Fraud Strategy & Analytics

https://github.com/arianayoum/fraud-analytics

Ariana Youm©

July 2025

Problem framing

How can we leverage transactional data and customer behavior to identify potentially fraudulent transactions to **minimize financial loss** while **preserving a smooth customer experience**?

- Are there high-risk patterns?
- Can we estimate potential fraud loss for these suspicious patterns?
- How can we balance false positives (blocking actual users) with fraud prevention?

***Note**: The questions highlighted throughout this deck represent a sample of the many possible analyses for fraud detection with this dataset. They are meant to illustrate the type of insights that can be uncovered but are not exhaustive. Fraud detection is an iterative process that benefits from ongoing exploration and questioning!*

Behavioural pattern mining

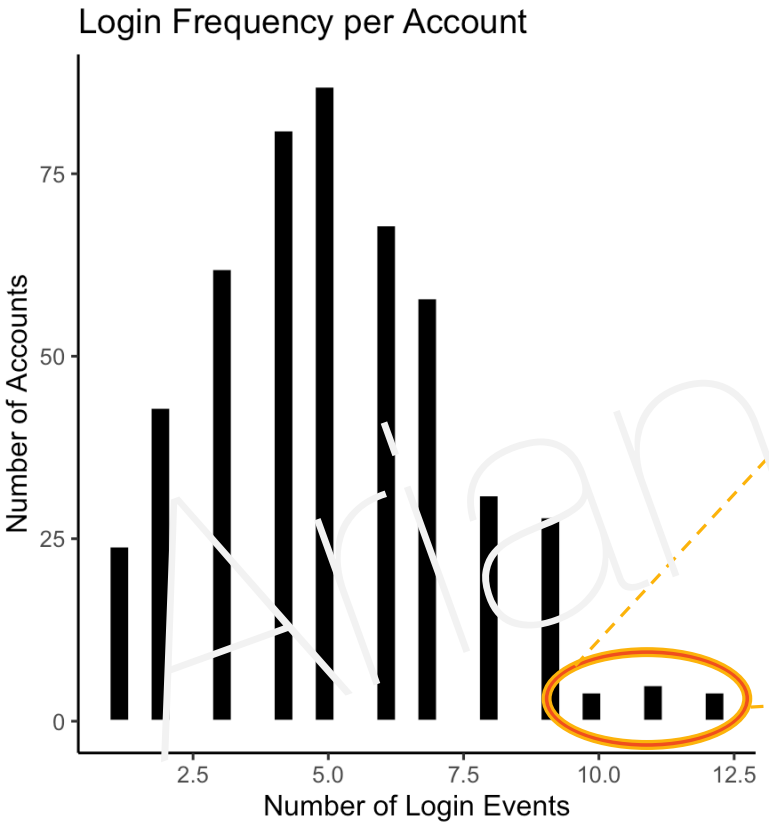
Understanding client behavior profiles

- Typical login frequency
- Typical transaction size per user
- Geographic changes

Flagging suspicious activity

- Unusual login attempts
- Multiple high-value transactions in a short span
- Sudden location changes
- New merchant interaction

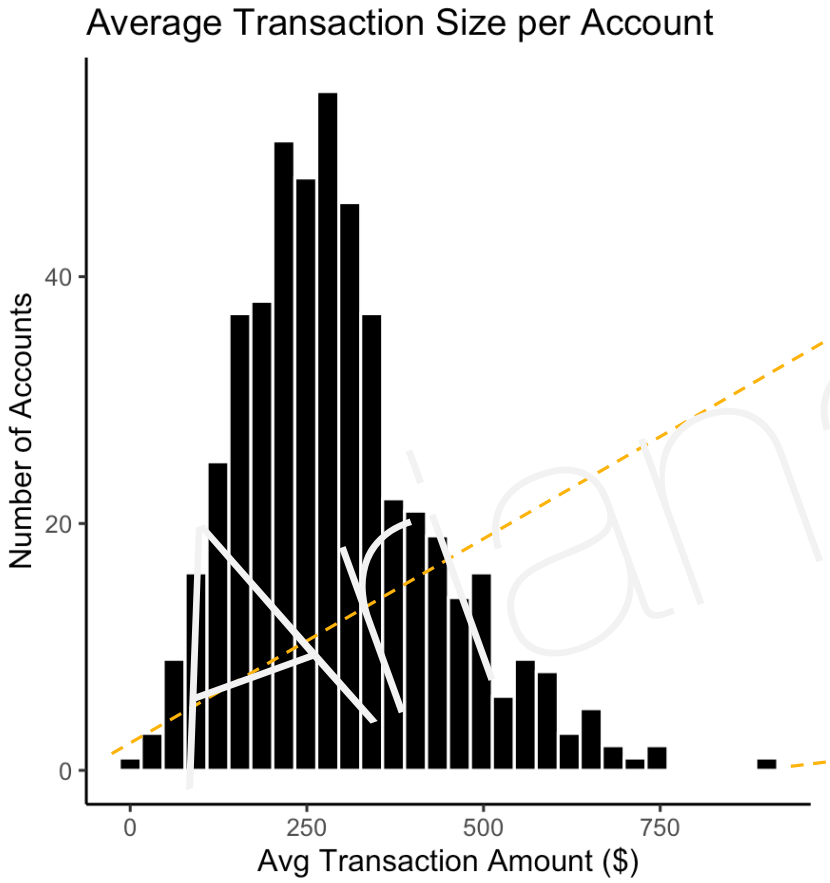
How often do users typically access their accounts?



