

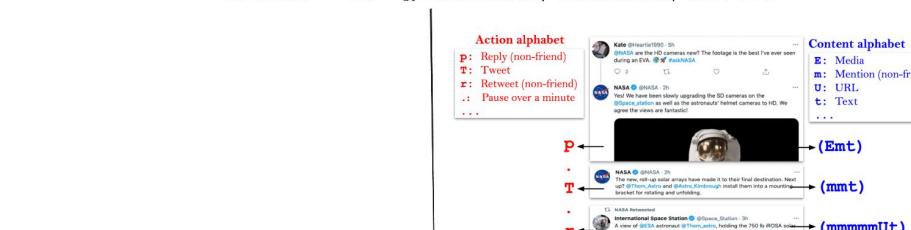


Measuring **change and **diversity** in Twitter accounts
helps identify suspicious activity.**

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3-12-2024

Project- [Applied Machine Learning](#)
Documentation - [Excalidraw](#)

Dataset

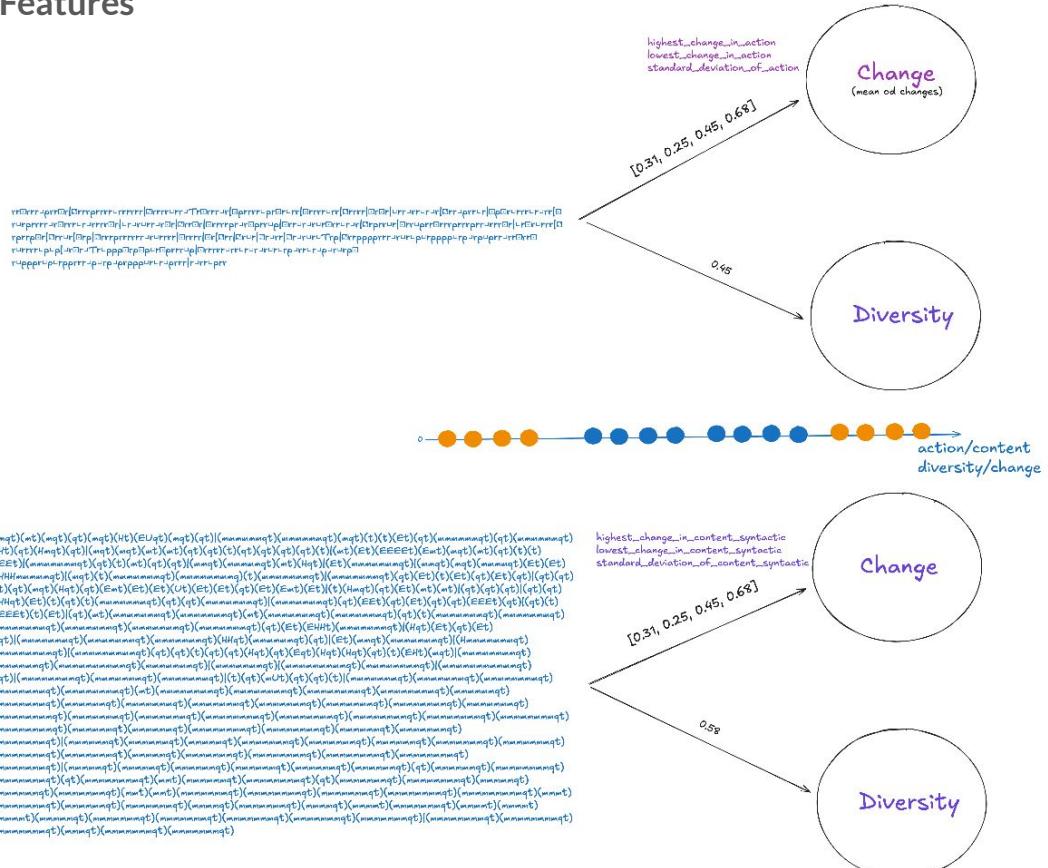


Change & Diversity

- Change
 - **Segment the data:** Divide it into segments based on pauses of more than 1 hour.
 - **Convert to TF vectors:** Transform each segment into Term Frequency (TF) vectors.
 - **Calculate cosine similarity:** Compute the cosine similarity between the vectors of each pair of segments.
 - **Determine change:** Use the formula **Change = 1 - Cosine Similarity** to quantify the difference

- Diversity
 - **Use the entire string:** Analyze the complete string without segmentation.
 - **Convert to TF vectors:** Transform the string into Term Frequency (TF) vectors.
 - **Calculate diversity:** Measure the diversity by computing the **Shannon entropy** of the TF vectors.

