) (0.8.2)
Requirement already satisfied: tqdm<5.0.0,>=4.38.0 in /Users/imacbimperatori/op
t/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-s
m==3.1.0) (4.59.0)
Requirement already satisfied: typer<0.4.0,>=0.3.0 in /Users/imacbimperatori/op
t/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-s
m==3.1.0) (0.3.2)
Requirement already satisfied: spacy-legacy<3.1.0,>=3.0.7 in /Users/imacbimperat
ori/opt/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core
-web-sm==3.1.0) (3.0.8)
Requirement already satisfied: blis<0.8.0,>=0.4.0 in /Users/imacbimperatori/opt/
anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-sm=
=3.1.0) (0.7.4)
Requirement already satisfied: thinc<8.1.0,>=8.0.8 in /Users/imacbimperatori/op
t/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-s
m==3.1.0) (8.0.8)
Requirement already satisfied: pydantic!=1.8,!=1.8.1,<1.9.0,>=1.7.4 in /Users/im
acbimperatori/opt/anaconda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.
0->en-core-web-sm==3.1.0) (1.8.2)
Requirement already satisfied: packaging>=20.0 in /Users/imacbimperatori/opt/ana
conda3/lib/python3.8/site-packages (from spacy<3.2.0,>=3.1.0->en-core-web-sm==3.
1.0) (20.9)
Requirement already satisfied: pyparsing>=2.0.2 in /Users/imacbimperatori/opt/an
aconda3/lib/python3.8/site-packages (from packaging>=20.0->spacy<3.2.0,>=3.1.0->
en-core-web-sm==3.1.0) (2.4.7)
Requirement already satisfied: smart-open<6.0.0,>=5.0.0 in /Users/imacbimperator
i/opt/anaconda3/lib/python3.8/site-packages (from pathy>=0.3.5->spacy<3.2.0,>=3.
1.0->en-core-web-sm==3.1.0) (5.1.0)
Requirement already satisfied: typing-extensions>=3.7.4.3 in /Users/imacbimperat
ori/opt/anaconda3/lib/python3.8/site-packages (from pydantic!=1.8,!=1.8.1,<1.9.
0,>=1.7.4->spacy<3.2.0,>=3.1.0->en-core-web-sm==3.1.0) (3.7.4.3)
```