Follow-up Analyses

- Do these select users have a history of legitimate, high log-in frequencies?
- Do these high-login events happen with a new device ID/IP address/geographic location for the account?
- Are these high-login events associated with unusual transaction times or high transaction amount to balance ratios?

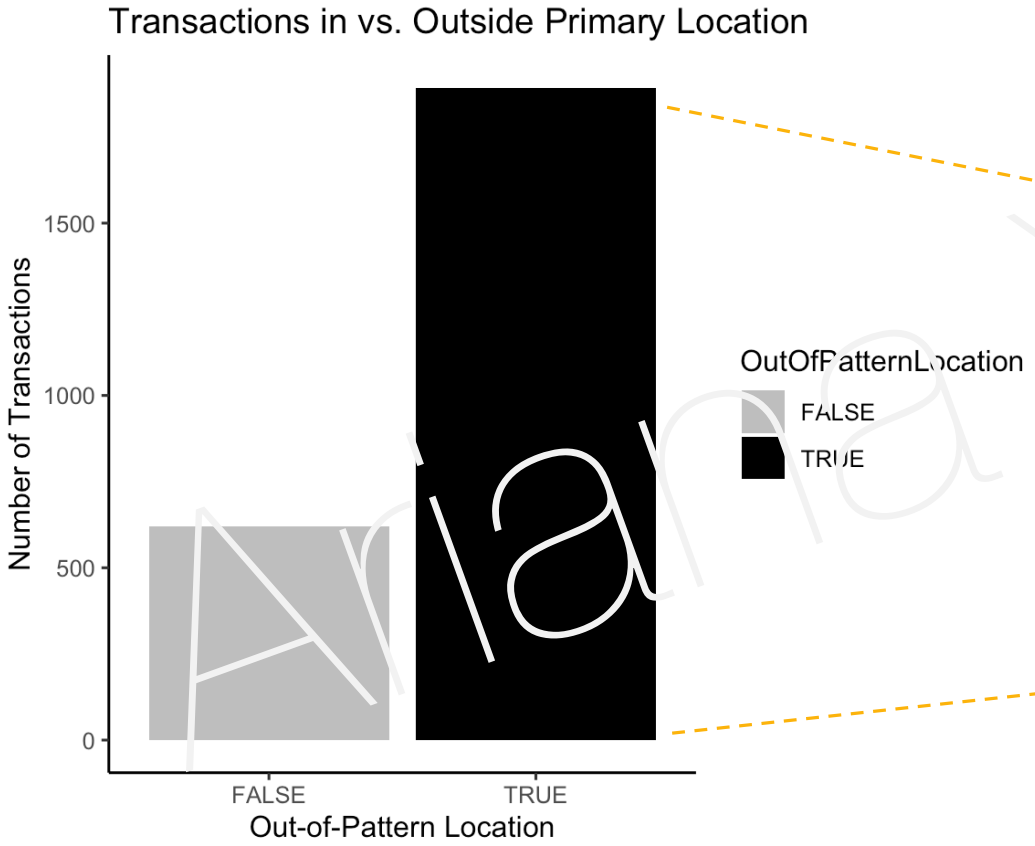
What is a "normal" spend per user or transaction?



Follow-up Analyses

- What is the velocity of consecutive transactions per user?
- Are these transactions occurring from multiple locations and devices?
- Are these transactions outliers relative to the user's normal behavior?
- Do any of these transactions exceed our transaction to balance ratio threshold?