Features



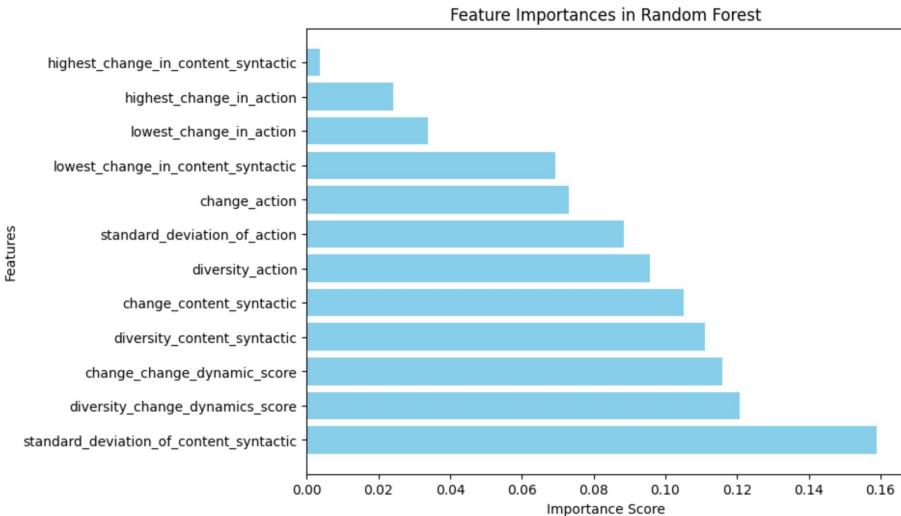
$$\text{Change Dynamic Score for change.} = \frac{\text{action weight } \left(\frac{a_{\text{change}} - a_{\text{mean}}}{a_{\text{standard deviation}}} \right) - \text{content weight } \left(\frac{c_{\text{change}} - c_{\text{mean}}}{c_{\text{standard deviation}}} \right)}{\text{action weight} + \text{content weight}}$$

$$\text{change dynamic score for change/diversity} = \frac{\text{action weight } \left(\frac{a_{\text{change}} - a_{\text{mean}}}{a_{\text{standard deviation}}} \right) - \text{content weight } \left(\frac{c_{\text{diversity}} - c_{\text{mean}}}{c_{\text{standard deviation}}} \right)}{\text{action weight} + \text{content weight}}$$

$$\text{Change Dynamic Score for diversity.} = \frac{\text{action weight } \left(\frac{a_{\text{diversity}} - a_{\text{mean}}}{a_{\text{standard deviation}}} \right) - \text{content weight } \left(\frac{c_{\text{diversity}} - c_{\text{mean}}}{c_{\text{standard deviation}}} \right)}{\text{action weight} + \text{content weight}}$$

Feature Importance

- Accuracy for Random Forest - 0.86
- Confusion Matrix:
[[9765 2025]
[2064 9678]]



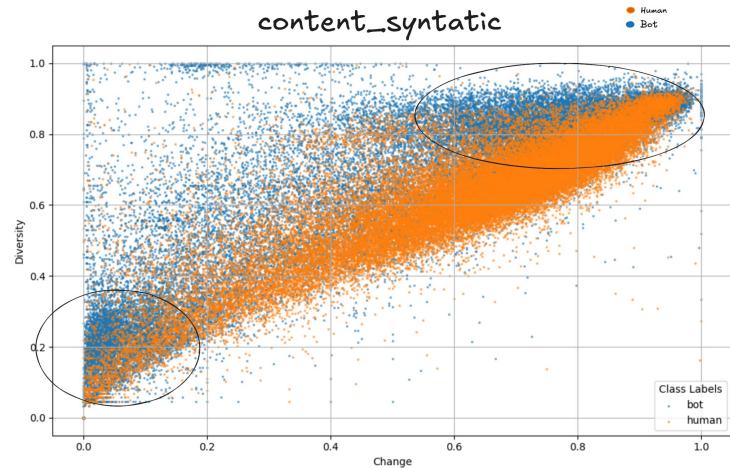


Research Questions

- Identifying the correlation between high change and low change with the bot-like behavior.
- Identifying the correlation between high change and low diversity with the bot-like behavior.

