project_analysis_2.0

May 6, 2022

0.1 Part One: Bored Ape Yatch Club

@angel-estrada7

[1]:

```
# Import dependancies
import os
import requests
import pandas as pd
import json
from dotenv import load_dotenv
from etherscan_py import etherscan_py
import plotly.express as px

import matplotlib.pyplot as plt
import hvplot.pandas
import numpy as np
import datetime as dt
import seaborn as sns
from pathlib import Path

%matplotlib inline
```

[2]:

```
# Loading .env containing our keys
load_dotenv()
```

[2]:

```
True
```

[3]:

```
# create variable for api key
api_key = os.getenv('COVALENT_API_KEY')
type(api_key)
```

[3]:

```
str
```

[4]:

```
# import dependancy
from etherscan_py import etherscan_py
etherscan_api = etherscan_py.Client(os.getenv('ETHERSCAN_API'))

# Print current eth price
```

```
eth_value = etherscan_api.get_eth_price()
eth_value
```

```
[4]: 2728.75
```

0.2 Set Variables

```
[5]: # Append url for our api
url = "https://api.covalenthq.com/v1"
chain_id = "/1"
azuki_address = "/0xED5AF388653567Af2F388E6224dC7C4b3241C544"
cryptopunks_address = "/0xb47e3cd837dDF8e4c57F05d70Ab865de6e193BBB"
BAYC_address = "/0xBC4CA0EdA7647A8aB7C2061c2E118A18a936f13D"
date_option = '/?quote-currency=USD&format=JSON&from=2017-01-01&to=2022-05-01'
page_option = '/transactions_v2/?
 ↪quote-currency=USD&format=JSON&block-signed-at-asc=false&no-logs=false&page-number=0&page-s
api_option = "&key=" + api_key
api_no_option = '/?key=' + api_key
```

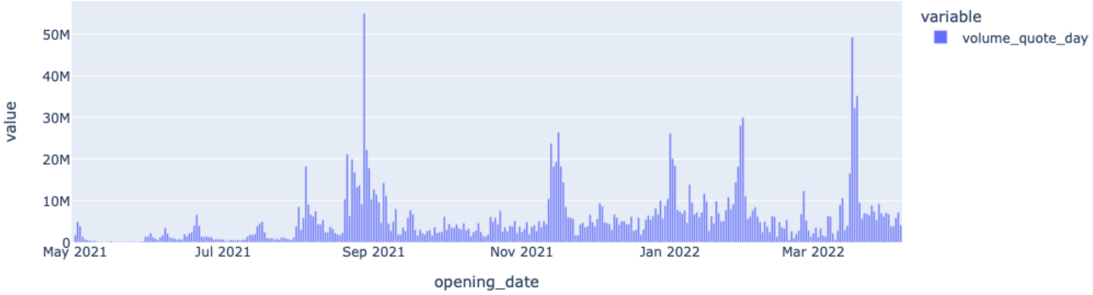
0.3 a. Daily Volume

```
[6]: # Create variables needed for owner data and add to url
BAYC_historical_url = url + chain_id + "/nft_market/collection" + BAYC_address␣
 ↪+ api_no_option

# Get request
BAYC_historical_json = requests.get(BAYC_historical_url).json()

# Convert historical json data to a dataframe and view data
BAYC_df = pd.DataFrame(BAYC_historical_json['data']['items'])

# Set index to date
BAYC_df = BAYC_df.set_index('opening_date')

# Create Volume dataframe
BAYC_vol_df = pd.DataFrame(BAYC_df, columns = ['volume_quote_day',␣
 ↪'unique_token_ids_sold_count_day']).sort_index()
BAYC_vol_df.head()
```

```
[6]:               volume_quote_day  unique_token_ids_sold_count_day
opening_date
2021-04-30        8.241964e+02                                1
2021-05-01        1.737182e+06                             1635
2021-05-02        4.950946e+06                             1534
2021-05-03        3.948996e+06                              996
2021-05-04        1.388962e+06                              336
```

[7]:

```
# Plot Volume quote per day
BAYC_volume = BAYC_vol_df['volume_quote_day'].astype(int)

# BAYC_volume.plot.bar(figsize = (20,4))
px.bar(BAYC_volume)
```



0.4 b. Recent 1000 transactions

[8]:

```
# Quering the API for transaction data
BAYC_tx_url = url + chain_id + "/address" + BAYC_address + page_option +␣
 ↪api_option
BAYC_tx = requests.get(BAYC_tx_url).json()

# Convert transactions data to dataframe
BAYC_tx_df = pd.DataFrame(BAYC_tx['data']['items'], columns =␣
 ↪['to_address_label','fees_paid', 'value_quote','block_signed_at']).
 ↪set_index('block_signed_at').sort_index()

BAYC_tx_df.head()
```

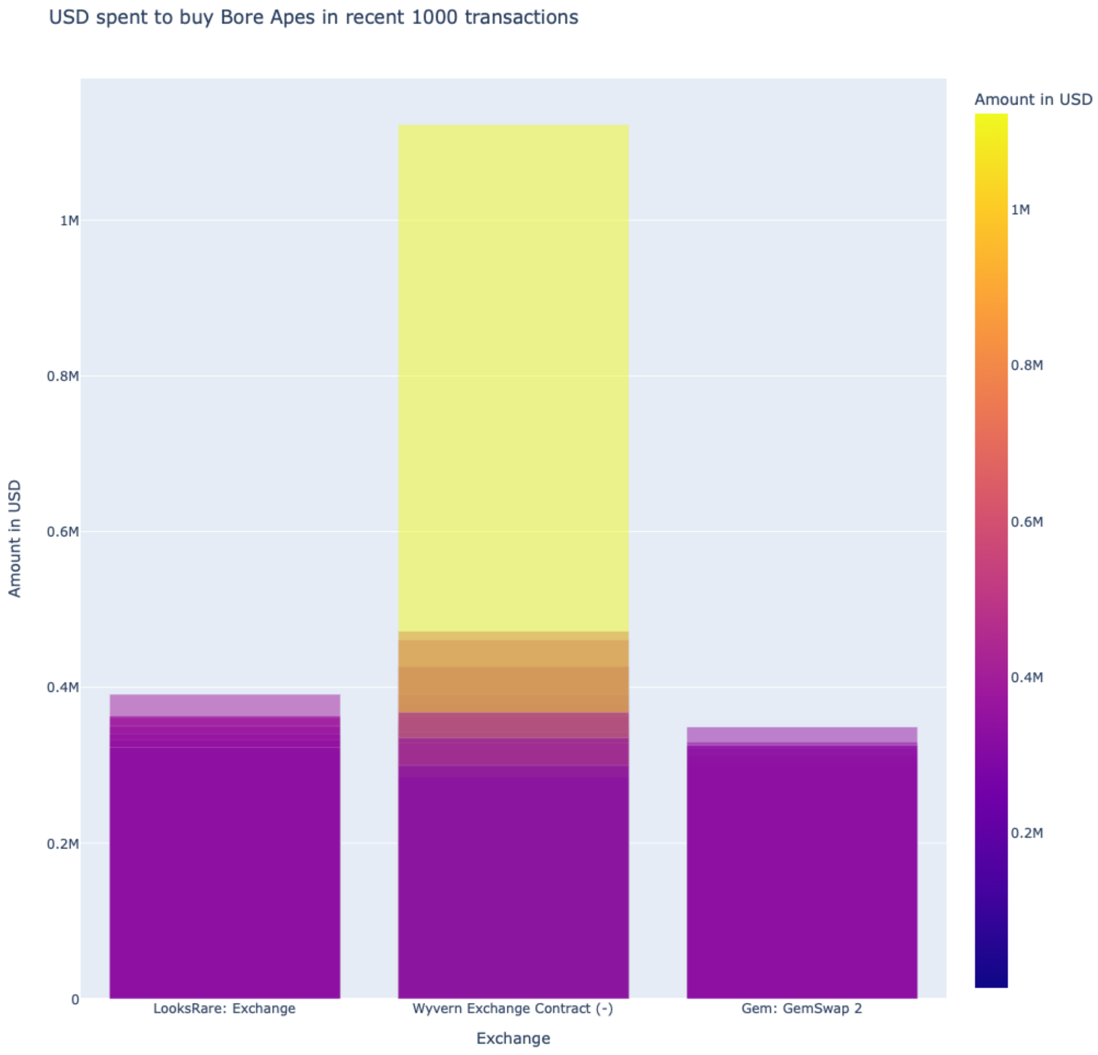
[8]:

```
                     to_address_label           fees_paid  value_quote
block_signed_at
2022-05-03T01:17:55Z             None  12168548098847650          0.0
2022-05-03T01:17:59Z             None   2259301753432880          0.0
2022-05-03T01:27:56Z             None   6401478612864081          0.0
2022-05-03T01:27:56Z             None   9922248312316456          0.0
2022-05-03T01:30:16Z             None   7634578388514804          0.0
```