```
Requirement already satisfied: urllib3<1.25,>=1.21.1 in /Users/imacbimperatori/o
pt/anaconda3/lib/python3.8/site-packages (from requests<3.0.0,>=2.13.0->spacy<3.
2.0,>=3.1.0->en-core-web-sm==3.1.0) (1.24.3)
Requirement already satisfied: certifi>=2017.4.17 in /Users/imacbimperatori/opt/
anaconda3/lib/python3.8/site-packages (from requests<3.0.0,>=2.13.0->spacy<3.2.
0,>=3.1.0->en-core-web-sm==3.1.0) (2020.12.5)
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in /Users/imacbimperatori/o
pt/anaconda3/lib/python3.8/site-packages (from requests<3.0.0,>=2.13.0->spacy<3.
2.0,>=3.1.0->en-core-web-sm==3.1.0) (3.0.4)
Requirement already satisfied: idna<2.9,>=2.5 in /Users/imacbimperatori/opt/anac
onda3/lib/python3.8/site-packages (from requests<3.0.0,>=2.13.0->spacy<3.2.0,>=
3.1.0->en-core-web-sm==3.1.0) (2.8)
Requirement already satisfied: click<7.2.0,>=7.1.1 in /Users/imacbimperatori/op
t/anaconda3/lib/python3.8/site-packages (from typer<0.4.0,>=0.3.0->spacy<3.2.0,>
=3.1.0->en-core-web-sm==3.1.0) (7.1.2)
Requirement already satisfied: MarkupSafe>=0.23 in /Users/imacbimperatori/opt/an
aconda3/lib/python3.8/site-packages (from jinja2->spacy<3.2.0,>=3.1.0->en-core-w
eb-sm==3.1.0) (1.1.1)
✔ Download and installation successful
You can now load the package via spacy.load('en_core_web_sm')
```

In [114…
```python
# Load the spaCy model
nlp = spacy.load('en_core_web_sm')
```

Bitcoin NER

In [121…
```python
# Concatenate all of the Bitcoin text together
all_btc_text = btc_df.text.str.cat()
all_btc_text
```

Out[121…
```
'Like Dogecoin devotees, the mayor of Reno, and the leaders of El Salvador, Aldo
Baoicchi is convinced cryptocurrency is the future. The CEO and founder of Canad
ian scooter maker Daymak believes this … [+4116 chars]Filed under:\r\nThe supply
chain attack has reached over a thousand organizations.\r\nIllustration by Alex
Castro / The Verge\r\nThree days after ransomware attackers started the holiday
weekend by comprom… [+3376 chars]image copyrightGetty Images\r\nThe gang behind
a "colossal" ransomware attack has demanded $70m (£50.5m) paid in Bitcoin in ret
urn for a "universal decryptor" that it says will unlock the files of all … [+41
40 chars]To get a roundup of TechCrunchs biggest and most important stories deli
vered to your inbox every day at 3 p.m. PDT, subscribe here.\r\nHello and welcom
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in 2021, the decentralized application world still has a lot of work to do when
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Michael Arrington cofounded TechCrunch and Crunchbase, as well as the venture fu
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[+12730 chars]SINGAPORE, July 28 (Reuters) - Bitcoin broke above $40,000 on Wedn
esday and headed for another attempt at breaking from its monthslong range as sh
ort sellers bailed out and traders drew confidence fr… [+351 chars]James Martin/
CNET\r\nA UK man was arrested in Spain for his alleged role in a massive hack of
high-profile Twitter accounts that targeted politicians\xa0and celebrities in 20
20, the US Department of Justi… [+1397 chars]A representation of virtual currenc
y bitcoin is seen in front of a stock graph in this illustration taken November
19, 2020. REUTERS/Dado Ruvic/IllustrationSINGAPORE, July 21 (Reuters) - Bitcoin
reco… [+497 chars]By Reuters Staff\r\nFILE PHOTO: A representation of virtual cu
rrency bitcoin is seen in front of a stock graph in this illustration taken Nove
mber 19, 2020. REUTERS/Dado Ruvic/Illustration\r\nSINGAPORE (… [+410 chars]Repre
sentations of cryptocurrencies Bitcoin, Ethereum, DogeCoin, Ripple, Litecoin are
placed on PC motherboard in this illustration taken, June 29, 2021. REUTERS/Dado
```

Ruvic/IllustrationWASHINGTON, Ju… [+3970 chars]REUTERS/Dado Ruvic/Illustration\r\nWelcome to 10 Things Before the Opening Bell. If this was forwarded to you, sign up here.\r\nMarkets Insider is selling its first NFTs. Get the details here.\r\nLet\'s get… [+2549 chars]Opinions expressed by Entrepreneur contributors are their own.\r\nI launched my first business more than three decades ago. I launched my most recent business six months ago. I've invested in dozens si… [+4277 chars]Representations of virtual currency bitcoin are seen in front of Tesla logo in this illustration taken, February 9, 2021. REUTERS/Dado RuvicJuly 21 (Reuters) - Electric-car maker Tesla Inc (TSLA.O) w… [+711 chars]Ransomware attacks, fueled by COVID-19 pandemic turbulence, have become a major money earner for cybercriminals, with the number of attacks rising in 2020.\r\nThese file-encrypting attacks have continu… [+4082 chars]image captionThe group recently demanded a huge bitcoin ransom for an attack targeting IT firm Kaseya\r\nWebsites for a Russian-linked ransomware gang blamed for attacks on hundreds of businesses world… [+1500 chars]Circle has announced that it plans to become a public company. The cryptocurrency company will merge with Concord Acquisition Corp, a SPAC. Circle is better known as one of the founding members of th… [+2706 chars]The world has known for months that more than half the world\'s bitcoin miners would be going dark as China cracked down on mining. Now that it\'s happened, the bitcoin algorithm has adjusted according… [+1938 chars]LONDON, July 20 (Reuters) - Bitcoin fell on Tuesday to its lowest in almost a month, slumping below $30,000 as regulators continued calls for tighter checks on cryptocurrencies.\r\nThe world\'s largest … [+1100 chars]By Reuters Staff\r\nAmazon app is seen on a smartphone in this illustration taken, July 13, 2021. REUTERS/Dado Ruvic/Illustration\r\n(Reuters) - Amazon.com Inc on Monday denied a media report saying the … [+1079 chars]'

In [122…
```python
# Run the NER processor on all of the text
btc_ner= nlp(all_btc_text)