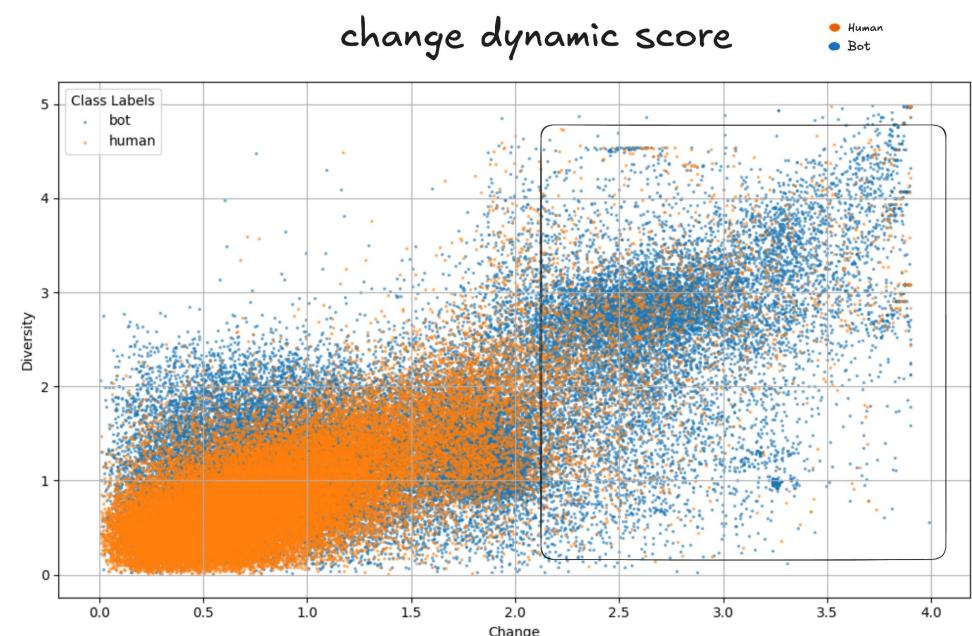
Goal

Suspicious account: Accounts at extremes of change and diversity spectrum. In other words, accounts with very high change and diversity or very low change and diversity are the most suspicious.



Change Dynamic Score

- Identify suspicious accounts confidently
- Normalized



Change Dynamic Score for change.

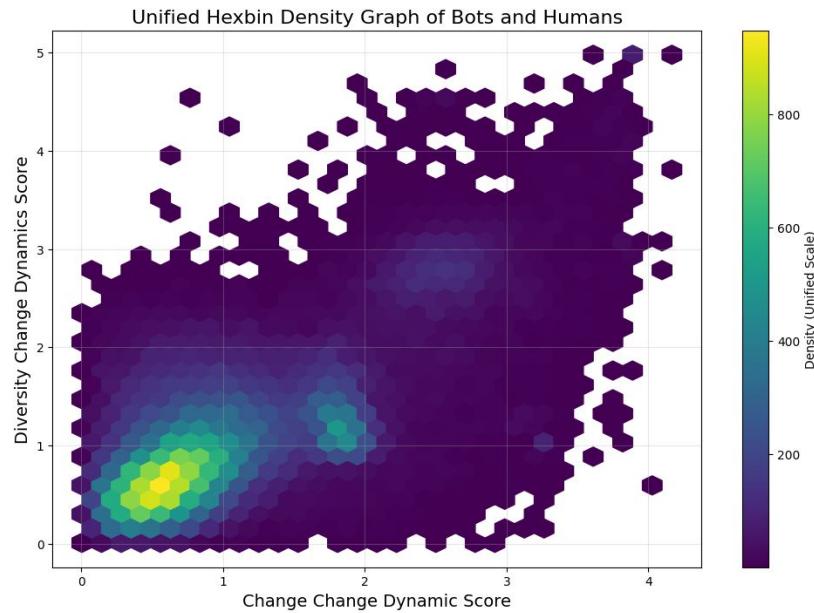
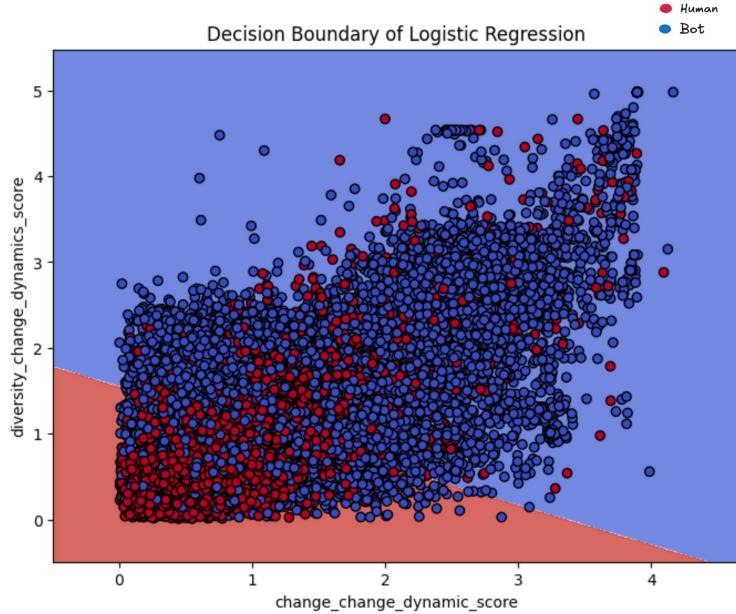
$$\frac{\text{action weight} \left(a_{\text{change}} - a_{\text{mean}} \right) - \text{content weight} \left(c_{\text{change}} - c_{\text{mean}} \right)}{\text{action weight} + \text{content weight}}$$