[9]:

```
# Filter Through data for non null transactions
BAYC_sales_df = BAYC_tx_df[BAYC_tx_df['value_quote'] != 0]
BAYC_sales = BAYC_sales_df[BAYC_sales_df['to_address_label'].notnull()].dropna()

# Creating the plot using plotly express
```

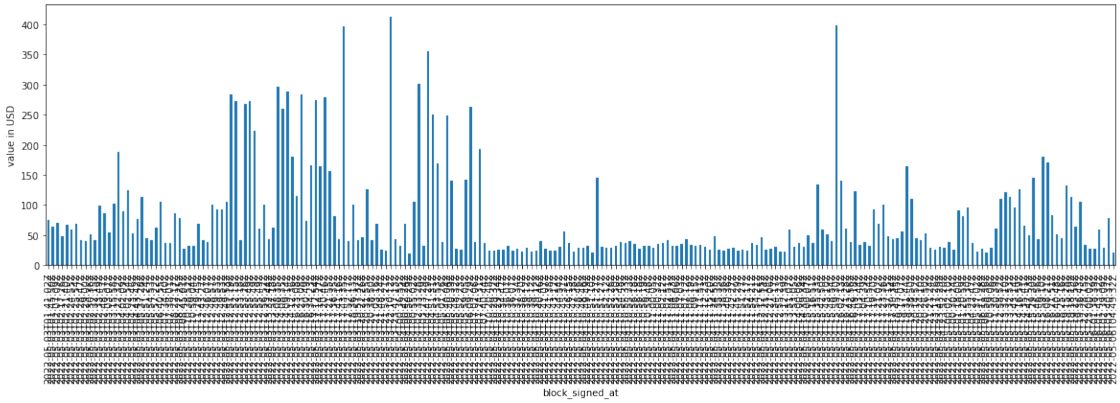
```
BAYC_fig = px.bar(BAYC_sales,
                  x='to_address_label',
                  y= 'value_quote',
                  color='value_quote',
                  height=1020,
                  width = 1000,
                  barmode = 'overlay',
                  labels={'value_quote':'Amount in USD', 'to_address_label': 'Exchange'},
                  title='USD spent to buy Bore Apes in recent 1000 transactions'
                 )
BAYC_fig.show()
```



0.5 c. Fees Spend

[10]:
```
# Filter Through data for non null transactions
BAYC_fees = BAYC_sales_df['fees_paid'].astype(int)/10**18*eth_value

BAYC_fees.plot.bar(rot = 90, figsize = (20,5), ylabel = 'value in USD')
```

[10]:
```
<AxesSubplot:xlabel='block_signed_at', ylabel='value in USD'>
```



0.6 Part TWO: Azuki

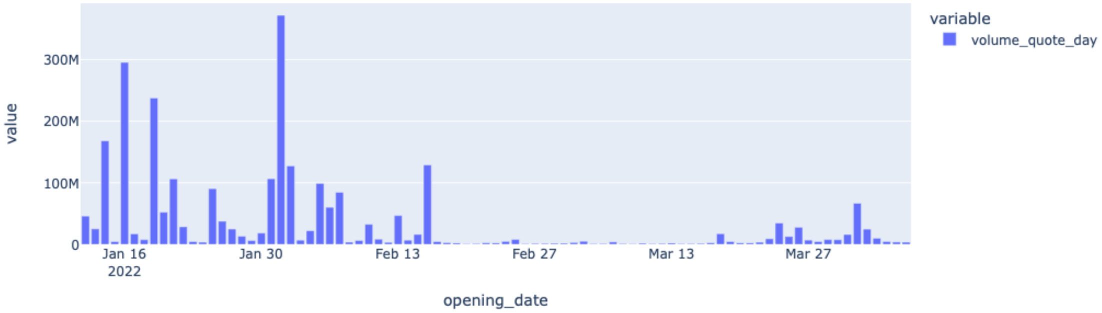
@mmsaki

0.7 a. Daily Volume

[11]:
```
# Create variables needed for owner data and add to url
azuki_url = url + chain_id + "/nft_market/collection" + azuki_address +␣
  ↪api_no_option

# Get request
azuki_historical_json = requests.get(azuki_url).json()

# Convert historical json data to a dataframe and view data
azuki_df = pd.DataFrame(azuki_historical_json['data']['items'])

# Set index to date
azuki_df = azuki_df.set_index('opening_date')

# Create Volume dataframe
azuki_vol_df = pd.DataFrame(azuki_df, columns = ['volume_quote_day',␣
  ↪'unique_token_ids_sold_count_day']).sort_index()
azuki_vol_df.head()
```

```
[11]:                volume_quote_day  unique_token_ids_sold_count_day
      opening_date
      2022-01-12          45941404.0                             2402
      2022-01-13          25129178.0                             1318
      2022-01-14         168151840.0                              470
      2022-01-15           4408686.0                              499
      2022-01-16         295638336.0                              368
```

```
[12]: # Plot Volume quote per day
      azuki_volume = azuki_vol_df['volume_quote_day'].astype(int)

      # Plot Historical daily volume
      px.bar(azuki_volume)
```



