

Fintech Group Project 01

Azuki, BAYC and Crypto Punks NFTs.

by Github users /[@dockingbay24](#) /[@angel-estrada7](#) and /[@mmsaki](#), 2022.

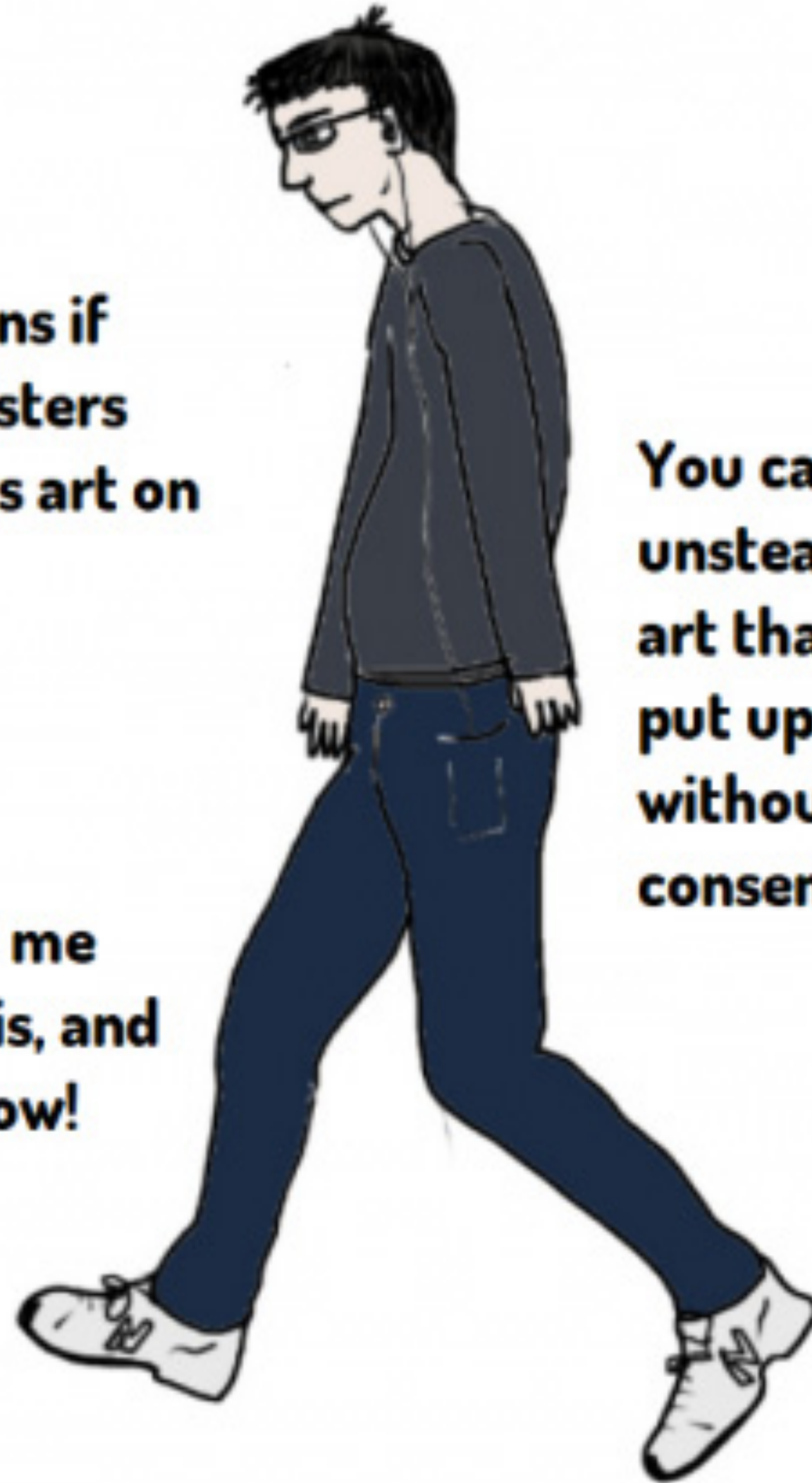
Table of Contents

- Hypothesis of Project
- Data Collection
- Data Cleanup & Exploration
- Data Analysis
- Discussion
- Postmortem
- Questions?



Azuki Token ID: 7558 | Current Owner: ron1n.eth | Sale: 27ETH

everyone else



So what happens if
somebody registers
somebody elses art on
Deloitte?

So what stops me
from doing this, and
saying mine now!

You cannot
unsteal that
art that was
put up
without
consent.