Change Dynamic Score for diversity.

$$\frac{\text{action weight} \left(a_{\text{diversity}} - a_{\text{mean}} \right) - \text{content weight} \left(c_{\text{diversity}} - c_{\text{mean}} \right)}{\text{action weight} + \text{content weight}}$$

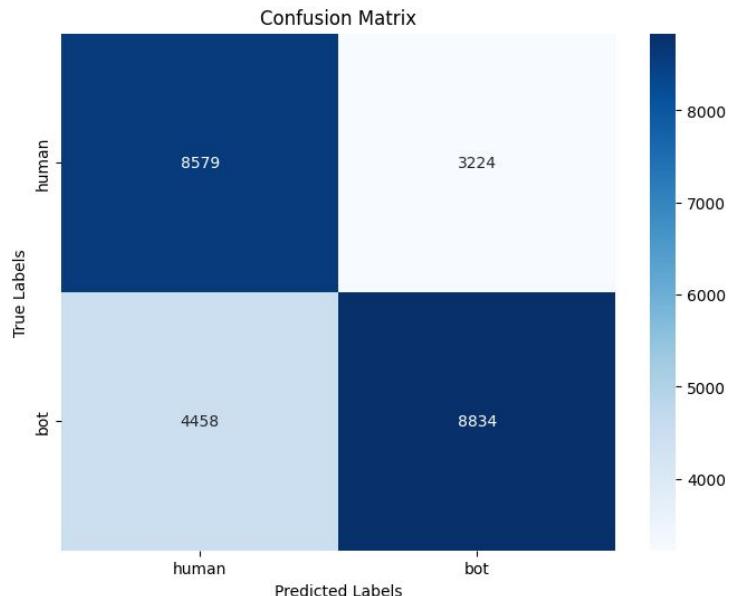