0.8 b. Recent 1000 transactions

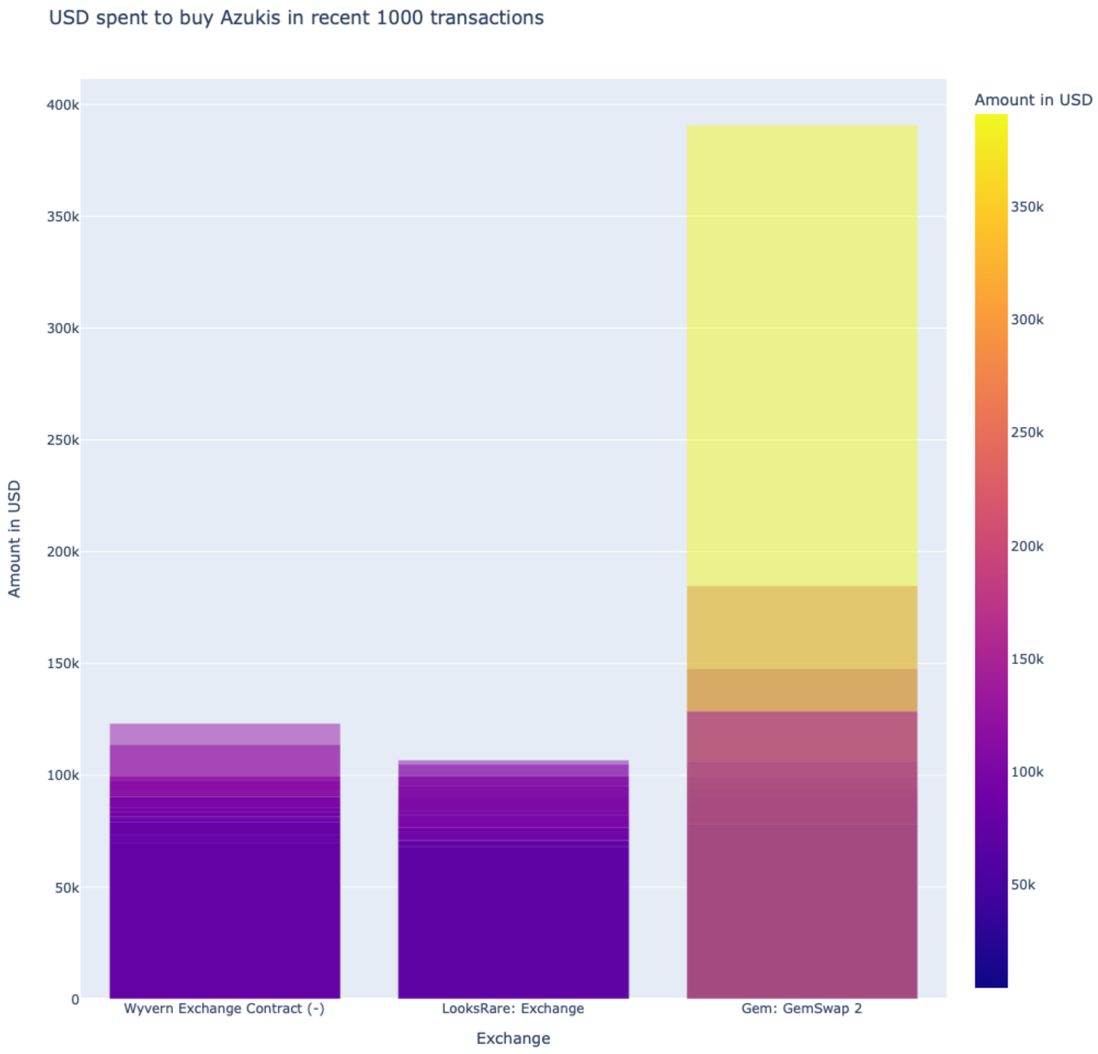
```
[13]: # Quering the API for transaction data
      azuki_tx_url = url + chain_id + "/address" + azuki_address + page_option +␣
       ↪api_option
      azuki_tx = requests.get(azuki_tx_url).json()

      # Convert transactions data to dataframe
      azuki_tx_df = pd.DataFrame(azuki_tx['data']['items'], columns =␣
       ↪['to_address_label','fees_paid', 'value_quote','block_signed_at']).
       ↪set_index('block_signed_at').sort_index()

      azuki_tx_df.head()
```

```
[13]:                                    to_address_label          fees_paid  \
      block_signed_at
      2022-05-03T01:14:10Z                           None   2723068601452056
      2022-05-03T01:17:28Z  Wyvern Exchange Contract (-)  10163645216888756
      2022-05-03T01:17:28Z                           None   2234463412438972
```

```
2022-05-03T01:18:07Z                          None   2057488554010604
2022-05-03T01:18:52Z                          None   2253722629285699

                       value_quote
block_signed_at
2022-05-03T01:14:10Z      0.000000
2022-05-03T01:17:28Z  85294.050293
2022-05-03T01:17:28Z      0.000000
2022-05-03T01:18:07Z      0.000000
2022-05-03T01:18:52Z      0.000000
```

[14]:

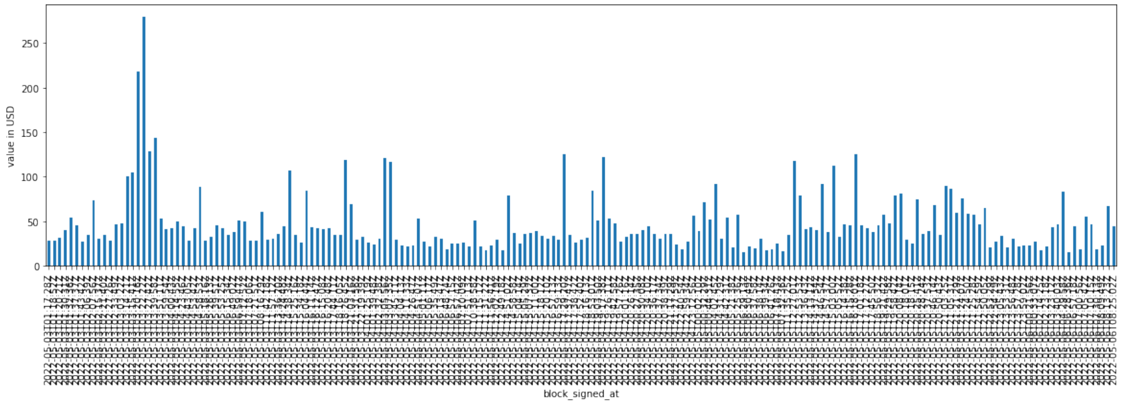
```
# Filter Through data for non null transactions
azuki_sales_df = azuki_tx_df[azuki_tx_df['value_quote'] != 0]
azuki_sales = azuki_sales_df[azuki_sales_df['to_address_label'].notnull()]

# Creating the plot using plotly express
azuki_fig = px.bar(azuki_sales,
                   x='to_address_label',
                   y= 'value_quote',
                   color='value_quote',
                   height=1020,
                   width = 1000,
                   barmode='overlay',
                   labels={'value_quote':'Amount in USD', 'to_address_label':␣
 ↪'Exchange'},
                   title='USD spent to buy Azukis in recent 1000 transactions'
                  )
azuki_fig.show()
```



