

# Investigating shocking events through temporal multilayer graph structure

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# Background

## CRYPTOCURRENCIES ARE TOO UNSTABLE FOR EVERYDAY USE

### Bitcoin price (last month)



### Why did Bitcoin drop? Analysts point to 5 potential reasons

Bitcoin's price fell approximately 8% in a span of 10 minutes, leaving crypto investors scrambling to make sense of the drop.

### Why is Bitcoin price up today?

Bitcoin price is up today as a handful of macroeconomic and crypto-specific factors play out to BTC's advantage.

[CoinmarketCap](https://cointelegraph.com/news/why-is-bitcoin-price-up-today)

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<https://cointelegraph.com/news/why-did-bitcoin-price-suddenly-drop-analysts-explain>

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## STABLE CRYPTOCURRENCIES?

- Stablecoins
  - Peg to US Dollars or other currencies
  - Collateral (in banks, other cryptos)

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- Algorithmic stabilization, no third party
- Luna Foundation Guard: Bitcoin reserve to protect the peg
- Value: \$18-billion dollars at its peak



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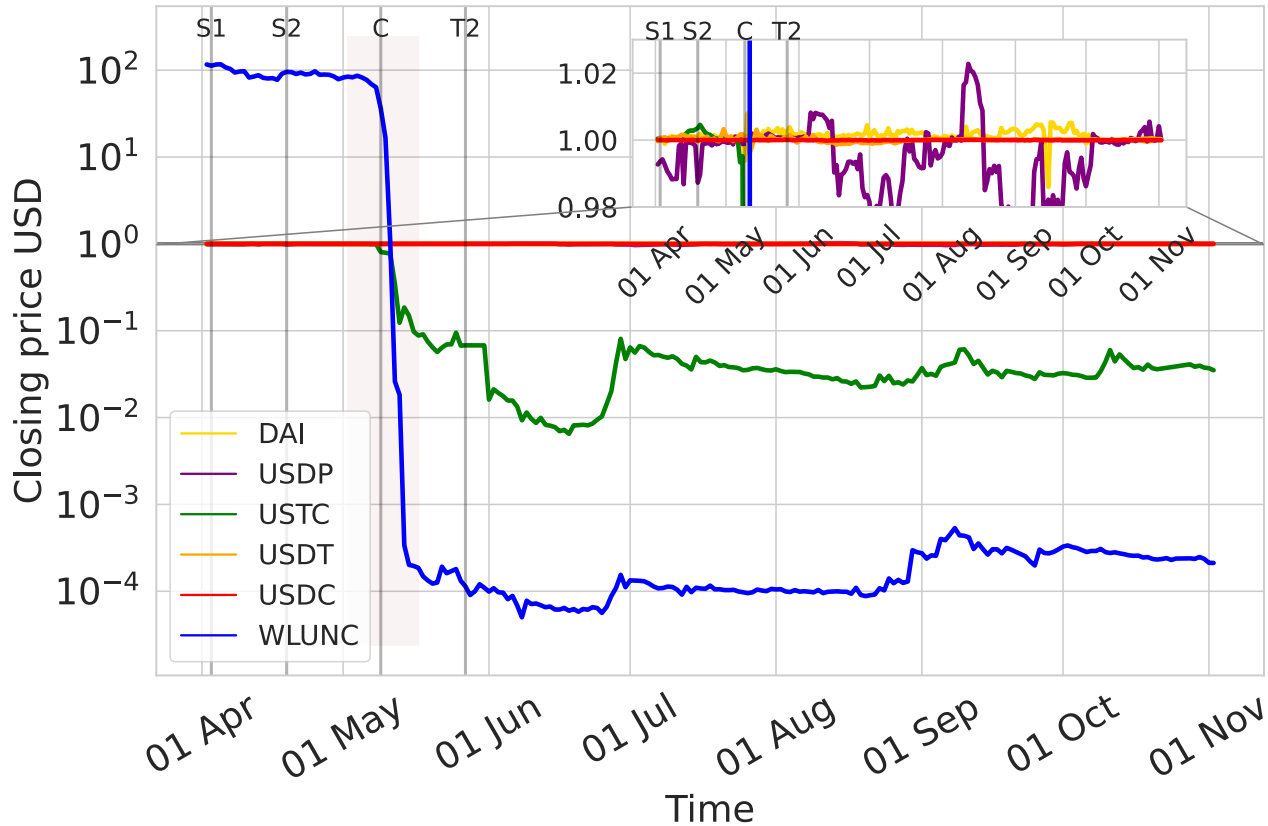
- Do Kwon, CEO: “95% of cryptocurrency companies are going to die ... but there's also entertainment in watching them die too.”