# Add a title to the document
btc_ner.user_data["title"] = "Bitcoin NER"
```

In [125…
```python
# Render the visualization
displacy.render(btc_ner, style='ent', jupyter=True)
```

Bitcoin NER

Like Dogecoin devotees, the mayor of Reno **GPE** , and the leaders of El Salvador **GPE** ,

Aldo Baoicchi **GPE** is convinced cryptocurrency is the future. The CEO and founder of

Canadian **NORP** scooter maker Daymak **ORG** believes this … [+4116 chars]Filed under:

The supply chain attack has reached over a thousand organizations.

Illustration by Alex Castro **PERSON** / The Verge **ORG**

Three days **DATE** after ransomware attackers started the holiday weekend **DATE** by

comprom… [+3376 chars]image copyrightGetty Images

The gang behind a "colossal" ransomware attack has demanded $70m **MONEY** (£50.5m

MONEY) paid in Bitcoin in return for a "universal decryptor" that it says will unlock the files of

all … [+4140 chars]To get a roundup of TechCrunchs biggest and most important stories

delivered to your inbox every day **DATE** at 3 p.m. PDT **TIME** , subscribe here.

Hello and welcome to Daily Crunch **ORG** for July 23, 2021 **DATE** . Its been an i... [+5456 chars]While retail investors grew more comfortable buying cryptocurrencies like Bitcoin and Ethereum **ORG** in 2021 **DATE** , the decentralized application world still has a lot of work to do when it comes to onboarding a... [+2288 chars]As longtime TechCrunch readers know well, Michael Arrington **PERSON** cofounded TechCrunch **LOC** and Crunchbase **ORG** , as well as the venture fund CrunchFund **PRODUCT** , which was later renamed Tuesday **DATE** Capital. But In 2017 **DATE** , Arringto... [+12730 chars]SINGAPORE, July 28 **DATE** (Reuters **ORG**) - Bitcoin broke above $ 40,000 **MONEY** on Wednesday **DATE** and headed for another attempt at breaking from its monthslong range as short sellers bailed out and traders drew confidence fr... [+351 chars]James Martin **PERSON** /CNET

A UK **GPE** man was arrested in Spain **GPE** for his alleged role in a massive hack of high-profile Twitter **PRODUCT** accounts that targeted politicians and celebrities in 2020 **DATE** , the US Department of Justi **ORG** ... [+1397 chars]A representation of virtual currency bitcoin is seen in front of a stock graph in this illustration taken November 19, 2020 **DATE** . REUTERS **ORG** / Dado Ruvic/IllustrationSINGAPORE **ORG** , July 21 **DATE** (Reuters **ORG**) - Bitcoin reco... [+497 chars]By Reuters **ORG** Staff

FILE **ORG** PHOTO: A representation of virtual currency bitcoin is seen in front of a stock graph in this illustration taken November 19, 2020 **DATE** . REUTERS **ORG** / Dado Ruvic/Illustration SINGAPORE **ORG** (... [+410 chars]Representations of cryptocurrencies Bitcoin, Ethereum, DogeCoin, Ripple, Litecoin are placed on PC motherboard in this illustration taken, June 29, 2021 **DATE** . REUTERS **ORG** / Dado Ruvic **PERSON** /IllustrationWASHINGTON, Ju **PERSON** ... [+3970 chars]REUTERS/ Dado Ruvic/Illustration Welcome **ORG** to 10 **CARDINAL** Things Before the Opening Bell **ORG** . If this was forwarded to you, sign up here.

Markets Insider is selling its first **ORDINAL** NFTs. Get the details here.

Let's get... [+2549 chars]Opinions expressed by Entrepreneur **ORG** contributors are their own.

I launched my first **ORDINAL** business more than three decades ago **DATE** . I launched

localhost:8888/lab/workspaces/auto-W/tree/Desktop/Fintech/Homework/NLP_Homework/Starter_Code/crypto_sentiment_solved.ipynb

13/20

my most recent business six months ago **DATE** . I've invested in dozens **CARDINAL** si...

[+4277 chars]Representations of virtual currency bitcoin are seen in front of Tesla logo in this

illustration taken, February 9, 2021 **DATE** . REUTERS **ORG** / Dado **GPE** RuvicJuly 21

(Reuters **ORG**) - Electric-car maker Tesla Inc **ORG** (TSLA.O) w... [+711

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These file-encrypting attacks have continu... [+4082 chars]image captionThe group recently

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Websites for a Russian **NORP** -linked ransomware gang blamed for attacks on hundreds

CARDINAL of businesses world... [+1500 chars]Circle has announced that it plans to become

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ORG , a SPAC **ORG** . Circle is better known as one of the founding members of th...

[+2706 chars]The world has known for months **DATE** that more than half **CARDINAL** the

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July 20 **DATE** (Reuters **ORG**) - Bitcoin fell on Tuesday **DATE** to its lowest in almost

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Amazon app is seen on a smartphone in this illustration taken, July 13, 2021 **DATE** .

REUTERS **ORG** / Dado Ruvic/Illustration **ORG**

(Reuters **ORG**) - Amazon.com Inc on Monday **DATE** denied a media report saying the

... [+1079 chars]

In [126…