0.9 c. fees paid

```
[15]: # Filter Through data for non null transactions
      azuki_fees = azuki_sales_df['fees_paid'].astype(int)/10**18*eth_value

      azuki_fees.plot.bar(rot = 90, figsize = (20,5), ylabel = 'value in USD')
```

```
[15]: <AxesSubplot:xlabel='block_signed_at', ylabel='value in USD'>
```



0.10 d. comparison

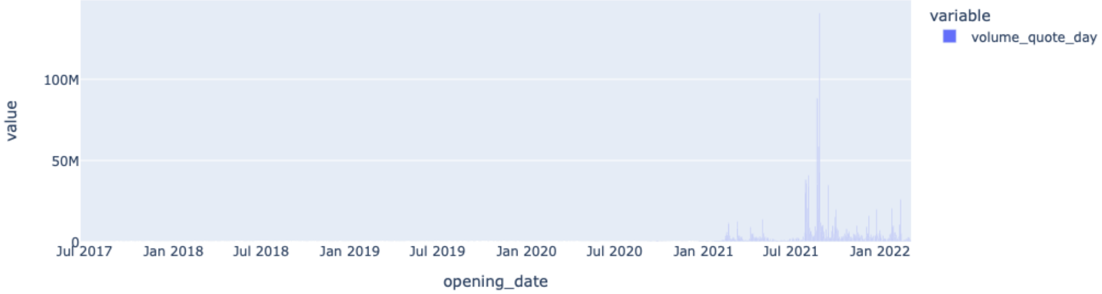
```
[16]: # Create variables needed for owner data and append to url
      cryptopunks_historical_url = url + chain_id + "/nft_market/collection" +␣
       ↪cryptopunks_address + api_no_option

      # Get request
      cryptopunks_historical_json = requests.get(cryptopunks_historical_url).json()

      # Convert historical json data to a dataframe and view data
      cryptopunks_df = pd.DataFrame(cryptopunks_historical_json['data']['items'])

      # Set index to date
      cryptopunks_df = cryptopunks_df.set_index('opening_date')

      # Create Volume dataframe
      cryptopunks_vol_df = pd.DataFrame(cryptopunks_df, columns =␣
       ↪['volume_quote_day', 'unique_token_ids_sold_count_day']).sort_index()
      cryptopunks_vol_df.head()
```

```
[16]:               volume_quote_day  unique_token_ids_sold_count_day
      opening_date
      2017-06-23                 0.0                               19
      2017-06-24                 0.0                               22
      2017-06-25                 0.0                               11
      2017-06-26                 0.0                               18
      2017-06-27                 0.0                               35
```

0.11 punk volume a.

[17]:

```
# Plot Volume quote per day
cryptopunks_volume = cryptopunks_vol_df['volume_quote_day'].astype(int)

# cryptopunks_volume.plot.line(figsize = (20,4))

px.bar(cryptopunks_volume)
```



0.12 punk sales b.

[18]:

```
# Quering the API for transaction data
cryptopunks_tx_url = url + chain_id + "/address" + cryptopunks_address +␣
 ↪page_option + api_option
cryptopunks_tx = requests.get(cryptopunks_tx_url).json()

# Convert transactions data to dataframe
cryptopunks_tx_df = pd.DataFrame(cryptopunks_tx['data']['items'], columns =␣
 ↪['to_address_label','fees_paid', 'value_quote','block_signed_at']).
 ↪set_index('block_signed_at').sort_index()

cryptopunks_tx_df.head()
```

[18]:

```
                     to_address_label         fees_paid  value_quote
block_signed_at
2022-04-27T21:12:57Z  CRYPTOPUNKS ( )  1421908968219564          0.0
2022-04-27T21:12:57Z  CRYPTOPUNKS ( )  1421908968219564          0.0
2022-04-27T21:12:57Z  CRYPTOPUNKS ( )  1421908968219564          0.0
2022-04-27T21:12:57Z  CRYPTOPUNKS ( )  1421908968219564          0.0
2022-04-27T21:14:42Z             None   6923227425050630          0.0
```

[19]:

```
# Create variables needed for owner data and append to url
```

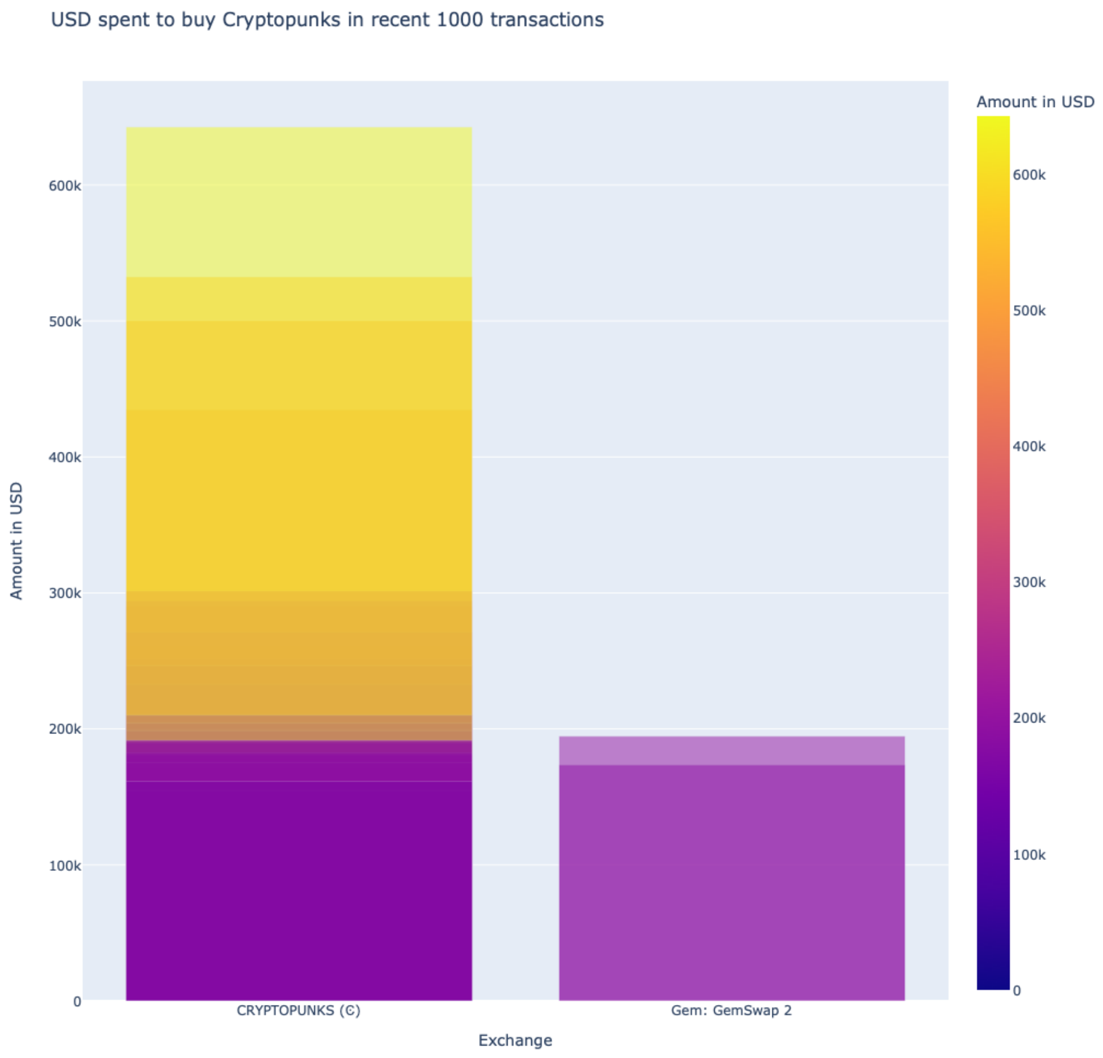
```
cryptopunks_historical_url = url + chain_id + "/nft_market/collection" +␣
 ↪cryptopunks_address + api_no_option

# Get request
cryptopunks_historical_json = requests.get(cryptopunks_historical_url).json()

# Convert historical json data to a dataframe and view data
cryptopunks_df = pd.DataFrame(cryptopunks_historical_json['data']['items'])

# Set index to date
cryptopunks_df = cryptopunks_df.set_index('opening_date')

# Create Volume dataframe
cryptopunks_vol_df = pd.DataFrame(cryptopunks_df, columns =␣
 ↪['volume_quote_day', 'unique_token_ids_sold_count_day']).sort_index()
cryptopunks_vol_df.head()
```