<https://www.terra.money/brand-assets>  
<https://www.youtube.com/watch?v=ROaGKETvMg0>

# Background

## STABLECOINS ... NOT SO STABLE



- Prices of Ethereum stablecoins
- Terra (green, USTC) and Luna (blue, WLUNC)
- Attack on May 9<sup>th</sup>: In a few days, they lost all their value.
- Why: Run on Bitcoin, target was that Bitcoin reserve, Terra and Luna are casualties

# Research questions

- Deliberate timed attack with devastating consequences
  - Several heavily interlinked currencies



- What is the impact of the shock on the currencies?
  - What changes can be observed?

# Temporal multilayer graphs

## MODEL

- **Chartalist** dataset by Shamsi et. Al.
  - ▶ Six currencies on ethereum
  - ▶ Transaction attributes: source, target, time, amount, currency

(A,C,t,'C1')  
(C,D,t,'C1')  
(C,A,t,'C2')  
(E,C,t,'C2')  
(D,F,t,'C2')  
(D,G,t,'C2')



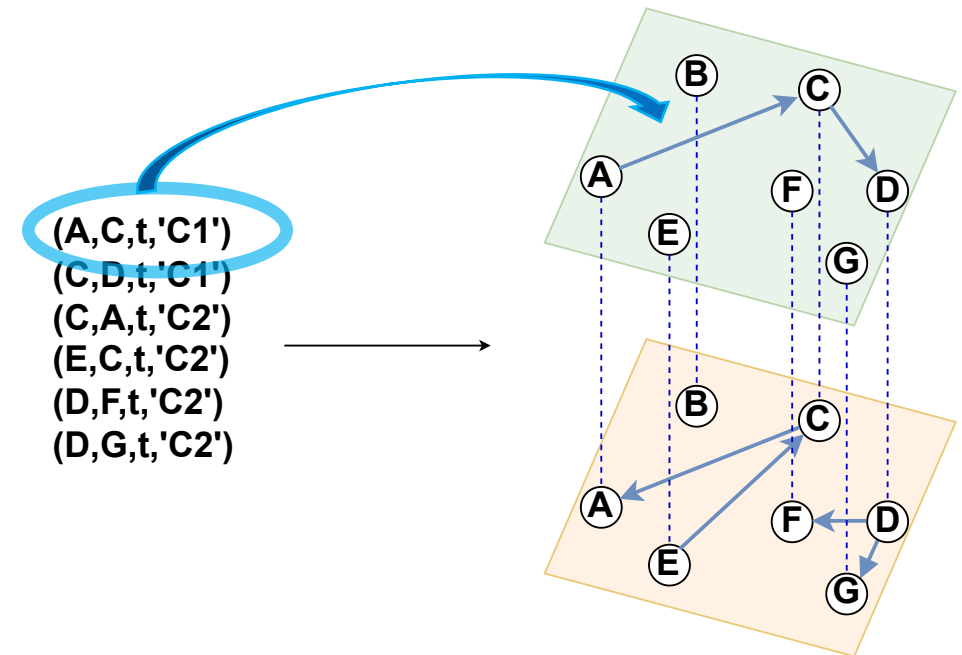
Pandas



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- **Temporal multilayer graph**
  - ▶ Nodes are wallets
  - ▶ Edges are transfer relationships
  - ▶ Edge weights from amounts
  - ▶ Currencies separated with layers
  - ▶ Focus on pre and post crash period, for a total of 26,209,860 transactions