Analysis - Logistic Regression



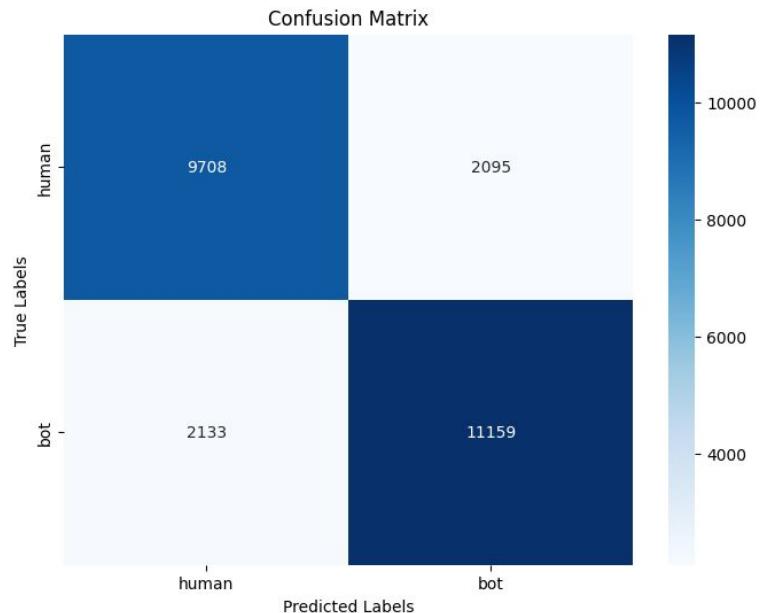
Results

- Used only
 - "Change_change_dynamic_score"
 - "Diversity_change_dynamics_score"
- Accuracy - 0.6939

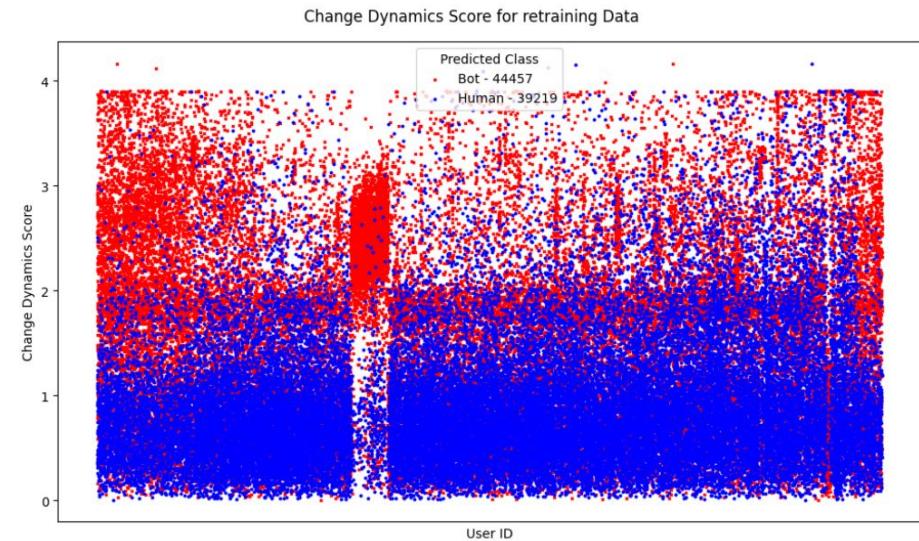
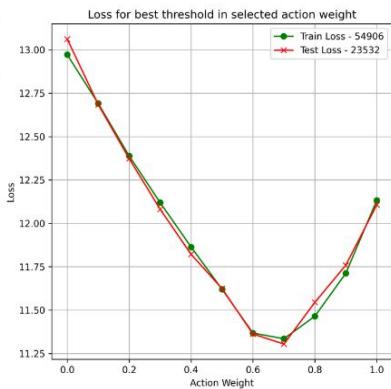
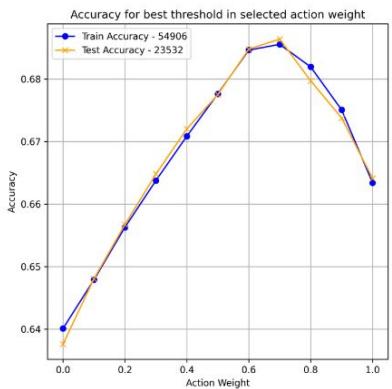