The NFT Alpha



Monetizes memes

Money goes
brrrrrrrrrrrrrr

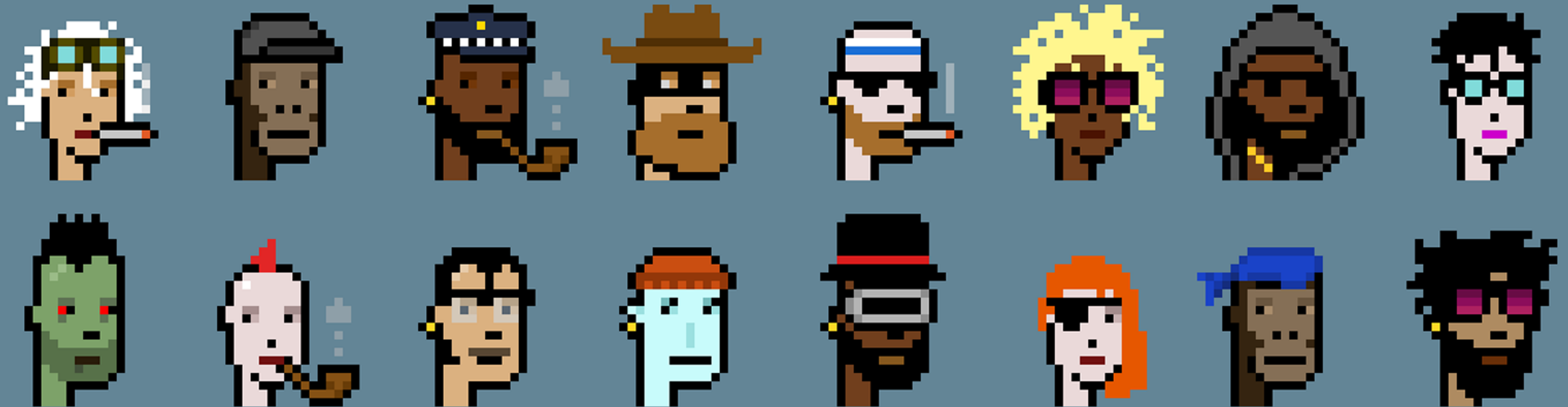
Creates something
for the community

1. Hypothesis

Hypothesis of Project

Our motivation and summary...

- Should you invest in [Azuki](#), [BAYC](#) or [Crypto Punks](#)?
- How can you tell which collection is performing well?



Data Collection

Describing what kinds of data we needed and where to find it.

2. Data Collection

Collecting data for NFT Collections

- Covalent API
- Etherscan Py Dependency
- Etherscan API
- CSV Import

group_project_01

May 5, 2022

0.1 Import dependancies

```
[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
```

```
[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

0.2 Current value of ETH

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

# Print current eth price and latest block height
eth_value = etherscan_api.get_eth_price()
eth_value
```

[4]: 2738.51

3. Data Cleanup & Exploration

Exploring our collection data through APIs preparing it for analysis

```
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
```

