

Project OMEN: Designing a Training Game to Fight Misinformation on Social Media

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Abstract

OMEN is a training game developed to educate players in social media analytics. This serious and scalable game uses a train-as-you-fight framework where players face a realistic scenario based on real events. The data, while “semi-synthetic”, has a volume and speed that matches the real world, giving players the opportunity to use tools and workflows that they would use if they were on the job. The players progress through several gaming levels, first learning the basics and eventually building up to more complicated concepts and skills such as distinguishing various types of information maneuvers and developing strategies to minimize hostile information attacks.

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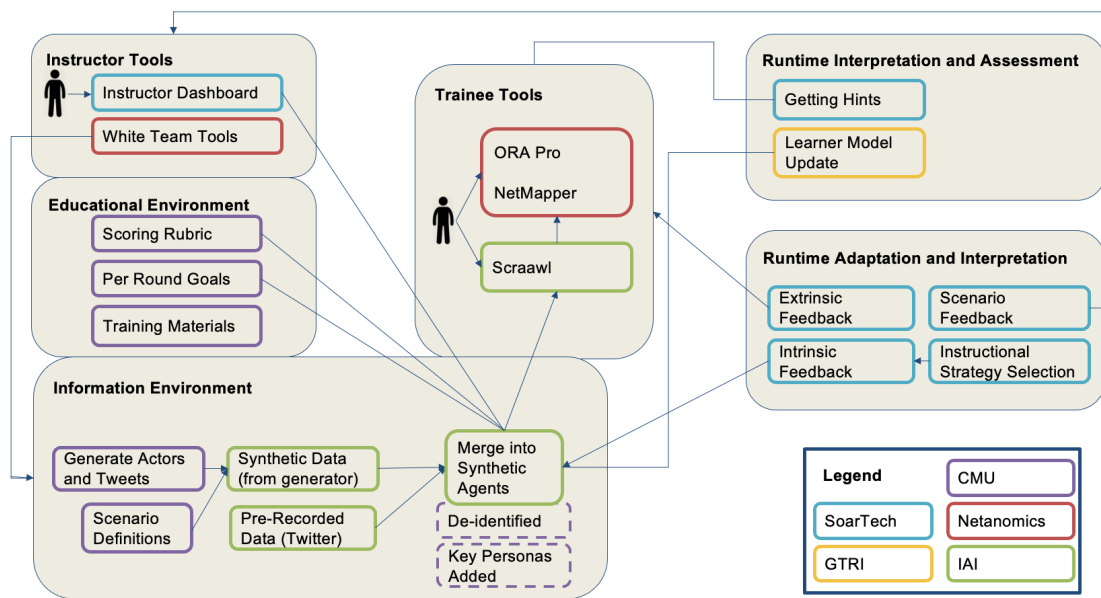
1 Overview

1.1 Background

Project OMEN (Operational Mastery of the Information Environment) is a training game designed and developed to help analysts fight misinformation on social media. It is a practical and scalable game for learning about social media analytics for either analysts or decision makers. The game is based on a “train-as-you-fight” framework. The story is based on real events, and the data is realistic. Additionally, the game accommodates actual tools and workflows, like ORA (Altman et al., 2020), NetMapper (Malloy and Carley, 2020), and Scraawl (Intelligent Automation, Inc., 2020).

1.2 Flowchart

The flowchart below shows the high-level structure of the game and the involvement of each of the companies involved in the project.



First, the “Instructor Tools”, “Educational Environment”, and “Trainee Tools” are completed.

- **Instructor Tools** - this includes the instructor dashboard and the white team tools
- **Educational Environment** - this includes materials associated with training and scoring the game
- **Trainee Tools** - this includes the software tools that the players will be using

These three items then feed into the “Information Environment” section of the flowchart.

- **Information Environment** –
 - First, the scenario is defined

- Actors and tweets fill out the scenario
- These two items feed into the Synthetic Data generator
- Next, the synthetic data and pre-collected twitter data are merged into synthetic agents, including some key personas
- Any data from the pre-collected twitter data is de-identified

The “Information Environment” then works in combination with the runtime elements.