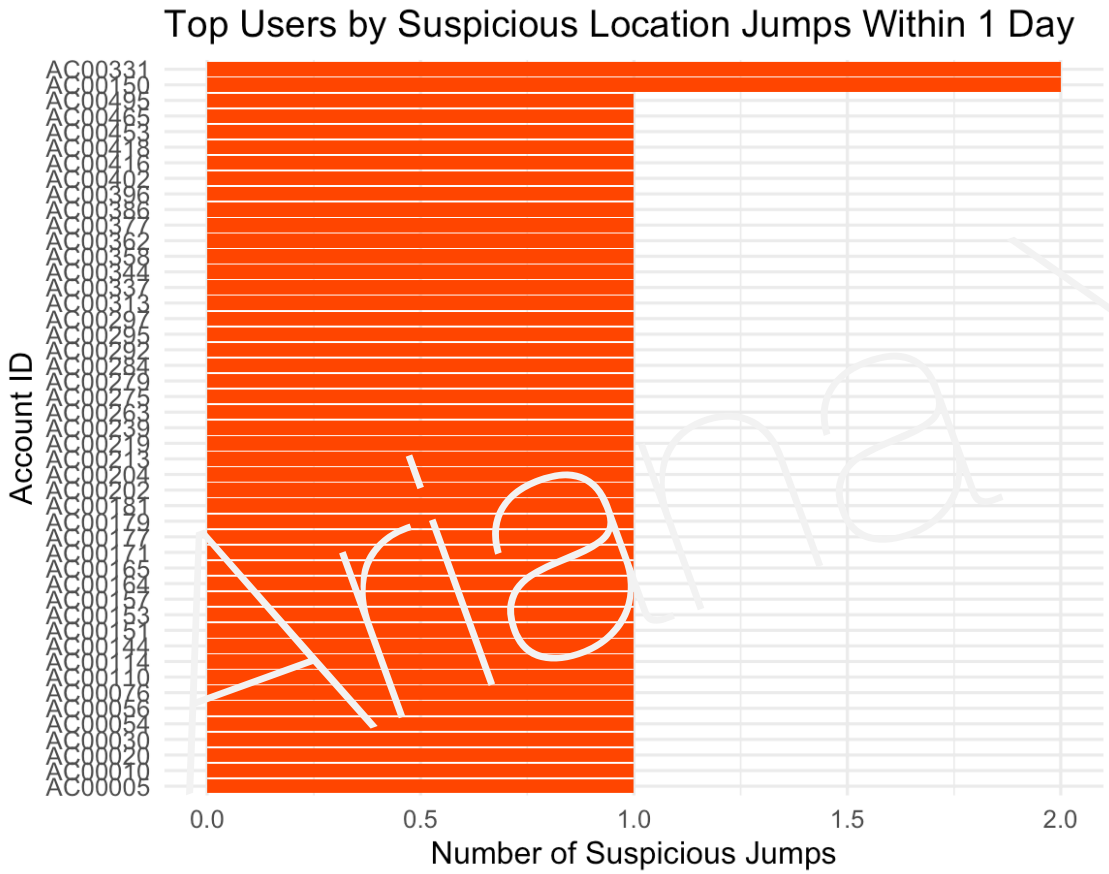
Where do users usually transact from?



Follow-up Analyses

- Do these out of pattern locations (outside of primary locations) occur so closely in time that it is unfeasible or unrealistic?
- Are users transacting from new locations after multiple failed login attempts?
- Is there an increase in transaction:balance ratios for these new locations?

Are there sudden location changes within account transactions?



- Accounts that have sudden transaction jumps across different geographic locations could be flagged for suspicious activity
- A more intricate analysis would involve feasibility of transactions (e.g. could they reach that destination within that time frame) and behavioural patterns (e.g. are they making more transactions within that new area?)

Product Ideas for Geographic Velocity

Geographic Velocity Tracking

Flag transactions or logins that come from geographically impossible travel speeds

- Calculate real-time travel speeds based on consecutive transaction locations and timestamps
- Assign a velocity risk score based on thresholds tied to realistic travel speeds
- Use this score to trigger alerts or step-up authentication

Geographic Velocity Heatmaps

Heatmaps of high-velocity activity clusters to identify fraud hotspots

- Create interactive dashboards showing geographic jumps by user over time

Customizable Thresholds

Customizable risk tolerances per customer segment

- Create different velocity risk tolerances for different customer profiles (e.g. frequent vs. infrequent travelers)
- Create adaptive thresholds based on historical user behavior and risk profiles

For a version without the watermark or if you'd like to chat, please contact me via LinkedIn!