4. Data Analysis

Analyzing our data and developing figures to answer our questions

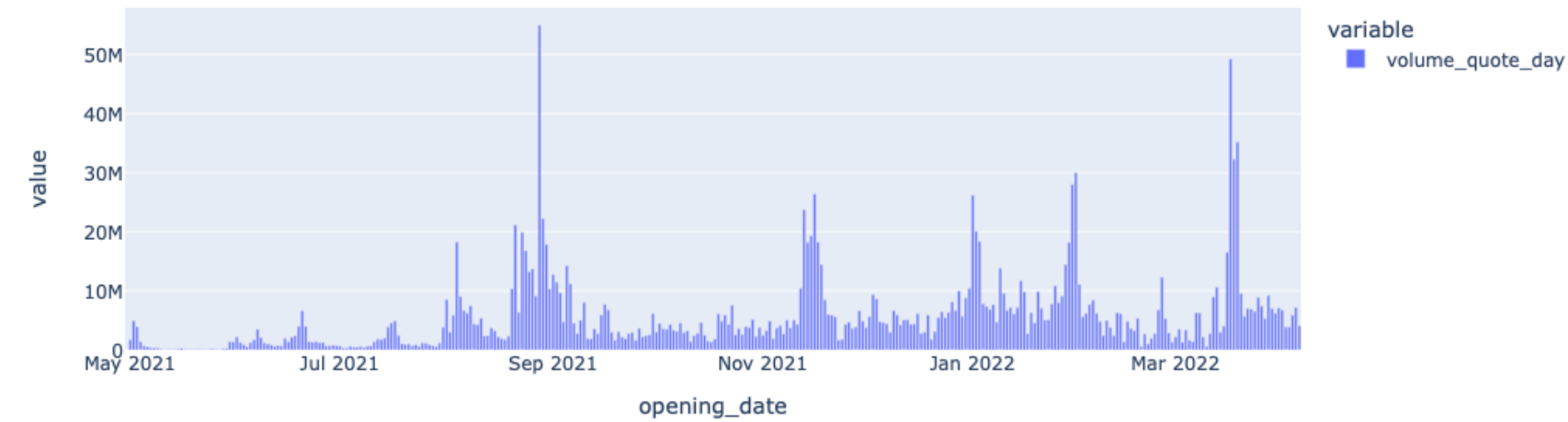
@angel-estrada7

Part 1: Bored Apes




```
[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]: # Querying 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

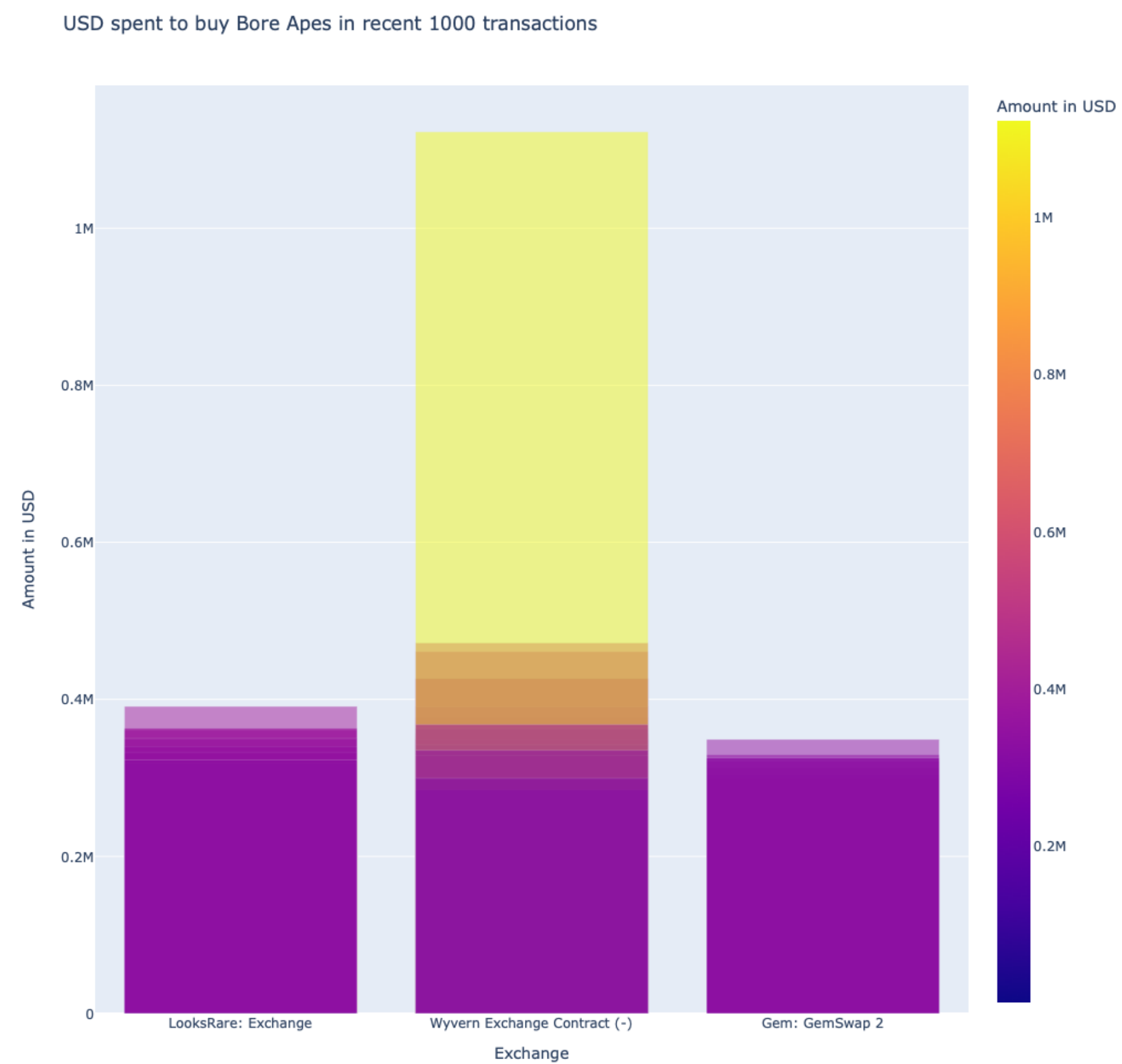
```
[9]: # Filter Through data for non null transactions
BAYC_sales_df = BAYC_tx_df[BAYC_tx_df['value_quote'] != 0]
BAYC_sales = BAYC_sales_df[BAYC_sales_df['to_address_label'].notnull()].dropna()