- **Runtime Interpretation and Assessment** - this gives the players hints when they need them, keeps track of their progress
- **Runtime Adaptation and Interpretation** - this gives players overall feedback

Each sub-step is owned by a different entity. The various groups involved are:

- CMU – the purple boxed items are items we worked on. They are described in this tech report. We primarily focused on defining the scenario and game, and we also helped some with the data processing
- Netanomics – this company provided ORA and NetMapper, two of the tools used in the game.
- IAI – this company provided Scraawl, one of the tools used in the game. They also worked on cleaning/uploading the data.
- SoarTech – this company primarily focuses on the game environment.
- GTRI – this company primarily focuses on the learner assessment model.

1.3 Timeline

The general timeline was broken up into three main phases:

[Storyline Planning](#) (03/2020 – 09/2020)

[Game Development](#) (10/2020 – 06/2021)

[Testing](#) (06/2021)

1.3.1 Storyline Planning

The storyline planning phase consisted of creating the general storyline, creating the synthetic items for the storyline, and defining the gamification and points system.

- **[General Storyline and Actors](#)** – The storyline consists of general background information, identification of key actors (countries, people, and organizations involved), and a key goal. The main event during this synthetic storyline was an upcoming NATO event in one of the countries involved, loosely based on Trident Juncture in 2018, and the beginning of the COVID-19 outbreak in 2020. In addition to generating the main events to occur on this timeline, we generated the events that occur in the background of the social media in the game, such as:
 - The timing of when bots would appear
 - Which new hashtags appear and when they appear
 - 2-4 disinformation or misinformation campaigns (what they are, what their goals are, timing, and BEND metrics)
- **[Synthetic Items](#)** – After creating the storyline, we generated the necessary synthetic items. Real tweets were collected to prime the synthetic generator, and these tweets

were anonymized and made to fit the storyline by shifting the time and geographic coordinates on the tweets, as well as hashtags and names as needed. These synthetic tweets were generated for each key actor and for each of the bot/cyborg types. Synthetic news articles and synthetic personas were also created, with parameters defined for the frequency and topics of their tweets. In a future iteration of the game, the synthetic tweets will be integrated with real tweets, and the playback of the tweet data will be tested.

- **Gamification/Points System** – When designing the assessment piece of the game, we defined the main lessons for each stage and determined the stages of the game where points can be earned. This will include designing an automated agent at each stage of the game to provide hints to struggling players. Examples of where players could earn points include:
 - Bot identification
 - Key actor identification
 - Disinformation campaign detection
 - BEND maneuver recognition
 - Discovery of a set of tweets that give away too much information about self

1.3.2 Game Development

After the storyline planning phase, the game was developed. These steps included:

- Collecting Twitter data from Trident Juncture 2018 and the early months of the COVID-19 pandemic
- Anonymizing the data and adjusting dates, hashtags, and names as needed
- Breaking up the data into the storyline days
- Adding tweets as needed for the storyline

In the future, we plan to hand off the specifications to the software engineers to create the game to create a professional version of the game. The engineers will work in sprint cycles and have bi-weekly or monthly meetings with the design team to work through issues in development. Major milestones of this phase include:

- Building of the core database
- Spec infrastructure and wiring diagram
- Data set-up – get ORA and Scraawl on a server
- Building of the front end
- Fine-tune metric
- Generate training materials
- Two major demos/walkthroughs – around February or March
- Get feedback after demos

1.3.3 Testing

We tested the game with the participants during the June exercises. They gave us feedback on various aspects of the game. In the future after the complete game development phase, the game will be tested by software testers and by end users. The

team will gather feedback throughout the testing phase and fix any bugs found. The development team will implement any changes needed in the game structure, metrics, training materials, or data.

2 Storyline

The storyline for the OMEN game was inspired by the Trident Juncture event in 2018 and the 2019-2020 coronavirus pandemic.

2.1 High-Level

The story takes place in Norway from December 5-9, 2022. Key actors include:

- Countries:
 - NATO member nations (Norway, USA, France, U.K, etc.)
 - Former USSR nations considering joining NATO (Ukraine)
 - Russia
 - Finland
- People:
 - US Admiral, commander of the exercise - Admiral Fogga
 - Norwegian Prime Minister – Erna Solberg
 - Russian Prime Minister – Vladimir Putin
 - Vice Admiral, Military Representative of Norway to the NATO Military Committee
- Organizations:
 - NATO
 - Norway News Now (NNN) – a synthetic mainstream news organization

In this 5-day story, NATO participates in a military exercise in Norway, and this exercise encounters some major hiccups including an outbreak of a flu pandemic inspired by COVID-19. Note that in this synthetic storyline, the goal is to seem realistic to the game players. Therefore, country names remain real and certain important actors were not changed or anonymized (including prime ministers and NATO Twitter accounts). However, news organizations and most individuals are artificial personas.