[19]:

```
              volume_quote_day  unique_token_ids_sold_count_day
opening_date
2017-06-23                 0.0                               19
2017-06-24                 0.0                               22
2017-06-25                 0.0                               11
2017-06-26                 0.0                               18
2017-06-27                 0.0                               35
```

[20]:

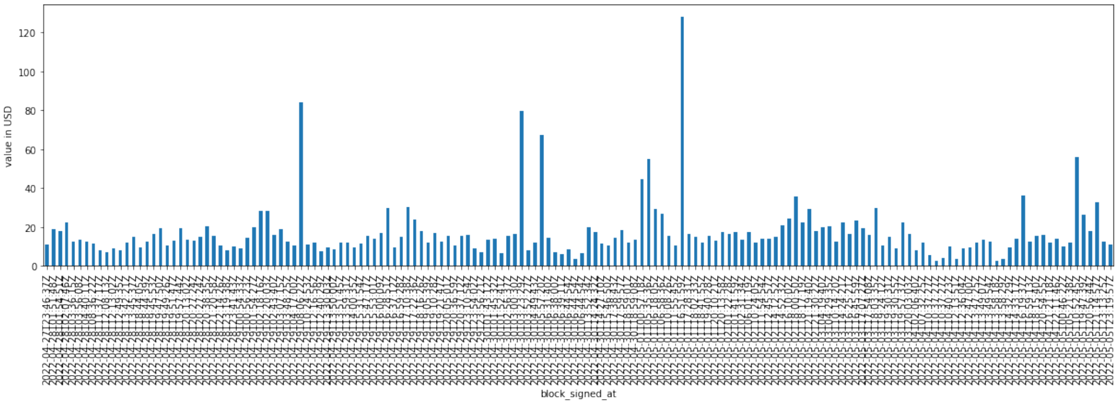
```
# Filter Through data for non null transactions
cryptopunks_sales_df = cryptopunks_tx_df[cryptopunks_tx_df['value_quote'] != 0]
cryptopunks_sales =␣
 ↪cryptopunks_sales_df[cryptopunks_sales_df['to_address_label'].notnull()].
 ↪dropna()


# Creating the plot using plotly express
cryptopunks_fig = px.bar(cryptopunks_sales,
                         x='to_address_label',
                         y= 'value_quote',
                         color='value_quote',
                         height=1020,
                         width = 1000,
                         barmode = 'overlay',
                         labels={'value_quote':'Amount in USD',␣
 ↪'to_address_label': 'Exchange'},
                         title='USD spent to buy Cryptopunks in recent 1000␣
 ↪transactions'
                        )
cryptopunks_fig.show()
```



0.13 punk fees c.

```
[21]: # Filter Through data for non null transactions
      cryptopunks_fees = cryptopunks_sales_df['fees_paid'].astype(int)/
       ↪10**18*eth_value

      # plot
      cryptopunks_fees.plot.bar(rot = 90, figsize = (20,5), ylabel = 'value in USD')
```

```
[21]: <AxesSubplot:xlabel='block_signed_at', ylabel='value in USD'>
```



0.14 combined fees d.

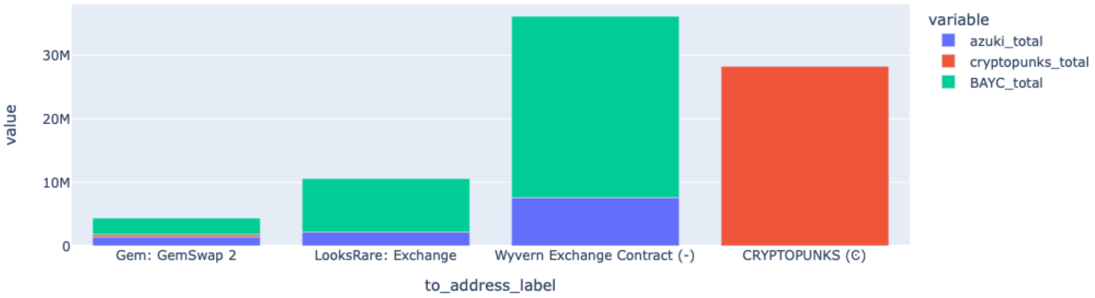
```
[22]: # Group by address label and sum the value
      azuki_total = azuki_sales.groupby('to_address_label').sum()
      cryptopunks_total = cryptopunks_sales.groupby('to_address_label').sum()
      BAYC_total = BAYC_sales.groupby('to_address_label').sum()
```

```
[23]: # Combine and rename columns for our total sales data
      combined_totals = pd.concat([azuki_total,cryptopunks_total,BAYC_total], axis=1)
      combined_totals.columns = ['azuki_total', 'cryptopunks_total','BAYC_total']
```

```
[24]: # Group by address label and sum the value
      combined_totals
```

```
[24]:                               azuki_total  cryptopunks_total    BAYC_total
      to_address_label
      Gem: GemSwap 2                1.408856e+06       3.683260e+05  2.568193e+06
      LooksRare: Exchange           2.145862e+06                NaN  8.420908e+06
      Wyvern Exchange Contract (-)  7.586556e+06                NaN  2.855636e+07
      CRYPTOPUNKS ( )                        NaN       2.824688e+07           NaN
```