# 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()

```

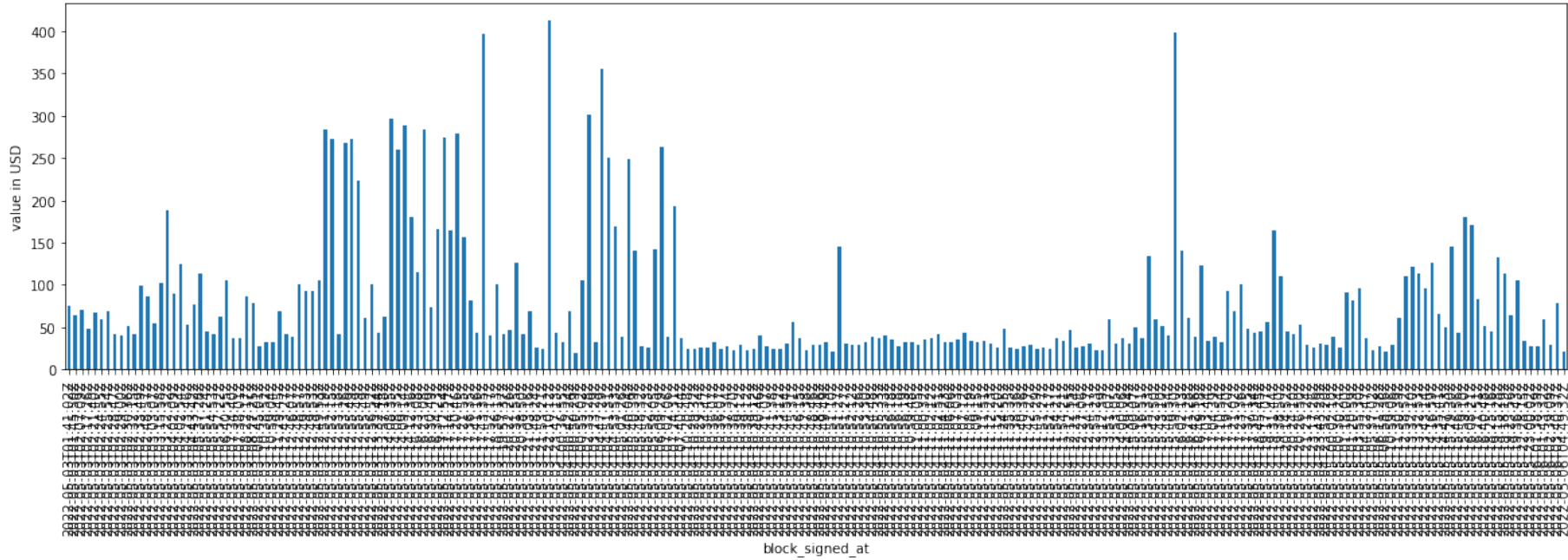


0.5 c. Fees Spend

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

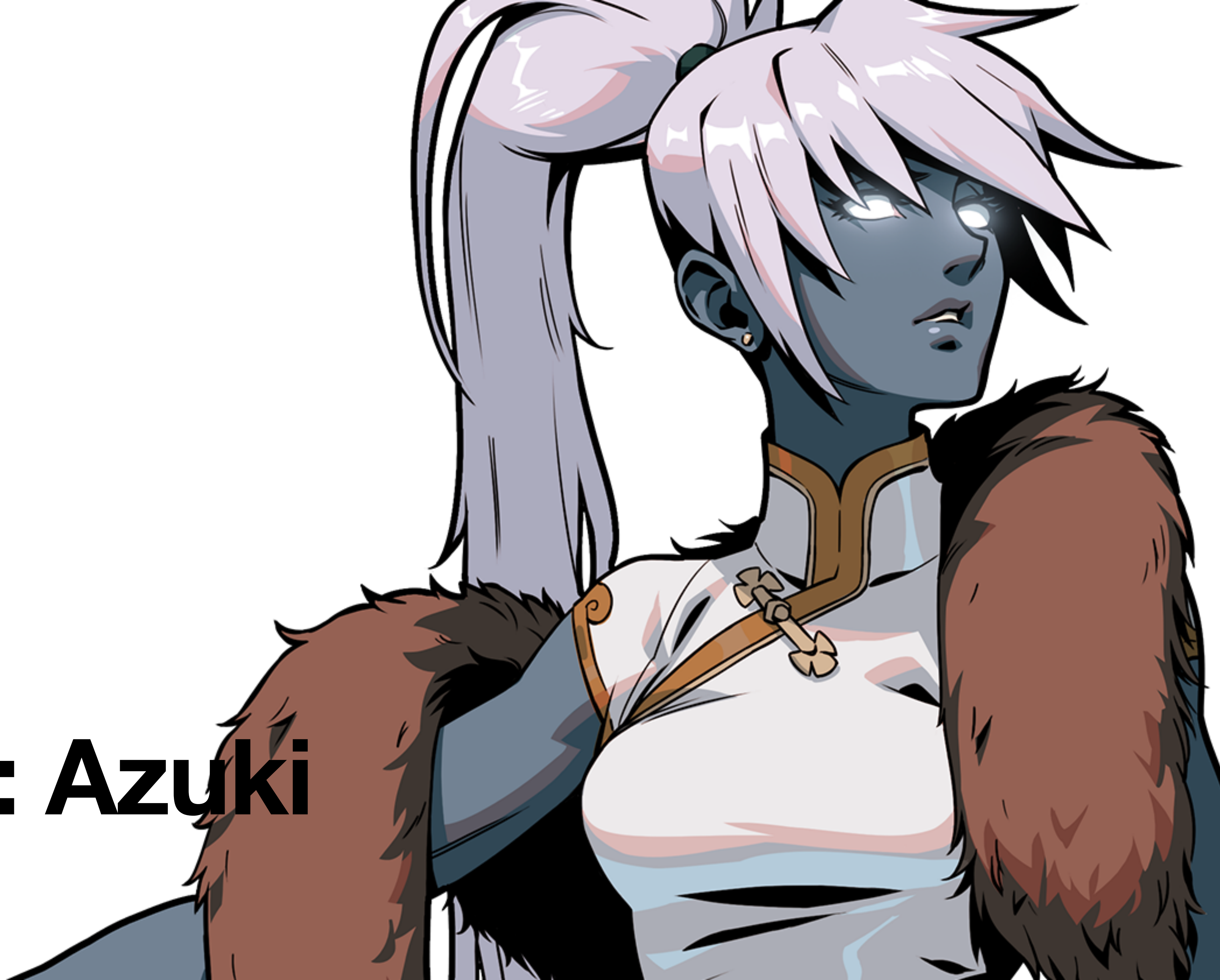
BAYC_fees.plot.bar(rot = 90, figsize = (20,5), ylabel = 'value in USD')
```

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



Part Two: Azuki

@mmsaki



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 + "\napi_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', '\nunique_token_ids_sold_count_day']).sort_index()
azuki_vol_df.head()
```

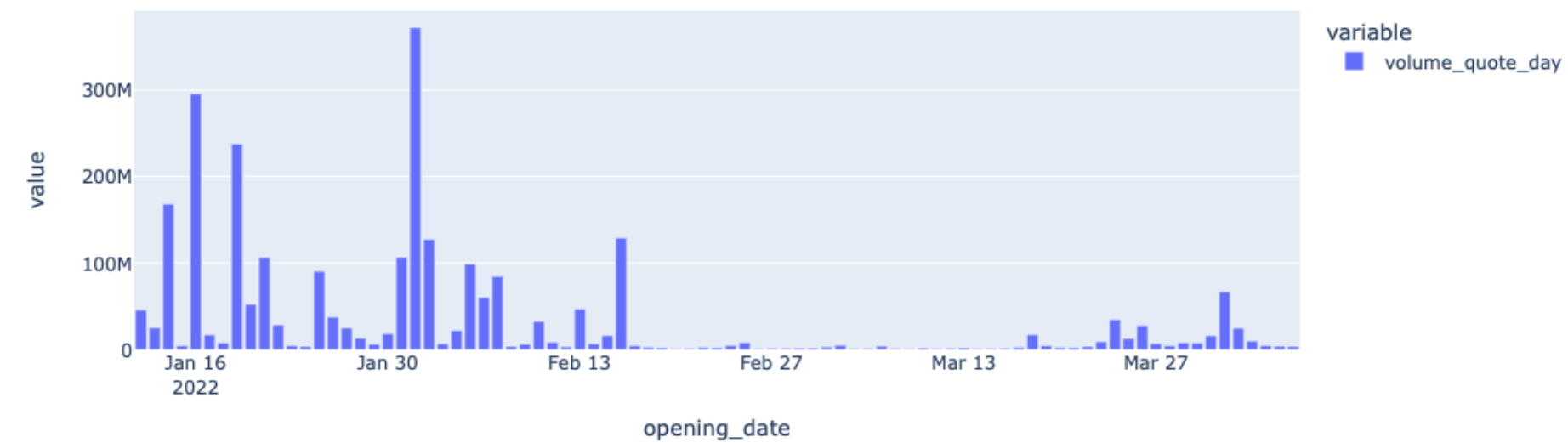