2.2 Data

The synthetic data intended for this game is currently under development. The synthetic data will include accounts and tweets, instead of having to use pre-collected Twitter data. It will be fit to the storyline with the appropriate tweet, actor, and bot distributions.

The intermediate data that is currently in use is based on COVID-19 data from Feb-Apr 2020 and Trident Juncture 2018 data. All tweets were shifted to have timestamps between Dec 5-9th, 2022. We altered or removed hashtags as needed, and manually added additional tweets based on the player's game play choices.

2.3 Day-by-Day

2.3.1 Day 1

On December 5th, 2022, participants arrived for the exercises. Norwegian Prime Minister Erna Solberg welcomed 50,000 military and civilian participants from 31 NATO and partner countries to Norway for Northern Lightning, making it NATO's largest exercise in two decades. With 10,000 vehicles, 150 aircraft, 65 ships, and the strike group for an aircraft carrier, this event was guaranteed to get the attention of the world. Recent relations between NATO and Russia, as well as Russia's shared Arctic border with Norway, left many reports viewing the event as an effort of NATO to reassure its members that the Alliance will defend them from Russia.

2.3.2 Day 2

On the second day, the exercises officially began. The exercise commander US Admiral Fogga was successfully leading the planned events. However, there were some minor protests from anti-NATO actors and peace activists in the streets, though the crowds were only a couple hundred people and no violence was reported. Additionally, there are initial reports and rumors that Admiral Fogga is starting to feel a bit ill.

2.3.3 Day 3

Day 3 started with the devastating news that the Norwegian frigate *Hvalross Lekter* had collided with a tanker from Malta. The frigate began taking on water and had to evacuate its 137-person crew; as a result, a major export oil terminal and gas plant were shut down for a few hours. While no one was seriously injured, this event damaged the reputation of NATO's power during the exercise. Environmentalists were concerned that there may have been an oil leakage. Additionally, helicopters during the exercise destroyed much of the land under them when they landed, with the Norwegian News Now (NNN) agency reporting on the enormous cost of cleaning up that Norway will have to pay for.

2.3.4 Day 4

On this day, there was mass mis/disinformation about the frigate/environmental concerns and the sizeable increase in COVID22 cases among NATO personnel. Additionally, a previously innocuous-looking BOTnet is now activated and amplifying the misinformation. Twitter was filled with memes and jokes about the Hvalross Lekter, with some branding the NATO exercise as "Lightning Dolt." Misinformation and fear about potential environmental damage spread quickly despite accurate news reporting that no oil leakage occurred. An online environmentalist group started complaining and organizing protests surrounding the destruction of their beautiful landscape. NNN also breaks the story that Admiral Fogga and at least a dozen other NATO exercise participants have been diagnosed with COVID22, bringing further negative attention to the events. Fogga and the other infected NATO individuals are moved to the USS *CAREFORALL*, where Fogga manages his schedule remotely. The events continued as planned, but public perception of NATO in Norway began to decline, as faith in the organization was shaken during this episode.

2.3.5 Day 5

On the final day of the exercise, Admiral Fogga worked to maintain the initial schedule of events despite 20 more men quarantining due to flu-like symptoms. Health experts grew concerned as they realized that he had been in direct contact with over 200 military personnel in the exercise in the previous days. Mis/Disinformation about the virus spreads on Twitter, with questionable cures for the virus being retweeted by online influencers. Other mis/disinformation surrounding the origins of the virus also began spreading, including that the virus was either weaponized by the Russians for this event as a targeted attack or that it is a CIA bioweapon that the intelligence agency lost control of. NNN published a very critical story of Northern Lightning that calls into question the strength of NATO. The exercise ends, and NATO announces that they will leave the USS CAREFORALL in Norway to take care of infected NATO personnel and locals. Additionally, NATOMed is staying for the foreseeable future.