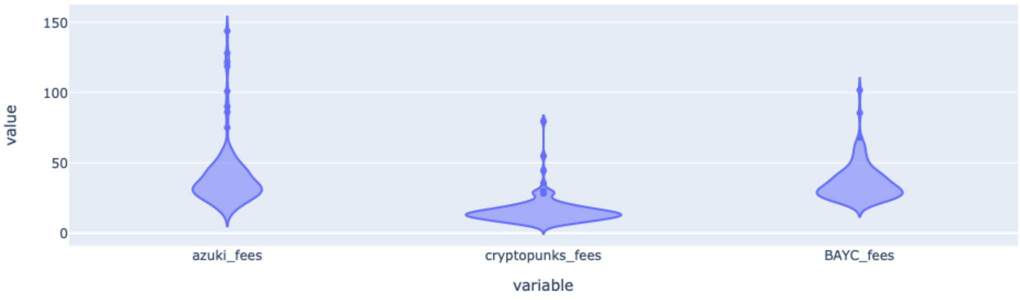
```
[25]: # Plot for combined figure
      combined_total_fig = px.bar(combined_totals)



      # Show Figure
      combined_total_fig.show()
```



0.15 combined fees e.

[26]:
```
# Combine and rename columns for our total sales data
azuki_usd_fees = azuki_sales['fees_paid'].astype(int)/10**18*eth_value
cryptopunks_usd_fees = cryptopunks_sales['fees_paid'].astype(int)/
 ↪10**18*eth_value
BAYC_usd_fees = BAYC_sales['fees_paid'].astype(int)/10**18*eth_value

# Combine dataframe and drop nulls
combined_usd_fees = pd.concat([azuki_usd_fees.reset_index(drop=True),
                               cryptopunks_usd_fees.reset_index(drop=True),
                               BAYC_usd_fees.reset_index(drop=True)],
                              axis=1
                             ).dropna()
combined_usd_fees.columns = ['azuki_fees', 'cryptopunks_fees','BAYC_fees']
```

[27]:
```
# Plot for combined figure
combined_fees_fig = px.violin(combined_usd_fees)

# Show Figure
combined_fees_fig.show()
```



0.16 Part Three: Cryptopunks

@dockingbay24

[28]:
```
# create variable for api key  for etherscan
ETHERSCAN_API_KEY = os.getenv("ETHERSCAN_API")

#set api url variables for Etherscan call
cryptopunks_contract = "0xb47e3cd837dDF8e4c57F05d70Ab865de6e193BBB"
etherscan_url = "https://api.etherscan.io/api"
module = "?module=contract"
action = "&action=getsourcecode"
address ="&address=" + cryptopunks_contract
etherscan_key = "&apikey=" + ETHERSCAN_API_KEY
```

[29]:
```
# Set API call string
url_cryptopunks_contract_details =␣
 ↪etherscan_url+module+action+address+etherscan_key

# Get results from API call
cryptopunk_contract_details= requests.get(url_cryptopunks_contract_details).
 ↪json()
```

0.17 Etherscan Cryptopunks Transactions

[30]:
```
# Set api url variables for Etherscan call
transaction_hash =␣
 ↪"0x15f8e5ea1079d9a0bb04a4c58ae5fe7654b5b2b4463375ff7ffb490aa0032f3a"␣
 ↪#replace with trans_hash
etherscan_url = "https://api.etherscan.io/api"
module = "?module=transaction"
action = "&action=getstatus"
address ="&&txhash=" + transaction_hash
etherscan_key = "&apikey=" + ETHERSCAN_API_KEY
```

[31]:
```
# Set API call string
url_cryptopunks_transactions = etherscan_url+module+action+address+etherscan_key
```

[32]:
```
# Get results from API call
cryptopunk_transaction=requests.get(url_cryptopunks_transactions).json()
```

0.18 a. Wrapped Cryptopunks

[33]:
```
# Append url for our api
url = "https://api.covalenthq.com/v1"
chain_id = "/1"    #TEMP is it always chain1 for most part?
option = "/nft_market/collection"
# Add search queries to api url
contract_address = "/0xb7f7f6c52f2e2fdb1963eab30438024864c313f6"   #Do we want␣
 ↪to compare other contracts
currency = "/?quote-currency=USD"
format_output = "&format=JSON"
date_from ="&from=2022-01-25"
date_to = "&to=2022-04-25"
covalent_api_key = "&key=" + api_key

url_nft_market_cap_detail = url + chain_id + option + contract_address +␣
 ↪currency + format_output + date_from + date_to  + covalent_api_key
```

[34]:
```
#set API call string
url_nft_market_cap_detail = url + chain_id + option + contract_address +␣
 ↪currency + format_output + date_from + date_to  + covalent_api_key
```

[35]:
```
#get results from API call
nft_market_cap = requests.get(url_nft_market_cap_detail).json()
```

[36]:
```
#set data into a dataframe
nft_market_cap_df = pd.DataFrame(nft_market_cap['data']['items'])
```

[37]:
```
#display head and tail of df
display(nft_market_cap_df.head())
```

```
   chain_id      collection_name                          collection_address  \
0         1  Wrapped Cryptopunks  0xb7f7f6c52f2e2fdb1963eab30438024864c313f6
1         1  Wrapped Cryptopunks  0xb7f7f6c52f2e2fdb1963eab30438024864c313f6

  collection_ticker_symbol opening_date         volume_wei_day  \
0                   WPUNKS   2022-03-30  201500000000000000000
1                   WPUNKS   2022-02-03     250000000000000000

   volume_quote_day average_volume_wei_day  average_volume_quote_day  \
0       687428.9000  201500000000000000000               687428.9000
1          664.4058     250000000000000000                  664.4058

   unique_token_ids_sold_count_day  … fourth_nft_image_token_id  \
0                                1  …                        51
1                                1  …                        51

                                    fourth_nft_image  \
0  https://wrappedpunks.com:3000/images/punks/51.png
1  https://wrappedpunks.com:3000/images/punks/51.png

                                fourth_nft_image_256  \
0  https://image-proxy.svc.prod.covalenthq.com/25…
1  https://image-proxy.svc.prod.covalenthq.com/25…

                                fourth_nft_image_512  \
0  https://image-proxy.svc.prod.covalenthq.com/51…
1  https://image-proxy.svc.prod.covalenthq.com/51…

                               fourth_nft_image_1024 fifth_nft_image_token_id  \
0  https://image-proxy.svc.prod.covalenthq.com/10…                       60
1  https://image-proxy.svc.prod.covalenthq.com/10…                       60

                                     fifth_nft_image  \
0  https://wrappedpunks.com:3000/images/punks/60.png
1  https://wrappedpunks.com:3000/images/punks/60.png

                                 fifth_nft_image_256  \
0  https://image-proxy.svc.prod.covalenthq.com/25…
1  https://image-proxy.svc.prod.covalenthq.com/25…

                                 fifth_nft_image_512  \
0  https://image-proxy.svc.prod.covalenthq.com/51…
1  https://image-proxy.svc.prod.covalenthq.com/51…

                                fifth_nft_image_1024
0  https://image-proxy.svc.prod.covalenthq.com/10…
1  https://image-proxy.svc.prod.covalenthq.com/10…

[2 rows x 39 columns]
```