```
[11]:
```

opening_date	volume_quote_day	unique_token_ids_sold_count_day
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]: # Querying 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]:
```

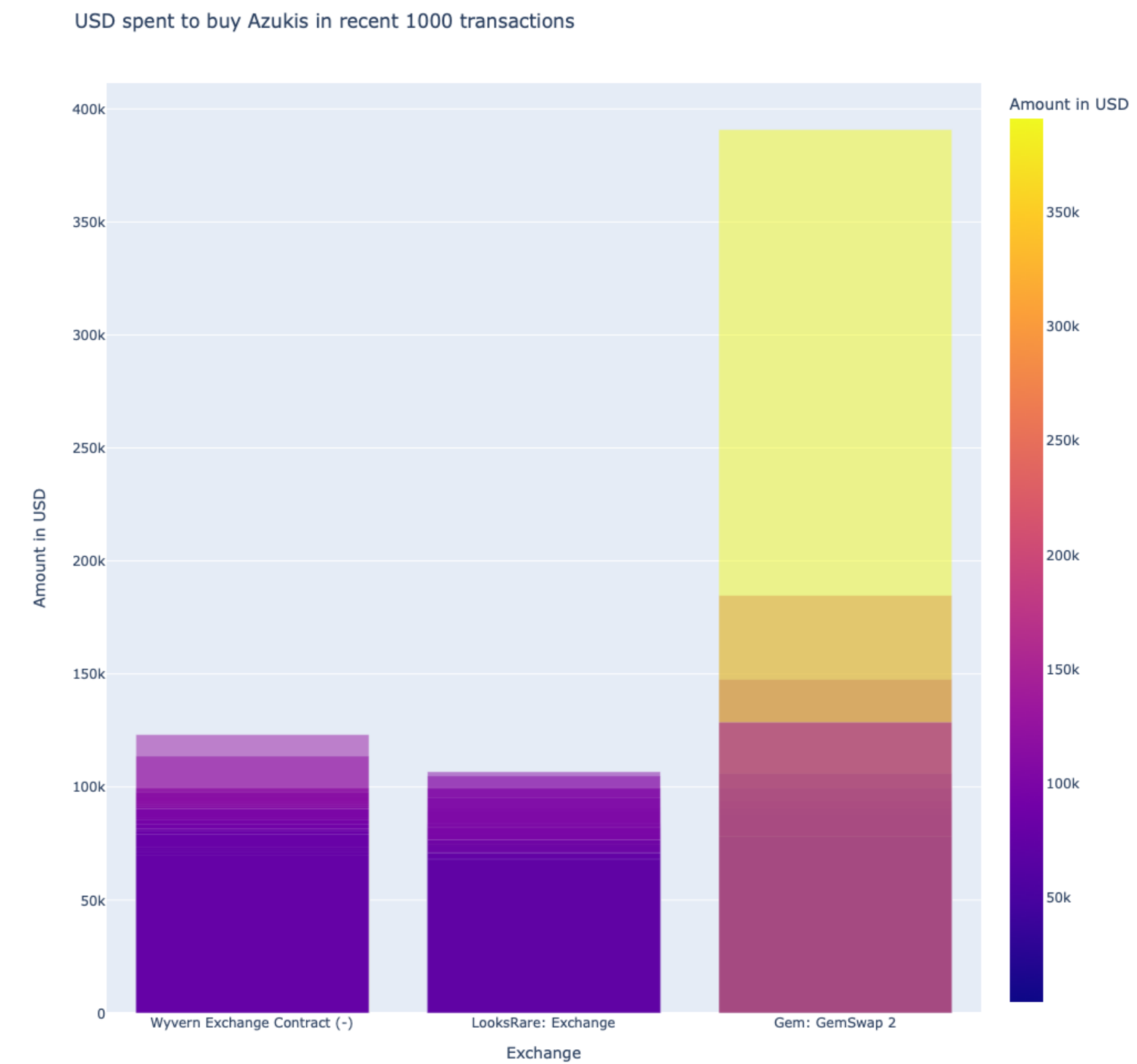
block_signed_at	to_address_label	fees_paid \
2022-05-03T01:14:10Z	None	2723068601452056