3 Actors

The game uses nine types of bots:

1. Normal Users (Personal, Commercial, Government)
2. Amplifier bots
3. Cyborg Bots
4. Chaos Bots
5. Coordinated Bots
6. Social Influence Bots
7. News Bots
8. Overt Bots
9. Random String Bots

These bot types are described in the “Bot Field Guide” (Beskow and Carley, 2019). During the synthetic storyline, we would expect the following daily bot distribution:

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Normal Users	49%	49%	45%	39%	35%	35%
Amplifier Bots	10%	9%	15%	15%	10%	15%
Cyborg Bots	2%	-	3%	5%	7%	6%
Chaos Bots	3%	8%	9%	5%	5%	4%
Coordinated Bots	-	-	6%	15%	15%	11%
Social Influence Bots	1%	1%	-	-	-	1%
News Bots	15%	15%	15%	17%	25%	25%
Overt Bots	5%	3%	2%	1%	1%	1%
Random String Bots	15%	15%	5%	3%	2%	1%

The following subsections go through each of these bot/user types that will be present in the game and describe those users’ motivation and show some example tweets. Example personas and accounts are described in the [Synthetic Personas](#) section.

3.1 Normal Accounts

Normal accounts include personal, commercial, and government accounts. In general, their traffic by day is described by the following table.

3.1.1 Motivation

Day 1	Most traffic not about NATO, the traffic that is about NATO has some complaints, some pro comments. Pro comments are fewer and mostly from official government or news sources, so not normal users.
Day 2	Most traffic not about NATO, the traffic that is about NATO has some complaints, some pro comments
Day 3	More traffic about NATO especially about the ship collision, users mostly trying to get more news info and interacting with news agencies
Day 4	Posting of lots of memes, more interaction with increasing number of foreign bots, organization of some protests or other anti-NATO movements
Day 5	Ever more traffic, now the flu outweighing NATO, lots of interaction with news media to try to figure out what is going on
Day 6	A lot of interaction with bots and with each other about NATO/flu issue, increasingly polarization and anger

3.1.2 Example Tweets

Tweet	Likes	Retweets
From NATO Account: “Today marks the first day of the history #NorthernLightning2022 bringing together 31 #NATO countries!”	100	5
“Why is #NATO taking over Norway? We don’t need their help. #NorthernLightning2022”	15	0
“Was the sinking ship part of the NATO exercise? #NorthernLightning”	2	0
Replying to a news story about the virus: “How many people did he come in contact with before he quarantined?”	1	0
“I can’t believe we let all of #NATO into our country only for them to BRING A PANDEMIC #Norway”	50	3
“Get these people out of Norway now!! #NorthernLightning”	15	5
“Thank you #NATO for your quick response to the pandemic! You’re setting a great example on how we need to proceed with this #flu22 going forward.	115	8

Note that all real NATO twitter account handles are considered normal, organizational accounts and are included in the game: @USNATO, @UKRINNATO,

@UKNATO, @TC_NATO, @SWEDENNATO, @SLEVNIANATO, @SHAPE_NATO, @PLINNATO, @NORWAYNATO, @NATOpress, @NATOLIBRARY, @NATODSG, @NATO_MARCOM, @NATO_ACT, @NATO, @LV_NATO, @ESTNATO, @CANADANATO, @AZMISSIONATO

3.2 Amplifier Bots

Amplifier bots are used to spread certain messages through retweets and likes. Some amplifier bots retweet any tweet with a given hashtag. Others amplify certain individuals or general topics. In general, their traffic by day is described by the following table.

3.2.1 Motivation

Day 1	Some Russian amplification of anti-NATO messages, sporadic and not well-coordinated. Other bots amplify pro-NATO messages.
Day 2	Some Russian amplification of anti-NATO messages, sporadic and not well-coordinated. Other bots amplify pro-NATO messages.
Day 3	An increasing number of retweets/likes on posts mocking the ship collision and memes that are anti-NATO
Day 4	An increasing number of retweets/likes on posts mocking the ship collision and memes that are anti-NATO
Day 5	Some amplification of the NNN news story and other news stories (some fake) about the French general contracting the flu, RT of fake origins of the virus
Day 6	Additional amplification of the NATO/general getting the flu; some of these accounts start re-tweeting environmentalist messages as well, sometimes retweeting actors from both the extreme left and right if it is anti-NATO

3.2.2 Example Tweets

Tweet	Likes	Retweets
RT “Why is #NATO taking over Norway? We don’t need their help. #NorthernLightning2022”	1500 (much more than the number of followers this account has)	250
RT “#AntiNATO protests take place in Norway’s streets at the beginning of #NorthernLightning” ****link to informational YouTube video that looks legitimate but is highly edited and portrays NATO poorly****	59	14