Pandas

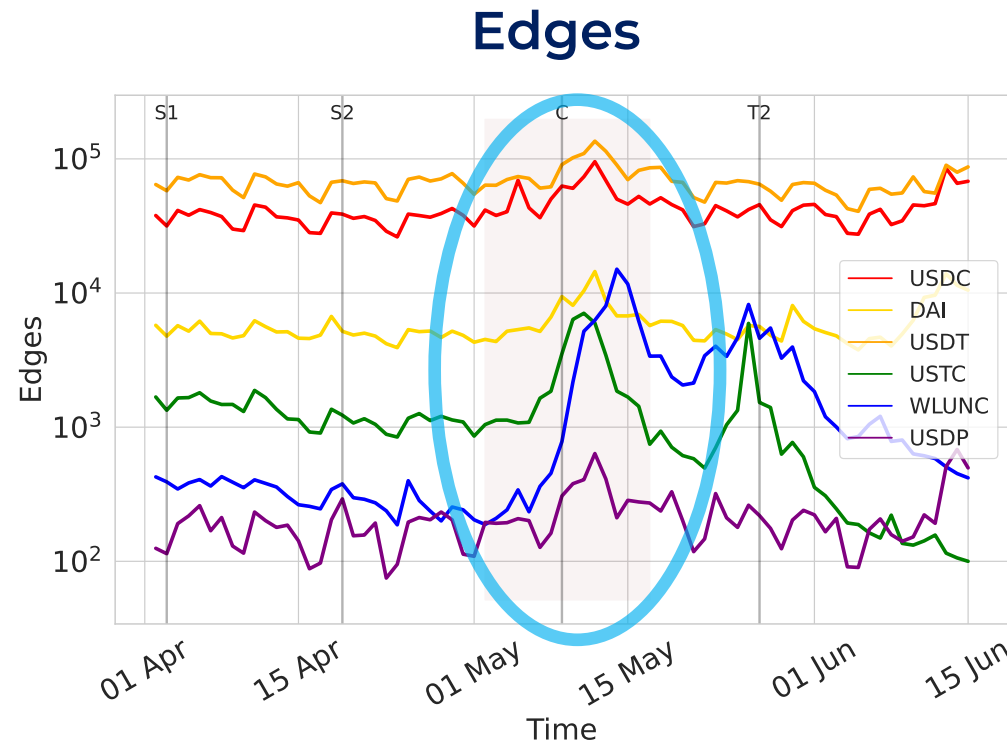


Raphtory

# Results

## WHAT ARE THE EFFECTS OF THE CRASH ON THE SYSTEM?

- Each currency (layer) treated as an individual graph.



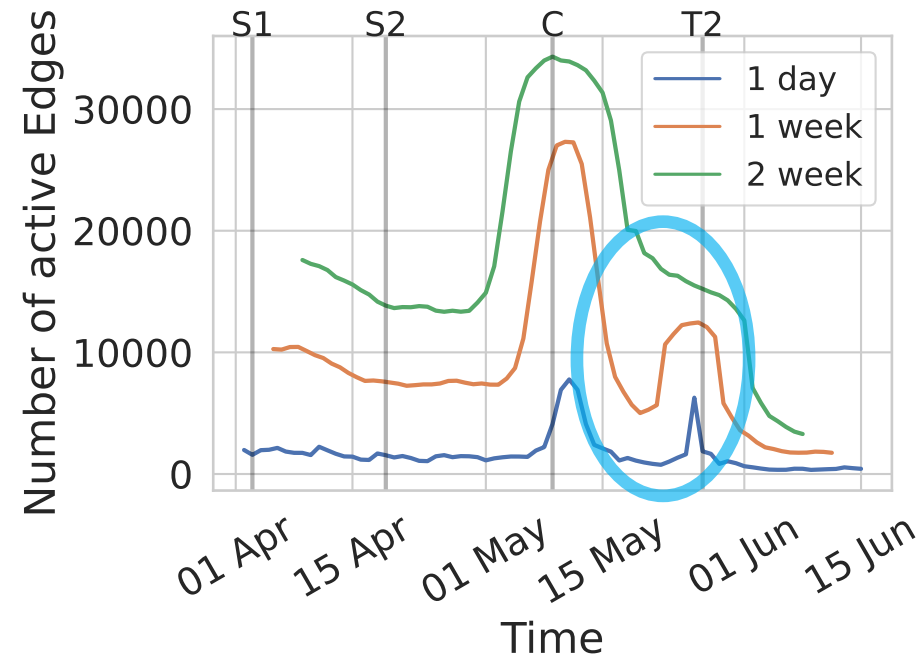
Response to the crash: trade with anyone

# Results

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- New edges, never seen before (layer by layer).