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()
```

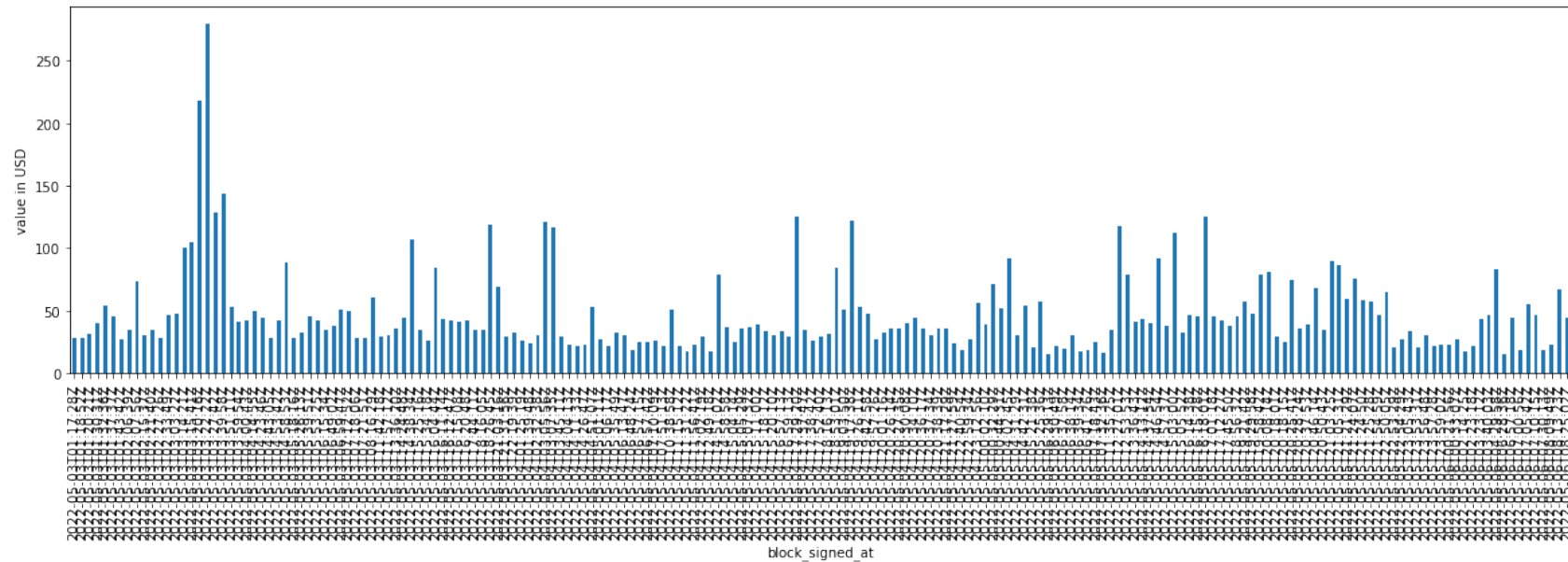


0.9 c. fees paid

```
[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]:

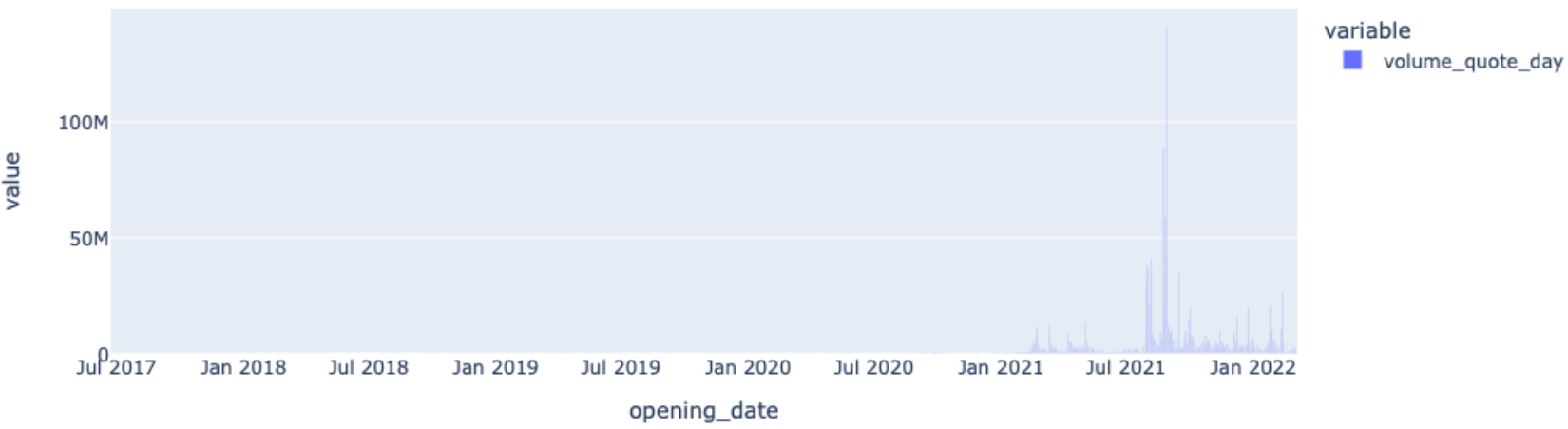
	volume_quote_day	unique_token_ids_sold_count_day
opening_date		
2017-06-23	0.0	19
2017-06-24	0.0	22
2017-06-25	0.0	11
2017-06-26	0.0	18
2017-06-27	0.0	35

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]: # Querying 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()