```
# List all Entities
for ent in btc_ner.ents:
    print(ent, ent.label_)
```

```
Reno GPE
El Salvador GPE
Aldo Baoicchi GPE
Canadian NORP
Daymak ORG
```

```
Alex Castro PERSON
The Verge ORG
Three days DATE
the holiday weekend DATE
$70m MONEY
£50.5m MONEY
every day DATE
3 p.m. PDT TIME
Daily Crunch ORG
July 23, 2021 DATE
Bitcoin and Ethereum ORG
2021 DATE
Michael Arrington PERSON
TechCrunch LOC
Crunchbase ORG
CrunchFund PRODUCT
Tuesday DATE
2017 DATE
July 28 DATE
Reuters ORG
40,000 MONEY
Wednesday DATE
chars]James Martin PERSON
UK GPE
Spain GPE
Twitter PRODUCT
2020 DATE
the US Department of Justi ORG
November 19, 2020 DATE
REUTERS ORG
Dado Ruvic/IllustrationSINGAPORE ORG
July 21 DATE
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REUTERS ORG
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Ju PERSON
Dado Ruvic/Illustration
Welcome ORG
10 CARDINAL
the Opening Bell ORG
first ORDINAL
Entrepreneur ORG
first ORDINAL
more than three decades ago DATE
six months ago DATE
dozens CARDINAL
February 9, 2021 DATE
REUTERS ORG
Dado GPE
Reuters ORG
Tesla Inc ORG
2020 DATE
Kaseya PERSON
Russian NORP
hundreds CARDINAL
Concord Acquisition Corp ORG
SPAC ORG
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```
more than half CARDINAL
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July 20 DATE
Reuters ORG
Tuesday DATE
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30,000 MONEY
Reuters ORG
July 13, 2021 DATE
REUTERS ORG
Dado Ruvic/Illustration ORG
Reuters ORG
Monday DATE
```

Ethereum NER

In [127…

```python
# Concatenate all of the Ethereum text together
all_eth_text = eth_df.text.str.cat()
all_eth_text
```

Out[127…

'There are many blockchain platforms competing for investors' and developers' attention right now, from the big daddy of them all, Ethereum, to so-called "Ethereum Killers" like Solana, which we wrote… [+2563 chars]Blockchain infrastructure startups are heating up as industry fervor brings more developers and users to a space that still feels extremely young despite a heavy institutional embrace of the crypto s… [+2468 chars]While retail investors grew more comfortable buying cryptocurrencies like Bitcoin and Ethereum in 2021, the decentralized application world still has a lot of work to do when it comes to onboarding a… [+2288 chars] Representations of cryptocurrencies Bitcoin and Ethereum are placed on PC motherboard in this illustration taken, June 29, 2021. REUTERS/Dado Ruvic/Illustration Aug 3 (Reuters) - The Ethereum platform… [+2412 chars]Cryptocurrencies spiked Monday after Amazon listed an open job for a digital currency and blockchain product lead.\xa0\r\nAmazon is known for plummeting the stocks of would-be rivals whenever rumors swirl… [+1425 chars]"Anthony Di Iorio, a co-founder of the Ethereum network, says he\'s done with the cryptocurrency world, partially because of personal safety concerns," reports Bloomberg, in a story shared by Slashdot… [+1550 chars]Representations of cryptocurrency Ethereum are placed on PC motherboard in this illustration taken, June 29, 2021. REUTERS/Dado Ruvic/IllustrationNEW YORK, July 30 (Reuters) - Ethereum, the second-la… [+3949 chars]Ether holders have "staked" more than $13 billion worth of the cryptocurrency on the ethereum 2.0 network, as excitement builds around the overhaul of the system and the potential growth of the staki… [+1851 chars]Ether is the cryptocurrency of the ethereum network.\r\nPhotothek/Getty Images\r\nEther holders have "staked" more than $13 billion worth of the cryptocurrency on the ethereum 2.0 network, as excitement … [+1935 chars]All the sessions from Transform 2021 are available on-demand now. Watch now.\r\nLivepeer has raised $20 million for its decentralized video transcoding network built on the Ethereum blockchain.\xa0Its ano… [+6544 chars]This article was translated from our Spanish edition using AI technologies. Errors may exist due to this process.\r\nThe firm Xoy Capital , based in Guadalajara, Jalisco, presented Xoycoin , the first … [+3547 chars]Shopify has made it possible for eligible sellers to sell NFTs (non-fungible tokens) via its platform, which opens up a whole new world for e-commerce merchants.\r\nOn Monday, the NBAs Chicago Bulls la… [+2148 chars]Personal Finance Insider writes about products, strategies, and tips to help you make smart decisions with your money. We may receive a small commission from our partners, like American Express, but … [+5827 chars]This article was translated from our Spanish edition using AI technologies. Errors may exist due to this process.\r\nThe Securities and Exchange Commission (CVM), the body that regulates securities in … [+1015 chars]After a successful testnet deployement, the London upgrade is now ready to be activated on the Ethereum mainnet. It will go live on block 12 965 000, which is expected between August 3-5, 2021.\r\nClie… [+5964 chars]At this point the average Hackaday reader is likely fa

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thereum, and Dogecoin. In the most basic of terms, these cryptocu… [+8977 chars]
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Polygon, a maker of a crypto-based platform for nonfungible tokens (NFTs), has s
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n/File Photo\r\nJ… [+806 chars]Representations of virtual currency bitcoin are s
een in front of Tesla logo in this illustration taken, February 9, 2021. REUTER
S/Dado RuvicJuly 21 (Reuters) - Electric-car maker Tesla Inc (TSLA.O) w… [+711 c
hars]By Reuters Staff\r\nA representation of the virtual cryptocurrency Ethereum
is seen among representations of other cryptocurrencies in this picture illustra
tion taken June 14, 2021. REUTERS/Edgar Su/Il… [+852 chars]'

In [128…
```python
# Run the NER processor on all of the text
eth_ner= nlp(all_eth_text)