Results

- Used all features
- Accuracy - **0.8315**

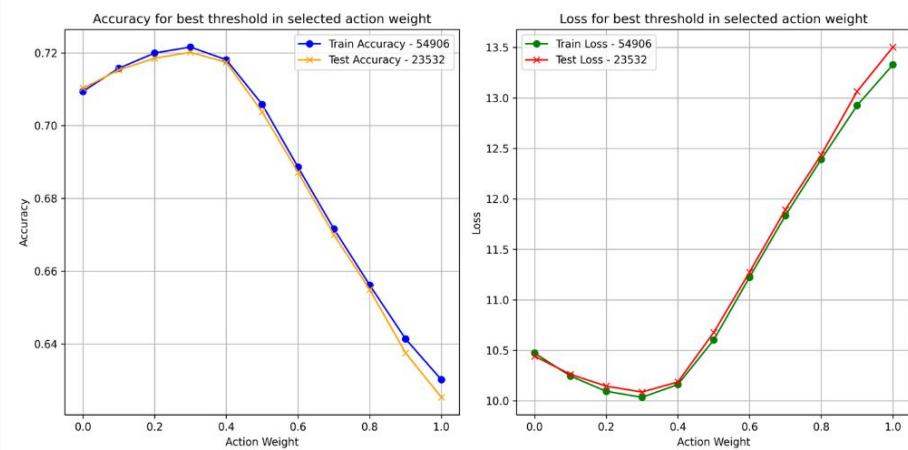
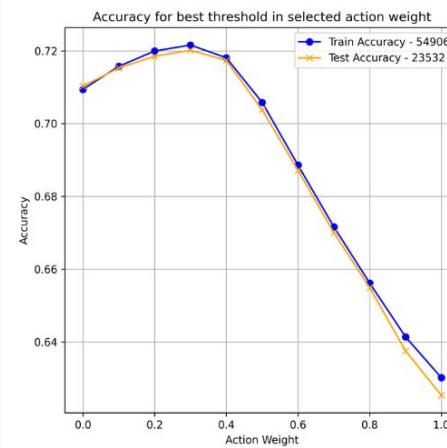
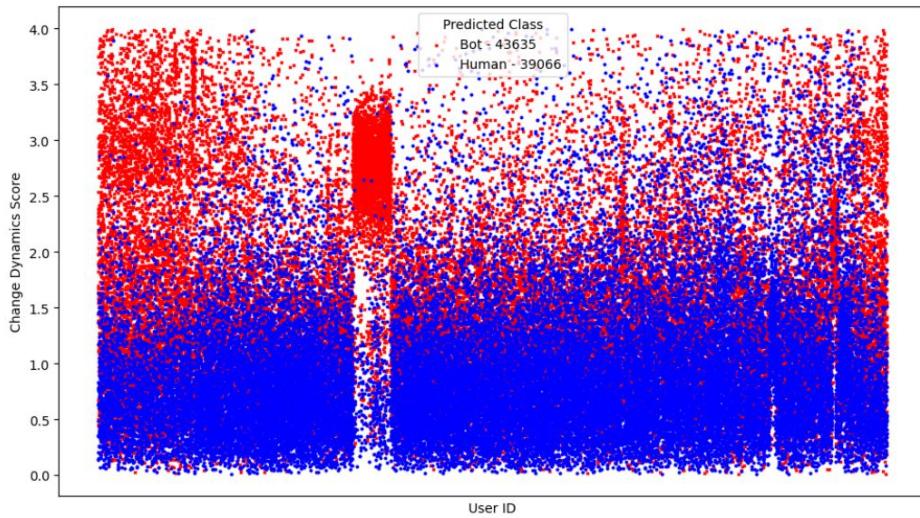


Thanks!

