

# BTP REPORT

## Metasurance:

## Blockchain-based Insurance Administration System with ML-driven Dynamic Pricing for New Metaverse Products

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### Non-Fungible Tokens Defined

A Non-Fungible Token (NFT, sometimes pronounced "niftie") is a digital token that is associated with a specific physical or digital asset that has a unique form and value

NFTs come in all shapes and sizes, but they have two key linked properties:

- They represent unique actual assets – whether physical or digital. Effectively, an NFT is an advanced digital version of a “certificate of ownership,” cryptographically encoded in a blockchain.
- As a result, the record of ownership is tamper-proof and the ownership history is always verifiable.

### The Value Proposition of NFTs

Today, NFTs are enabling creators to revolutionize the art market, and they also enable additional use cases, including support for many types of unique physical and digital goods, such as concert tickets, identity documents, and more.

Potential applications of NFTs are nearly limitless: trustless transfers, trading, fractional ownership, security tokens, and more.

### Risks associated with NFTs

- NFT loss
  - Loss of private key
- NFT Destroyed
  - For off-chain metadata or token, developers can change the metadata at any time, meaning there's a chance that your NFT will look different than when you bought it. If the original hosting solution shuts down or is compromised, your digital assets are likely at risk of disappearing.
- NFT Theft
  - Developer risks and possible human errors that may result in malicious or even vulnerable smart contracts that are targets for hackers.
  - Hacked Marketplaces, Exchanges, Wallets
  - Theft of private keys through cyberattacks, phishing, malware, and device theft
  - Copymints and copyright issue

In this project, we aim to design an insurance framework for metaverse objects like art, collectibles, virtual land and avatars using blockchain.

## Insurance pricing model

Given a asset A, it can be damaged N times with Si claim amount in a period of e years, then  
Total Loss (L) = Total Claims (N) x Average Claim Severity (S) / Risk Exposure (e)

The technical price  $\pi$  (or: pure/risk premium) then follows as:

$$\pi = \mathbb{E} \left( \frac{L}{e} \right) \stackrel{\text{indep.}}{=} \mathbb{E} \left( \frac{N}{e} \right) \times \mathbb{E} \left( \frac{L}{N} \mid N > 0 \right) = \mathbb{E}(F) \times \mathbb{E}(S)$$

assuming independence between the frequency and the severity component of the premium.

For an NFT insurance, N (No. of claims) = 0/1 only in the given year

And S (Claim severity) = min(x% of NFT price as declared in policy, Maximum insured amount)

Thus, L (Total loss amount) = 0/S

$\therefore \pi$  (pure/risk premium) = E(claim is made in a given year)  $\times$  Insured NFT price

E(claim is made in a given year) = P(claim is made in a given year) since maxClaim=1

We thus have to train a ML model that calculates

- NFT Valuation at the time of insurance proposal
- Risk Prediction i.e. probability of a NFT loss, theft or burn in a given period of time

## Nft Valuation

### Previous Work

[Mapping the NFT revolution: market trends, trade networks, and visual features](#)

The results of this paper include the statistical properties of the market, a network of interactions between traders (linked by buyer and seller), and a clustering of objects by visual features and collections. The paper also proposes a linear regression model with features based on these results to predict NFT prices.

In paper [The NFT Hype: What Draws Attention to Non-Fungible Tokens?](#), authors use fiat market data like S&P 500, google search trends, and the prices of cryptocurrencies as indicators for future price of an NFT. This team highlights that google search trend data is associated with major cryptocurrency returns and NFT collection.

[TweetBoost: Influence of Social Media on NFT Valuation](#) tries to calibrate the influence of social media on NFT prices.

We take inspiration from all the above models and design a linear regression model to predict NFT price.

## Data

To gather public market data, we used the commonly referenced Yahoo Finance API. The Yahoo Finance API is a widely used tool for financial data that has led to it becoming extremely frictionless for developers.

With the majority of an NFT's value being tied to Hype surrounding a particular project, it is important for us to determine a way to quantify this metric. One such method is in using Google Trends data to track the relative search volume of a collections name over time. The PyTrends API allows us to extract this information for concatenation with our dataset.

With the NFT, public market data, and Google Trends data, we were able to build the following data dictionary that would prepare the data to be fed into a model.

## Features

opening\_date : Date of which information is being pulled.

average\_volume\_quote\_day : Average price of the NFT as of opening\_date.

unique\_token\_ids\_sold\_count : The number of NFTs from a given collection sold in one day.

Relative Search Volume : Relative google search volume for collection name on a scale from 0-100

Events -1,0,1 : Indicating bad news, no news, and good news respectively

Gas : A measure of network traffic, which indicates the transaction fee of purchase

ETH\_USD, BTC\_USD : Closing price of ETH & BTC token.

GC=F, ^GSPC, ^DJI, ^NDX : Closing price of gold, S&P, Dow Jones, Nasdaq 100 value.

MSFT,AAPL,NFLX,TSLA : Closing Microsoft, Apple, Netflix, Tesla stock price.

## Results

Accuracy is 65.44% and 70.02% for linear regression models on individual NFT collections - Bored Ape Yacht Club (BAYC) and Cryptopunks respectively .

## Currently Working

We are currently working on a RNN regression model for 10 NFT collections.

For NFT Risk Prediction, we are currently assembling a dataset that can calculate optimal risk probability.

## Future Plans

We plan to experiment with multiple ML models to gauge the best architecture for NFT Valuation and Risk Prediction.

Thereafter, work will be done to complete the insurance framework including

- Application procedure
- Claim process
- Claim review process

By using ML models

- to prevent NFT plagiarism
  - to detect NFT wash trading
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