What is a Bot?

- Any account that leverages computer code to automate activity is considered a bot
- On Twitter, automated activities include posting a status, retweeting a status, liking a status, replying to a user, and following a user
- Although we often simplify bot detection to a binary classification, most accounts are hybrid accounts, and have activity from both automated programs and human intervention
- Bots can be positive, neutral, or malicious
**The Information Environment**

**Narrative**

**Counter Narrative**

Global Marketplace of Beliefs and Ideas

Bots/trolls are force multipliers that spread narrative and attack the counter narrative

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**Motivation**

**Problem:** Network viz is one of the most powerful means of exploratory network analysis, but is difficult if not impossible for large networks

**(One) solution:** K-Core analysis provides a way of reducing the network to a manageable size while retaining essential structure, facilitating network visualization
Data

- Following connections between Twitter bot accounts that use random alpha-numeric 15 digit screen names
- These accounts are spread out across the globe; deployed by numerous actors with widely varying purposes
- Node attribute includes account creator language setting
- We will use ORA and K-Core analysis to reduce this data to a manageable size while retaining essential structure in order to ‘triage’ the network

Import Table of Links
Large Meta-network

Import Node Attributes
Import Node Attributes

View Language Attribute
Generate K-Core Report

Evaluate K-Core Results

K-Cores

K-Core algorithm requires a symmetric network, and therefore the input network was symmetrized using the union method.

A k-core is a set of nodes in which each member node is connected to at least k other members. There is at most one k-core for a network for each value of k. The k-cores are nested; for example, all nodes in the 4-core are in the 3-core. Isolates are only in the 0-core.

<table>
<thead>
<tr>
<th>K-Core</th>
<th>Number of nodes</th>
<th>Percent of nodes</th>
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<tbody>
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</tr>
<tr>
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<td>24786</td>
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<tr>
<td>17</td>
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</tbody>
</table>
View K-Core Attribute

Filter by 4-Core & Create New Meta-network
New Meta-network

Visualize Network
Reduce Network

Visualize bot-nets
Color by Language

Color by Language
Adjust Language Colors

Color by Louvain Grouping
Color by Louvain Grouping

Color by Dense Subgraphs
Building out the Dense Network

- Produce Tweets in Arabic
- Produce Tweets in Russian

Initial Seed Nodes (Initial Random String Usernames)
Conclusion

• K-Core offers a one viable solution for network reduction and visualization

Questions