RT “I can’t believe we let all of #NATO into our country only for them to BRING A PANDEMIC #Norway”	126	322
RT “BREAKING: French General visited secret CIA bio-weapons lab ONE WEEK before attending #NorthernLightning. If they are so bad at keeping research safe, we need to #LeaveNATO #KeepThePeace #AntiNATO #NorwayFirst” **** Link to Black news site with fake story ****	21	9
Reply to: “#LightningDolt shows the World how WEAK NATO is. We don’t Need them” So True #LeaveNATO	388	102
Reply to: ““I can’t believe we let all of #NATO into our country only for them to BRING A PANDEMIC #Norway” #LightningDolt #AntiNATO	3	7
RT “Thank you #NATO for your quick response to the pandemic! You’re setting a great example on how we need to proceed with this #flu19 going forward.”		

3.3 Cyborg Bots/Trolls

These accounts exhibit both human behavior and computer activity. Human-level activity is demonstrated through thoughtful or nuanced statements in replies, while the computer activity is demonstrated through the scale and timing of all their other messages (these are typically amplification messages, so large numbers of retweets). In general, their traffic by day is described by the following table.

3.3.1 Motivation

Day 1	Mostly anti-NATO tweets
Day 2	
Day 3	Troll tweets about the sinking of the ship; coins the term #LightningDolt
Day 4	Some more anti-NATO tweets pertaining to how the organization cannot protect themselves from problems.

Day 5	Tweets about how the CIA is responsible for the spreading virus even though the flu appears to have originated elsewhere.
Day 6	More tweets criticizing NATO for allowing the USA to bring the virus to Europe, also tweets including fake “cures” for the illness.

3.3.2 Example Tweets

Tweet	Likes	Retweets
It has been almost 70 years since the founding of the most #murderous_alliance of the post-war era, #NATO. A tool of brutal repression, the North Atlantic Terrorist Organization is a huge threat. People, resist! #AntiNATO	17	8
<p>FLU-AGENDA-DEPOPULATION-CONFIRMED! This is a BIOWEAPON! Now It Makes Perfect Sense! - GREAT VIDEO explains: https://beforeitsnews.com/health/2020/01/confirmed-this-is-a-bio-weapon-it-now-makes-perfect-sense-great-video-3005250.html</p> <p><i>(In a reply to US president Trump and other official accounts giving a normal update on the new disease outbreak and where it originated - for Day 5)</i></p>	13	4
<p>During #NorthernLightning, Remember these Statistics of NATO's "peacekeeping operations"</p> <p>http://communismgr.blogspot.gr/2016/04/statistics-of-natos-peaceking-operations.html... #AntiNATO #NATO #imperialism</p>	22	47
<p>Here’s more on the possibility that this disease came from a CIA bioweapons project. Not 100% conclusive, but very strongly indicates that this was the case. @Author of the accurate article has well-deserved credibility decades of national security experience. His sources are the real deal.</p> <p>LINK TO NEWS ARTICLE</p> <p><i>*****User appears to be a real person with a normal username and screen name and profile picture. Links to real or mostly real sources then twists it*****</i></p>	172	407
<p>NATO is a vehicle for maximizing US imperialism. Despite its official claims, NATO is not maintaining peace and security in Europe! They can’t even navigate a simple boat.</p>	2.5k	992

NATO just gives cover for Washington’s global objectives... #LeaveNATO #FluPandemic2022 #LightningDolt		
****Link to video about US imperialism or a picture/meme of a shipwreck that is much exaggerated****		
#LeaveNATO Right now. Cold War is over since 1991 and Russia is stronger and better than ever. We should work with them. Why does NATO still exist?	277	83
#LightningDolt #AntiNATO #WasteOfMoney		

3.4 Coordinated Bots

Coordinated bots are two or more bots that are all cloned to send roughly the same tweets and retweets at around the same time. The content and timing of these accounts are very similar. These bots are created either by the same person, or these accounts just replicate and echo another account that the creator does not own. In general, their traffic by day is described by the following table.

3.4.1 Motivation

Day 1	
Day 2	
Day 3	Retweeting and re-phrasing the messaging from the cyborg bots.
Day 4	Retweeting and re-phrasing the messaging from the cyborg bots.
Day 5	Retweeting and re-phrasing the messaging from the cyborg bots.
Day 6	Retweeting and re-phrasing the messaging from the cyborg bots.