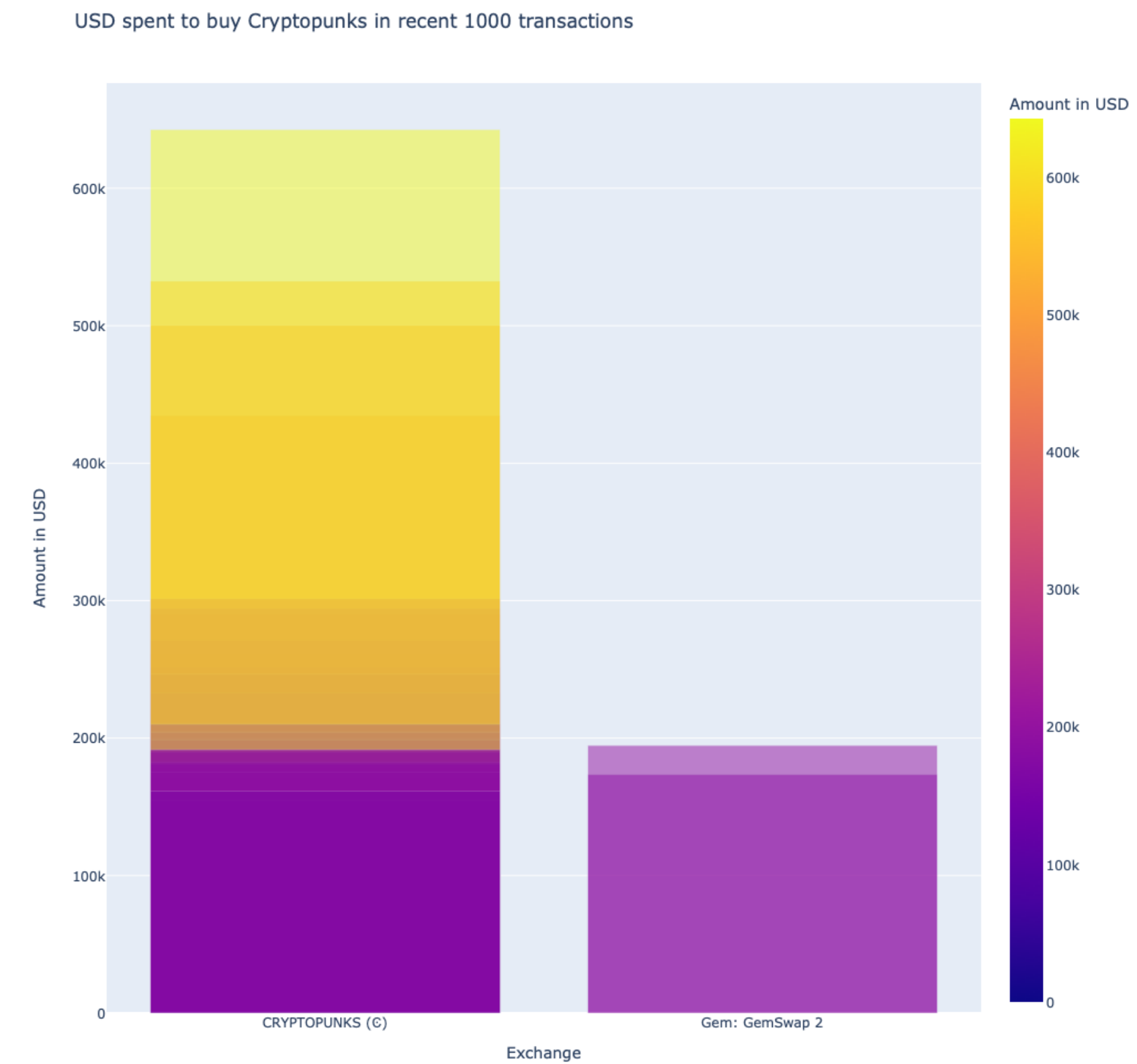
# Convert transactions data to dataframe
cryptopunks_tx_df = pd.DataFrame(cryptopunks_tx['data']['items'], columns =
↳['to_address_label', 'fees_paid', 'value_quote', 'block_signed_at']).
↳set_index('block_signed_at').sort_index()

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
```

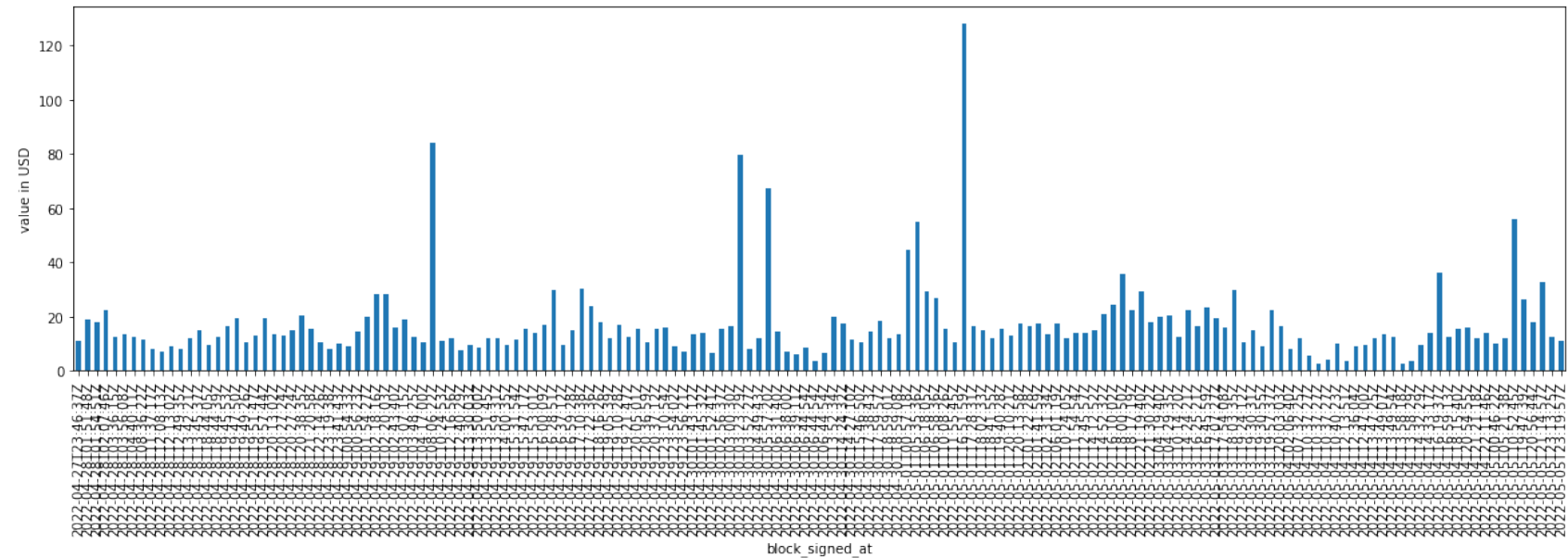



0.13 punk fees c.