[38]:
```
#TEMP descibe data
nft_market_cap_df.describe()
```

[38]:
```
       chain_id  volume_quote_day  average_volume_quote_day  \
count       2.0          2.000000                  2.000000
mean        1.0     344046.652900             344046.652900
std         0.0     485615.830927             485615.830927
min         1.0        664.405800                664.405800
25%         1.0     172355.529350             172355.529350
50%         1.0     344046.652900             344046.652900
75%         1.0     515737.776450             515737.776450
max         1.0     687428.900000             687428.900000

       unique_token_ids_sold_count_day  floor_price_quote_7d  \
count                              2.0          2.000000
mean                               1.0     344046.652900
std                                0.0     485615.830927
min                                1.0        664.405800
25%                                1.0     172355.529350
50%                                1.0     344046.652900
75%                                1.0     515737.776450
max                                1.0     687428.900000

       gas_quote_rate_day
count            2.000000
mean          3034.590450
std            533.112056
min           2657.623300
25%           2846.106875
50%           3034.590450
75%           3223.074025
max           3411.557600
```

```
[39]: #TEMP list columns of df
      nft_market_cap_df.columns
```

```
[39]: Index(['chain_id', 'collection_name', 'collection_address',
             'collection_ticker_symbol', 'opening_date', 'volume_wei_day',
             'volume_quote_day', 'average_volume_wei_day',
             'average_volume_quote_day', 'unique_token_ids_sold_count_day',
             'floor_price_wei_7d', 'floor_price_quote_7d', 'gas_quote_rate_day',
             'quote_currency', 'first_nft_image_token_id', 'first_nft_image',
             'first_nft_image_256', 'first_nft_image_512', 'first_nft_image_1024',
             'second_nft_image_token_id', 'second_nft_image', 'second_nft_image_256',
             'second_nft_image_512', 'second_nft_image_1024',
             'third_nft_image_token_id', 'third_nft_image', 'third_nft_image_256',
             'third_nft_image_512', 'third_nft_image_1024',
             'fourth_nft_image_token_id', 'fourth_nft_image', 'fourth_nft_image_256',
             'fourth_nft_image_512', 'fourth_nft_image_1024',
             'fifth_nft_image_token_id', 'fifth_nft_image', 'fifth_nft_image_256',
             'fifth_nft_image_512', 'fifth_nft_image_1024'],
            dtype='object')
```

```
[40]: # Create a new data frame for graphing volume, drop un-needed columns
      market_cap_df_graph = nft_market_cap_df[["opening_date","volume_quote_day"]].
       ↪copy()
```

```
[41]: # TEMP display market_cap_df_graph
      market_cap_df_graph
```

[41]:

```
  opening_date  volume_quote_day
0   2022-03-30       687428.9000
1   2022-02-03          664.4058
```

[42]:

```
# Graph dataframe for analysis
from bokeh.models.formatters import NumeralTickFormatter
formatter = NumeralTickFormatter(format="0,0")

market_cap_df_graph.hvplot.bar(
    x='opening_date',
    y='volume_quote_day',
    xlabel='Opening Date',
    ylabel='Volume',
    rot=90,
    title='Volume Quote Per Day - 0xb7f7f6c52f2e2fdb1963eab30438024864c313f6',
    height= 600,
    width = 2000
).opts(
  yformatter=formatter
)
```

[42]:

```
:Bars   [opening_date]   (volume_quote_day)
```

0.19 b. Punks not wrapped

[43]:

```
# Set variables
url = "https://api.covalenthq.com/v1"
chain_id = "/1"    #TEMP is it always chain1 for most part?
option = "/nft_market/collection"

# Add search queries to api url
contract_address2 = "/0xb47e3cd837dDF8e4c57F05d70Ab865de6e193BBB"
currency = "/?quote-currency=USD"
format_output = "&format=JSON"
date_from ="&from=2022-01-25"
date_to = "&to=2022-04-25"
covalent_api_key = "&key=" + api_key

# Append url for our api
url_nft_market_cap_detail2 = url + chain_id + option + contract_address2 +␣
 ↪currency + format_output + date_from + date_to  + covalent_api_key
```

[44]:

```
#set API call string
url_nft_market_cap_detail2 = url + chain_id + option + contract_address2 +␣
 ↪currency + format_output + date_from + date_to  + covalent_api_key
#get results from API call
nft_market_cap2 = requests.get(url_nft_market_cap_detail2).json()
```

[45]:

```
#set data into a dataframe
nft_market_cap_df2 = pd.DataFrame(nft_market_cap2['data']['items'])
```

[46]:

```
#set data into a dataframe
nft_market_cap_df2 = pd.DataFrame(nft_market_cap2['data']['items'])
#create a new data frame for graphing volume, drop un-needed columns
market_cap_df_graph_2 = nft_market_cap_df2[["opening_date","volume_quote_day"]].
  ↪copy()
```

[47]:

```
#Graph dataframe for analysis
from bokeh.models.formatters import NumeralTickFormatter
formatter = NumeralTickFormatter(format="0,0")

market_cap_df_graph_2.hvplot.bar(
    x='opening_date',
    y='volume_quote_day',
    xlabel='Opening Date',
    ylabel='Volume',
    rot=90,
    title='Volume Quote Per Day - Cryptopunks',
    height= 600,
    width = 1000
).opts(
  yformatter=formatter
)
```

[47]:

```
:Bars   [opening_date]   (volume_quote_day)
```

[48]:

```
from bokeh.models.formatters import NumeralTickFormatter
formatter = NumeralTickFormatter(format="0,0")
graph2 = market_cap_df_graph_2.hvplot.bar(
    x='opening_date',
    y='volume_quote_day',
    xlabel='Opening Date',
    ylabel='Volume',
    rot=90,
    label='0xb47e3cd837dDF8e4c57F05d70Ab865de6e193BBB',
    height= 600,
    width = 1000
).opts(
  yformatter=formatter
)

graph1  = market_cap_df_graph.hvplot.bar(
    x='opening_date',
    y='volume_quote_day',
    xlabel='Opening Date',
    ylabel='Volume',
    rot=90,
    label='0xb7f7f6c52f2e2fdb1963eab30438024864c313f6',
    height= 600,
    width = 1000
).opts(
  yformatter=formatter
)
```

[49]:

```
graph2 * graph1
```

[49]:

```
:Overlay
   .Bars.A_0xb47e3cd837dDF8e4c57F05d70Ab865de6e193BBB :Bars   [opening_date]
(volume_quote_day)
   .Bars.A_0xb7f7f6c52f2e2fdb1963eab30438024864c313f6 :Bars   [opening_date]
(volume_quote_day)
```

