

Risky Business? Deep Dives into DeFi

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Decentralized Finance (DeFi) is an emerging new financial ecosystem built on the back of blockchain technology. With over \$2 trillion locked in cryptocurrencies and the rapid adoption of new DeFi products by retail users and institutions, it's natural to wonder how this new financial ecosystem will disrupt the traditional financial sector. We seek to investigate current patterns of usage in DeFi lending protocols, and quantify risk and user behaviors across various protocols. Our strategy is to exploit powerful AI models and technology developed for transaction data such as those arising in health and commerce. For example, we can utilize temporal clustering to characterize different types of users and then use these in a dashboard to understand how usage of lending protocols changes over time.

We are developing these methods to analyze any lending protocol in the DeFi sphere. As we develop these methods, we are testing them on data that we've collected from the AAVEv2 protocol¹, which is one of the largest lending protocols in DeFi. This data has been collected using an API provided by thegraph.com, which compiles data directly from AAVE. We provide some examples of our analyses below. We welcome suggestions and collaborations to further extend these analyses to address compelling DeFi questions.

First, we sought to understand how lending protocols are already being used. Figure 1 shows groups of AAVE users with different usage and risk profiles discovered by clustering. Figure 2 illustrates a model of AAVE transactions, we created using Neural Temporal Point Processes (NTPP) applied to AAVE transaction data. NTPP can learn the structure and usage of a protocol from the transaction data, and the resulting models can be applied to do tasks such as prediction, clustering, and anomaly detection.

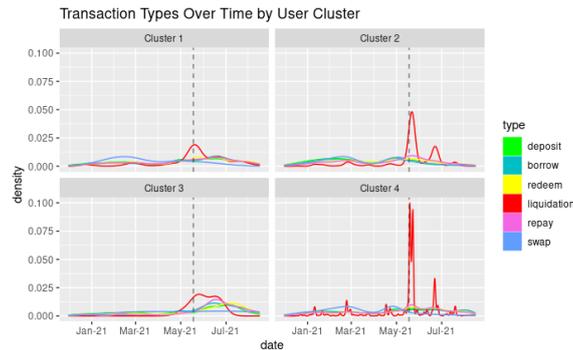


Figure 1: Groups of AAVE users found by clustering. Cluster 1 is a group that tends to take out stable loans. Cluster 4 shows a higher-risk group that gets liquidated more often.

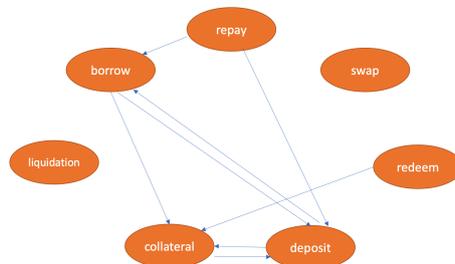


Figure 2: Structure of lending protocol found by marked TPP model applied to AAVE transactions data.

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¹<https://aave.com/>

Liquidations, the DeFi equivalent of defaults on loans, can help us learn about risky behavior in lending protocols. We are using statistical methods and advanced AI to learn about risk in DeFi, starting from liquidations in lending protocols. Can we identify which conditions in the market create risk as a whole? Can we effectively use AI to learn what behavioral patterns are good predictors that a user will eventually liquidate? Which users are having the biggest influence on liquidation? In Figure 3, we use survival analysis to examine how the choice of coins impacts how long loans last before being liquidated. Time to liquidation varies markedly for different combination of unstable and stable coins used for collateral and principal. Figure 3 illustrates the network of AAVE users who are liquidated and users (or smart contracts) who are the liquidators. Network analysis can further illuminate users behaviors and risks.

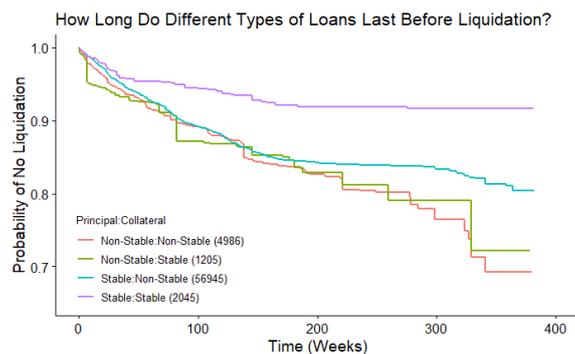


Figure 3: Loan liquidations by principal:collateral combination

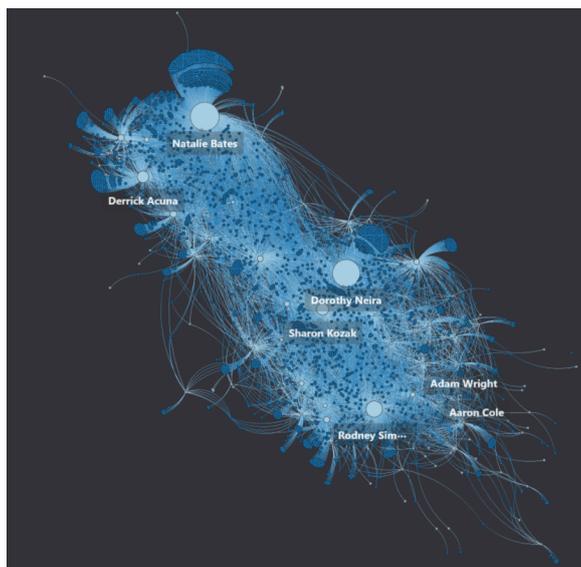


Figure 4: Network of AAVE liquidators and users who are liquidated.