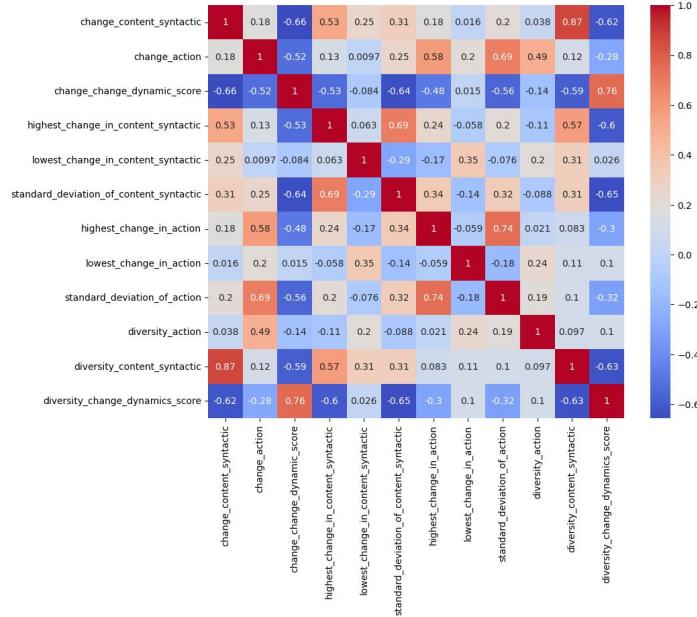




Change Dynamics (Entropy) Score for retraining Data



correlation matrix



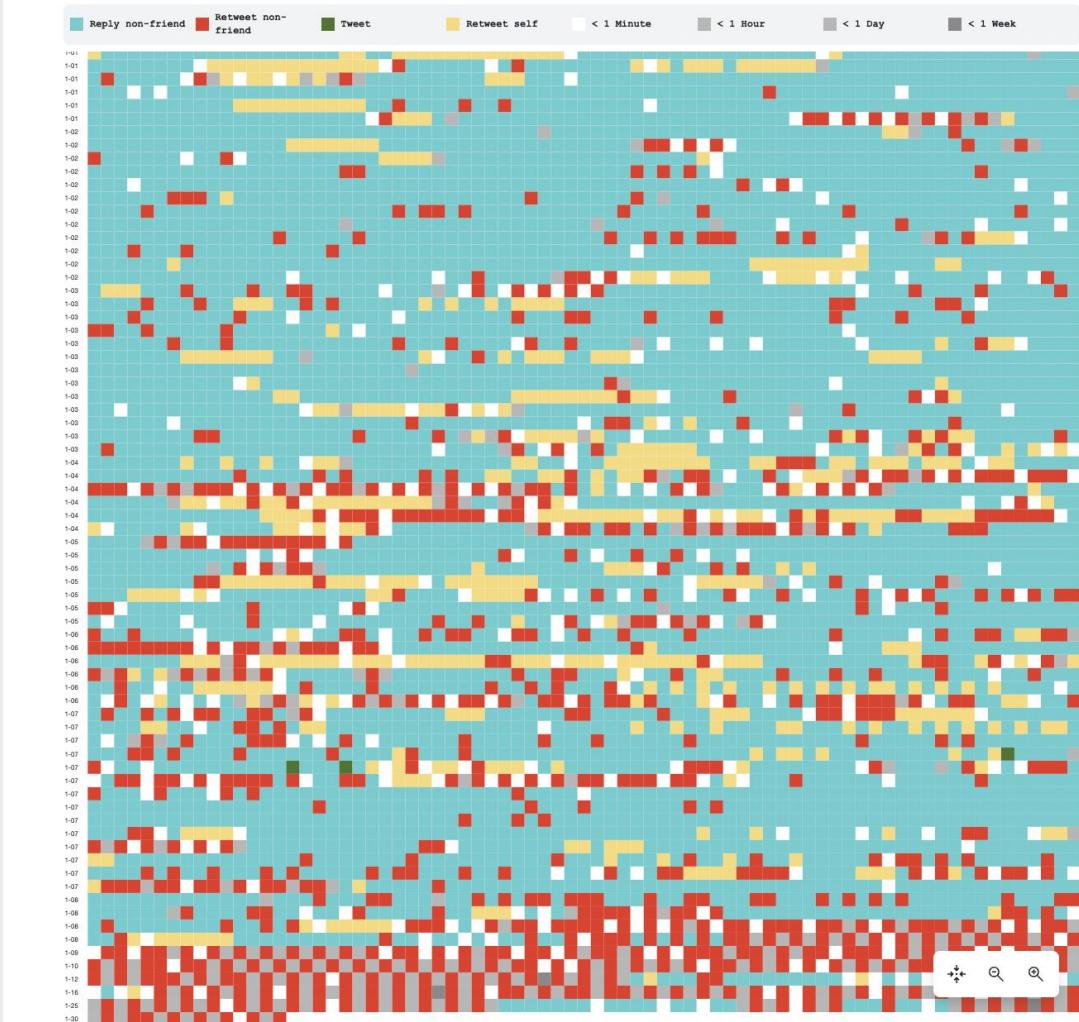
Low Change

- CNN News twitter account
- Ref - [agwagram](#)
- Similar Behaviour
- Bot-like behaviour
- Automated for do specific task



High Change

- @CassidyRae1414, user id:2648502412
- Ref - [agwagram](#)
- Behaviour changes frequently
- US presidential day(2018) has a high change



low Diversity

- CNN News twitter account
- Ref - [agwagram](#)
- Number of behaviour changes are low



High Diversity

- @TEN_GOP (Tennessee)
- Ref - [agwagram](#)
- Number of behaviour changes are high