```
[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 total sales comparison recent 1000 tx 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]:
to_address_label  azuki_total  cryptopunks_total  BAYC_total
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.

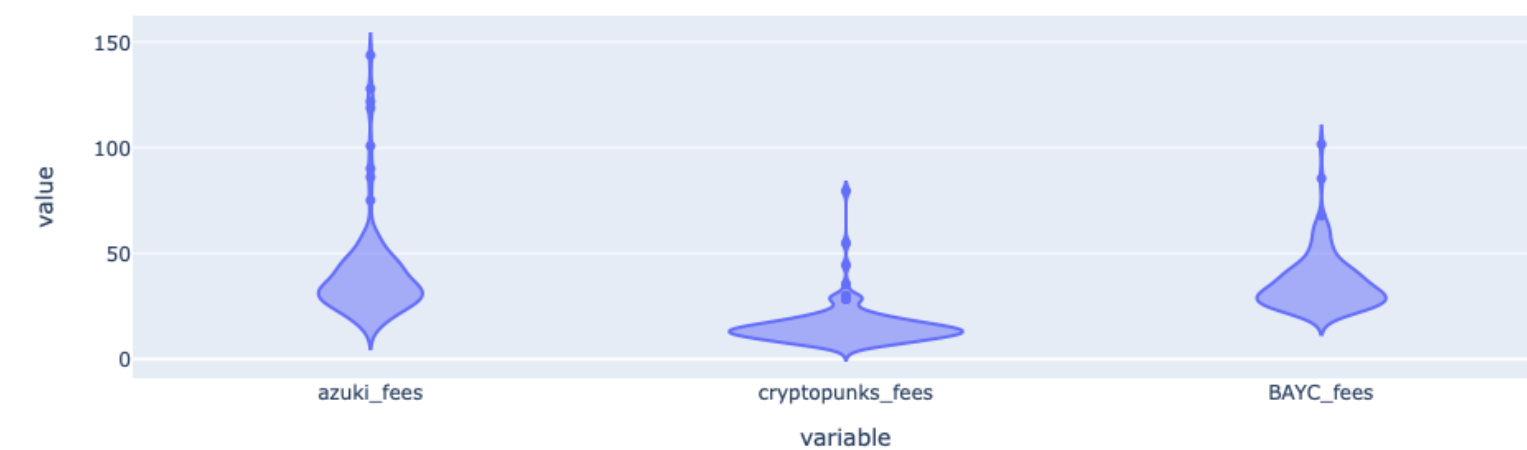
```
[26]: # Combine and rename columns for our total sales data
azuki_usd_fees = azuki_sales['fees_paid'].astype(int)/10**18*eth_value
cryptopunks_usd_fees = cryptopunks_sales['fees_paid'].astype(int)/
↪ 10**18*eth_value
BAYC_usd_fees = BAYC_sales['fees_paid'].astype(int)/10**18*eth_value

# 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()
```





Part Three: Cryptopunks

@dockingbay

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 =
    ↳"0x15f8e5ea1079d9a0bb04a4c58ae5fe7654b5b2b4463375ff7fffb490aa0032f3a"
    ↳#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	20150000000000000000	
1	WPUNKS	2022-02-03	250000000000000000	
	volume_quote_day	average_volume_wei_day	average_volume_quote_day	\
0	687428.9000	20150000000000000000	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 \			

```
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 = "/" #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	0x810fdb7e5cfe	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	0xddde8df9a7dc9f	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.

5. Discussion

Combining our data and discussing our findings

Summary Discussion

CryptoPunks, Azuki & BAYC

- Would not recommend investment at this time unless you were a seasoned NFT collector, looking at long term royalty market in metaverse or were passionate about a particular punk.
- I would recommend trying to get in on ground for new NFT releases and have a plan why you are getting into market.
- Possibly reasons to invest:
 - Passion for NFTs
 - Flip for profit
 - Creator
 - Community love
- CryptoPunks activity and pricing stayed pretty level from inception 2017 through mid-2020 then the market exploded in parallel with adoption of Crypto currencies.

6. Postmortem

Did we find everything we expected to find?

- **Difficulties**

- Setting proper scope on NFTs there is a lot of data that is available
- Concating data from multiple data sources
- Data cleaning
- Choosing which data to compare and study
- Selecting plots to display data
- Using unfamiliar libraries
- Working in git as a group
- Coordinating schedules with people remote

- **How did we deal with the difficulties**

- Googling
- Stackoverflow
- Reading official documentation
- Consulting instructor
- Asking tutors

- **What would we research next if we had more time?**

- Global NFT market sales comparison
- Burned tokens vs Active tokens
- Correlate NFTs that were around pre 2020 to major crypto pricing trends
- How can we separate authentic sales from suspicious NFT transactions?
- Why would I buy an NFT vs just create my own?

7. Questions

Open floor Q&A with the audience



thank you,