### New edges on USTC

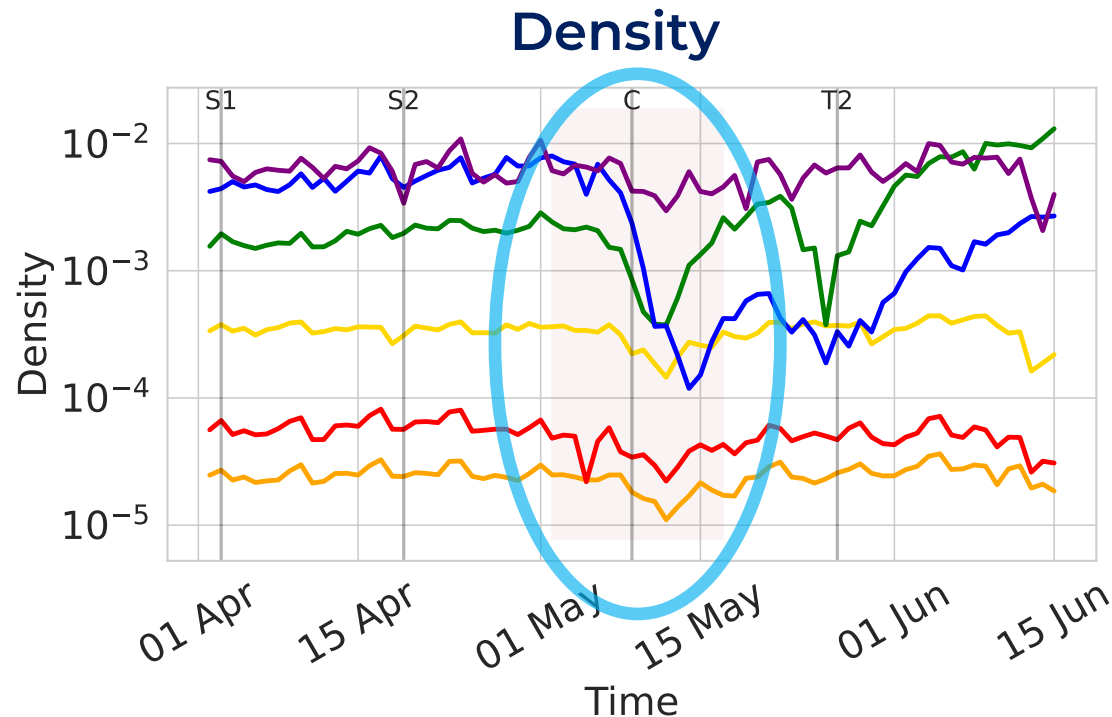


A second resurgence: Terra 2.0 launch (visible at the right time scales)

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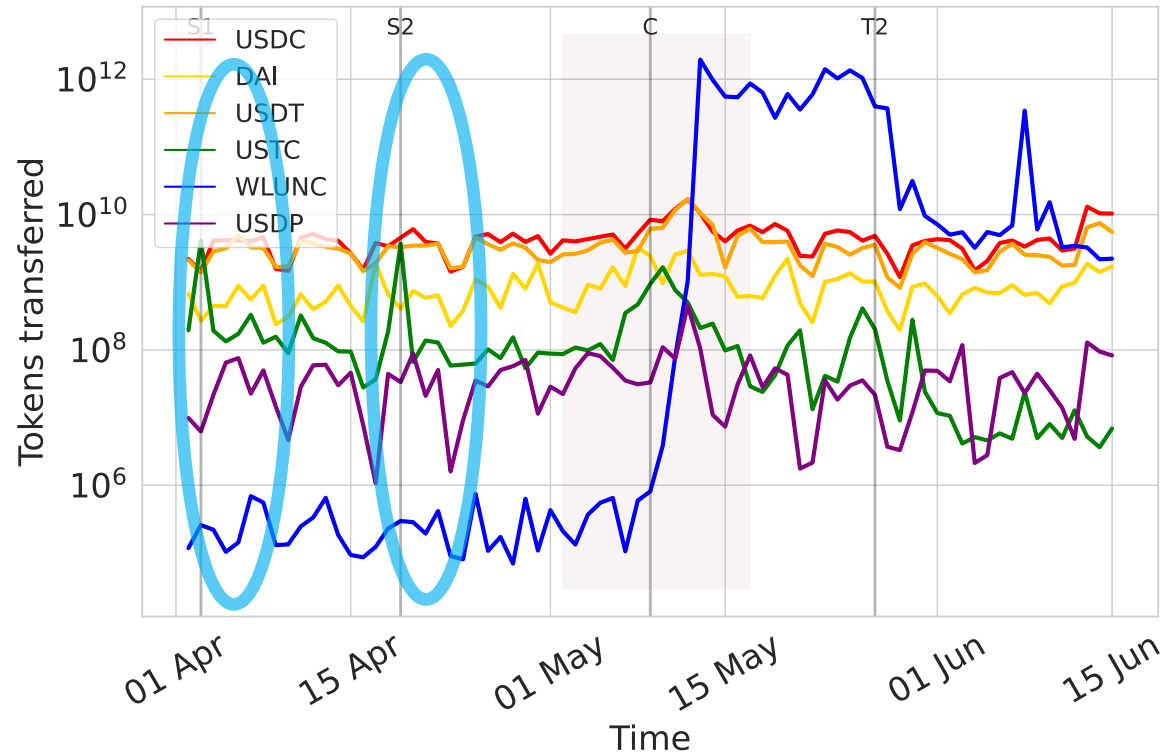


Temporary but significant changes in network structure.