[50]:

```
market_cap_df_graph['Token'] = '0xb7f7f6c52f2e2fdb1963eab30438024864c313f6'
market_cap_df_graph_2['Token'] = '0xb47e3cd837dDF8e4c57F05d70Ab865de6e193BBB'

# combine dataframes into a single df
combined_df = pd.concat([market_cap_df_graph, market_cap_df_graph_2],␣
 ↪join="outer", ignore_index=False)
```

0.20 c. Combined Token Graph

[51]:

```
# Combined Token graph
from bokeh.models.formatters import NumeralTickFormatter
formatter = NumeralTickFormatter(format="0,0")
combined_df.hvplot.scatter(
    x='opening_date',
    y='volume_quote_day',
    xlabel='Date',
    ylabel='Volume',
    rot=90,
    label='Combined Analysis',
    by='Token',
    attr_labels=False,
    height= 600,
    width = 1000
).opts(
  yformatter=formatter
)
```

[51]:

```
:NdOverlay   [Token]
   :Scatter   [opening_date]   (volume_quote_day)
```

0.21 d. import historical data

[52]:
```
# Read in all cryptopunkowners
cryptopunk_owners_path = Path("./Resources_punks/2022-05_all_cryptopunk_owners.
 ↪csv")

# Read in top20 sales, by ether value
top20_sales_path = Path("./Resources_punks/top20_sales_by_ether_value.csv")
```

[53]:
```
#import into dataframes
cryptopunk_owners_df = pd.read_csv(cryptopunk_owners_path, index_col="#",␣
 ↪parse_dates=True, infer_datetime_format=True)
top20_sales_df = pd.read_csv(top20_sales_path, index_col="Punk",␣
 ↪parse_dates=True, infer_datetime_format=True)

# Display tem values for dataframes
display(cryptopunk_owners_df.head())
display(top20_sales_df.head())
```

```
           Account     OpenSea / ENS  Number Owned     last Active
#
1  0xb7f7f6c52f2e2  WrappedCryptoPu           428     7 hours ago
2  0xa858ddc0445d8               NaN           423     1 month ago
3  0xa25803ab86a32       wilcox.eth           238     28 days ago
4  0xb88f61e6fbda8               NaN           215   11 months ago
5  0x577ebc5de943e               NaN           165      5 days ago
```

```
      Ether  EtherValueUSD_M      Date
Punk
5822   8000            23.70  02/12/22
7804   4200             7.57  03/11/21
3100   4200             7.58  03/11/22
5577   2500             7.70  02/09/22
4156   2500            10.26  12/09/21
```

[54]:
```
#plot top20 sales by Punk based on Ether
top20_sales_df.hvplot.scatter(
    x='EtherValueUSD_M',
    y='Ether',
    xlabel='Ether value in USD Millions',
    ylabel='Ether',
    rot=90,
    label='Top 20 Sales By Ether',
    by='Punk',
    height= 600,
    width = 1000
).opts(
    bgcolor='lightgray',
    #fontsize={'title': 16, 'labels': 14, 'xticks': 6, 'yticks': 12}
)
```

[54]:

```
:NdOverlay   [Punk]
   :Scatter   [EtherValueUSD_M]   (Ether)
```

[55]:

```
# Plot top20 sales by Punk based on Ether
top20_sales_df.hvplot.table(
    x='EtherValueUSD_M',
    y='Ether',
    xlabel='Ether value in USD Millions',
    ylabel='Ether',
    rot=90,
    label='Top 20 Sales By Ether',
    by='Punk',
    height= 600,
    width = 1000
).opts(
    bgcolor='lightgray',
   #fontsize={'title': 16, 'labels': 14, 'xticks': 6, 'yticks': 12}
)
```

[55]:

```
:Table   [Ether,EtherValueUSD_M,Date]
```

[56]:

```
#validate dataframe total owned is 10,000
cryptopunk_total_assets = cryptopunk_owners_df['Number Owned'].sum()
cryptopunk_total_assets
```

[56]:

```
10000
```

[57]:

```
#find mean number of NFTs owned per owner
cryptopunk_owners_mean = cryptopunk_owners_df['Number Owned'].mean()
cryptopunk_owners_mean
```

[57]:

```
2.914602156805596
```

[58]:

```
#top20 asset owners
top20_cryptopunk_owners = cryptopunk_owners_df.head(20)
top20_cryptopunk_owners
```

[58]:

```
            Account    OpenSea / ENS  Number Owned    last Active
#
1   0xb7f7f6c52f2e2  WrappedCryptoPu           428    7 hours ago
2   0xa858ddc0445d8              NaN           423    1 month ago
3   0xa25803ab86a32       wilcox.eth           238    28 days ago
4   0xb88f61e6fbda8              NaN           215  11 months ago
5   0x577ebc5de943e              NaN           165     5 days ago
```

```
6   0x69021ae876958         sov.eth          146   6 months ago
7   0x26f744711ee9e             NaN          141    4 years ago
8   0x4084df8bf74ba             NaN           98            NaN
9   0x269616d549d7e             NaN           96     9 days ago
10  0x31a5ff62a1b2c             NaN           93    1 month ago
11  0x7174039818a41             NaN           89    3 years ago
12  0xcc7c335f3365a             NaN           87    13 days ago
13  0x51688cd36c188             NaN           79     6 days ago
14  0x810fdbc7e5cfe             NaN           77   13 hours ago
15  0xf5a4ba515dd36             NaN           75    1 month ago
16  0xcffc336e6d019             NaN           74   2 months ago
17  0x6f4a2d3a4f47f             NaN           70     9 days ago
18  0x062c5432107e3             NaN           68   3 months ago
19  0x7760e0243ca9b             NaN           66    3 years ago
20  0xdde8df9a7dc9f          Kenney           66   2 months ago
```

```
[59]: #total amount of assets owned by the top20 owners
      top20_owners_assets = cryptopunk_owners_df['Number Owned'].head(20).sum()
      perc_top20_owners_assets = top20_owners_assets /cryptopunk_total_assets *100
      print(f"The Top 20 owners own {top20_owners_assets} NFTs, which is␣
       ↪{perc_top20_owners_assets:.2f}% of total assets.")
```

```
The Top 20 owners own 2794 NFTs, which is 27.94% of total assets.
```

```
[60]: #total amount of assets owned by the top100 owners
      top100_owners_assets = cryptopunk_owners_df['Number Owned'].head(100).sum()
      perc_top100_owners_assets = top100_owners_assets /cryptopunk_total_assets *100
      print(f"The Top 100 owners own {top100_owners_assets} NFTs, which is␣
       ↪{perc_top100_owners_assets:.2f}% of total assets.")
```

```
The Top 100 owners own 4705 NFTs, which is 47.05% of total assets.
```

```
[61]: #total amount of assets owned by the top20 owners
      bot20_owners_assets = cryptopunk_owners_df['Number Owned'].tail(20).sum()
      perc_bot20_owners_assets = bot20_owners_assets /cryptopunk_total_assets *100
      print(f"The Bottom 20 owners own {bot20_owners_assets} NFTs, which is␣
       ↪{perc_bot20_owners_assets:.2f}% of total assets.")
```

```
The Bottom 20 owners own 20 NFTs, which is 0.20% of total assets.
```