3.4.2 Example Tweets

Tweet	Likes	Retweets
Reply to: “Here’s more on the possibility that this disease came from a CIA bioweapons project. Not 100% conclusive, but very strongly indicates that this was the case. @Author of the accurate article has well-deserved credibility with decades of national security experience. His sources are the real deal. LINK TO NEWS ARTICLE ” Poster is twisting the article.	27	13
Wow @Author you are so Right! #LeaveNATO		

<p>Reply to: #LeaveNATO Right now. Cold War is over since 1991 and Russia is stronger and better than ever. We should work with them. Why does NATO still exist? #LightningDolt #AntiNATO #WasteOfMoney”</p> <p>**laughing emoji**</p> <p>****Meme showing defense secretary of Russia being a strong man vs. defense secretaries of Europe all being smiling women*****</p>	10	5
<p>Reply to: “Here’s more on the possibility that this disease came from a CIA bioweapons project. Not 100% conclusive, but very strongly indicates that this was the case. @Author of the accurate article has well-deserved credibility with decades of national security experience. His sources are the real deal. LINK TO NEWS ARTICLE”</p> <p>My own intelligence sources confirm this as well. We need to inform the people! #AntiNATO #Peace (<i>The poster is twisting the article.</i>)</p>	123	72
<p>RT “NATO is a vehicle for maximizing US imperialism. Despite its official claims, NATO is not maintaining peace and security in Europe! They can’t even navigate a simple boat.</p> <p>NATO just gives cover for Washington’s global objectives... #LeaveNATO #FluPandemic2022 #LightningDolt</p> <p>****Link to video about US imperialism or a picture/meme of a shipwreck that is much exaggerated*****”</p> <p>GREAT VIDEO!</p>	12	4
<p>RT “FLU-AGENDA-DEPOPULATION-CONFIRMED! This is a BIOWEAPON! Now It Makes Perfect Sense! - GREAT VIDEO explains: https://beforeitsnews.com/health/2020/01/confirmed-this-is-a-bio-weapon-it-now-makes-perfect-sense-great-video-3005250.html”</p> <p>(Spam US president Trump and other official accounts giving a normal update on the new disease outbreak and where it originated)</p>	2	0
<p>If NATO cannot secure a bioweapon, they cannot give us security</p>	500	212

#NorwayFirst #AntiNATO		
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3.5 Social Influence Bots

Social Influence bots try to manipulate the social media network by intentionally mentioning, retweeting, and liking each other repeatedly. These efforts increase the visibility of their accounts and make them look more popular than they are. In general, their traffic by day is described by the following table.

3.5.1 Motivation

Day 1	Network of bots circulating information like that of the news bots.
Day 2	Network of bots circulating information like that of the news bots.
Day 3	
Day 4	
Day 5	
Day 6	Network of bots circulating information like that of the coordinated bots.

3.5.2 Example Tweets

Tweet	Likes	Retweets
RT #NorthernLightning2022 is the largest #NATO exercise since the end of the Cold War with around 50,000 participants.	1-5	0
RT Serious damage to the Norwegian frigate Hvalross Lekter - deliberately driven aground after collision with 62,000-ton oil Tanker MV Sola at 0426 this morning in Hjeltefjorden	1-5	0
RT Donald Trump has been highly critical of #Germany for what he sees as its unfairly low military spending. But at the #NorthernLightning2022 exercise, Germany was the second largest participant with ca. 10,000 troops.	1-5	0
RT What facts do you want to know about #Coronavirus , the flu spreading like wildfire at #NorthernLightning ? Join @AndersonCooper & @DrSanjayGupta for a live CNN global town hall. Coronavirus - Facts and Fears, tonight at 8 p.m. ET	1-5	0
RT NYT reporter tests positive for #COVID22 after covering Norway's #NorthernLightning #coronavirus outbreak -	1-5	0

RT After days of spreading #COVID22 in #Norway, #NorthernLightning ends.	1-5	0
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3.6 News Bots

News bots are typically beneficial and productive bots. Many news organizations have bots that automatically post their news stories and summaries. General news aggregators also have bot accounts that monitor many news sites and automatically retweets news articles from several news agencies. However, some of these news bots can have malevolent intent or can have ties to foreign countries (i.e., Russia’s IRA mimicking US city news aggregators). In general, their traffic by day is described by the following table.