# Results

CAN WE ANTICIPATE THE CRASH BY MONITORING THE CRYPTOCURRENCIES?

Tokens transferred ( sum of edge weights )

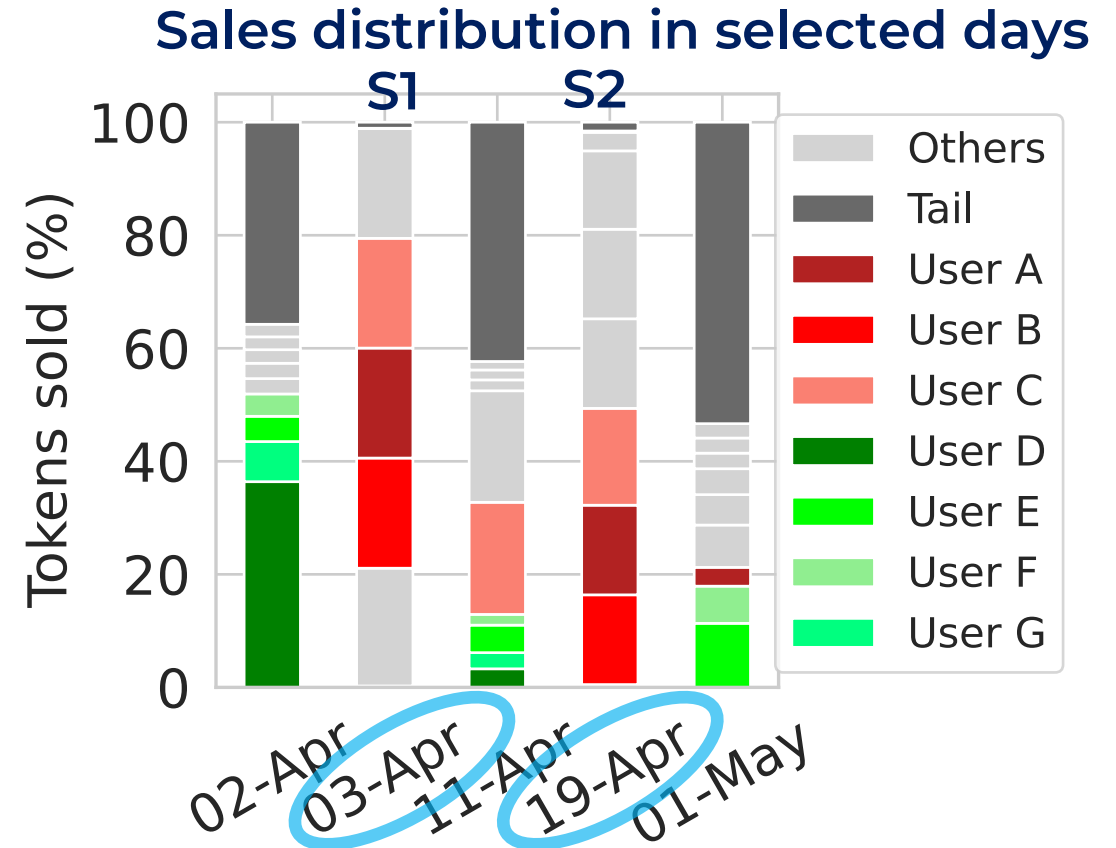


Edge weights on the layers reveal anomalies

# Results

## CAN WE LOCATE INDIVIDUALS ASSOCIATED WITH THE CRASH?

- Method: measure token sold each day, with a focus on anomalous days
- Bars 1,3,5 are normal days
- Bars 2 and 4 are anomalous days



On the anomalous days, a few users dominate the token transfers

# Conclusions

Problem: Studying shocking events.  
Solution: temporal multilayer networks

Importance of network structure, layers and time

Future works

- Cross chain prediction tasks (RAPHTORY ML SOON)
- Application to other datasets with important events

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`pip install raphatory`  
Slack: [tinyurl.com/5n8vrt6e](https://tinyurl.com/5n8vrt6e)  
[www.pometry.com/open-house](http://www.pometry.com/open-house)