# Add a title to the document
eth_ner.user_data["title"] = "Ethereum NER"
```

In [129…
```python
# Render the visualization
displacy.render(eth_ner, style='ent', jupyter=True)
```

Ethereum NER

There are many blockchain platforms competing for investors' and developers' attention right
now, from the big daddy of them all, Ethereum **PERSON** , to so-called " Ethereum Killers
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PERSON (Reuters **ORG**) - The Ethereum **PERSON** platform… [+2412
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concerns," reports   Bloomberg   **PERSON**   , in a story shared by   Slashdot   **NORP**   ... [+1550

chars]Representations of cryptocurrency   Ethereum   **PERSON**   are placed on PC motherboard

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/IllustrationNEW YORK,   July 30   **DATE**   (Reuters   **ORG**   ) - Ethereum, the   second

ORDINAL   -la... [+3949 chars]Ether holders have "staked"   more than $13 billion   **MONEY**

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Photothek   **PERSON**   /Getty Images

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Livepeer   **PERSON**   has raised $20 million   **MONEY**   for its decentralized video transcoding

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due to this process.

The firm   Xoy Capital   **PERSON**   , based in   Guadalajara   **GPE**   ,   Jalisco   **GPE**   , presented

Xoycoin   **PERSON**   , the first ... [+3547 chars]Shopify has made it possible for eligible sellers to

sell NFTs (non-fungible tokens) via its platform, which opens up a whole new world for e-

commerce merchants.

On   Monday   **DATE**   , the NBAs   Chicago Bulls   **ORG**   la... [+2148 chars]Personal Finance

Insider writes about products, strategies, and tips to help you make smart decisions with your

money. We may receive a small commission from our partners, like   American Express   **ORG**   ,

but ... [+5827 chars]This article was translated from our   Spanish   **NORP**   edition using   AI

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The Securities and Exchange Commission   **ORG**   (CVM), the body that regulates securities in

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Clie **PERSON** … [+5964 chars]At this point the average Hackaday **DATE** reader is likely familiar with so-called " Proof of Work **WORK_OF_ART** " (PoW) cryptocurrencies, such as Bitcoin, Ethereum **ORG** , and Dogecoin. In the most basic of terms, these cryptocu… [+8977 chars]All the sessions from Transform 2021 are available on-demand now. Watch now.

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In [130…

```python
# List all Entities
for ent in eth_ner.ents:
    print(ent, ent.label_)
```

```
Ethereum PERSON
Ethereum Killers WORK_OF_ART
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2.0 CARDINAL
Livepeer PERSON
$20 million MONEY
Ethereum PERSON
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Guadalajara GPE
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The Securities and Exchange Commission ORG
London GPE
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August 3-5, 2021 DATE
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