3.6.1 Motivation

Day 1	Mostly regular, neutral press coverage of the impending exercise as well as other news topics of the day
Day 2	Some coverage of anti-NATO protests but also continuing regular coverage of the impending exercises and regular news topics
Day 3	News agencies start increasingly covering the exercises after the ship collision
Day 4	Start tweeting about the anti-NATO commentary and environmental concerns
Day 5	Again, an increase in NATO coverage after news breaks that the general has the flu
Day 6	Overall, some neutral and some negative coverage in the aftermath of the exercises, decreased somewhat from the previous days

3.6.2 Example Tweets

Tweet	Likes	Retweets
#NorthernLightning2022 is the largest #NATO exercise since the end of the Cold War with around 50,000 participants.	200	5
Donald Trump has been highly critical of #Germany for what he sees as its unfairly low military spending. But at the #NorthernLightning2022 exercise, Germany was the second largest participant with ca. 10,000 troops.	20	1
Serious damage to the Norwegian frigate Hvalross Lekter - deliberately driven aground after collision with 62,000-ton oil Tanker MV Sola at 0426 this morning in Hjeltefjorden 7 sailors suffered minor injuries and all 137 crew evacuated	35	3

#NorthernLightning2022		
What facts do you want to know about #Flu22 , the flu spreading like wildfire at #NorthernLightning ? Join @AndersonCooper & @DrSanjayGupta for a live CNN global town hall. Coronavirus - Facts and Fears, tonight at 8 p.m. ET	150	50
NYT reporter tests positive for #FLU22 after covering Norway's #NorthernLightning #flu outbreak -	200	20
After days of spreading #flu22 in #Norway , #NorthernLightning ends.	20	5

3.7 Overt Bots

Overt bots are bots that explicitly claim to be a bot. Many of these bots can be beneficial or productive, as they are tied to hobbies or regional news. Others, however, can be propaganda bots associated with malicious actors. Because these bots state that they are bots, they are allowed by Twitter to generate bot-like activity, and not all users seeing their tweets will check their account description.

3.7.1 Motivation

Day 1	Mostly regional bots that re-tweet/post news articles that mention the region.
Day 2	Mostly regional bots that re-tweet/post news articles that mention the region.
Day 3	Mostly regional bots that re-tweet/post news articles that mention the region.
Day 4	Mostly regional bots that re-tweet/post news articles that mention the region.
Day 5	Mostly regional bots that re-tweet/post news articles that mention the region.
Day 6	Mostly regional bots that re-tweet/post news articles that mention the region.

3.7.2 Example Tweets

Tweet	Likes	Retweets
RT #USMC tanks operating in #Norway during #NorthernLightning #NorthernLightning2022	1-5	0
This year, #Norway will host #NATO 's high-visibility exercise #NorthernLightning22 with 10000s of soldiers participating. As always, #NATO will conduct this defensive exercise in full transparency and invite international observers.	1-5	0
RT #BREAKING : Norwegian defense minister in quarantine, rest of gov members being tested for deadly #flu	1-5	0

#COVID2022 #FluUpdate #Norway #Flu #Europe		
RT #Norway suspends arms sales to #NATO fellow #Turkey , in first such action by an alliance country	1-5	0
RT Welcome to #Norway ! Here's what you need to know: Norwegians are born with skis on, and they really love their fish. #NorthernLightning	1-5	0
RT After days of spreading #COVID22 in #Norway, #NorthernLightning ends.	1-5	0

4 Synthetic Personas

The following sections detail how we created various account handles for use in the game.

4.1 NATO and Military Accounts

The following accounts were merged between the COVID-19 and Trident Juncture data sets to create NATO and Military accounts for the game. Some of these account names exist already, while others we made up for the purposes of the game.

COVID Screen Name	Trident Juncture Screen Name	Screen Name for the Game	Comments
CDCgov	NATOpres	NATOMed	potential reach
Surgeon_General	USNavy	NavyMed	potential reach
BorisJohnson	NATO_MARCOM	NATOMarineUK	most mentioned
Mike_Pence	USMC	NATOMarine	potential reach
WhiteHouse	DeptofDefense	NATODefense	potential connectors
UN	NATO	NATO	
Helene_wpli	arpulawski	philohare	Navy/Marine account; uses many mentions in tweets
SarahGould_SA	janusz_walczak	subspecialist1	Navy/Marine account; uses many mentions in tweets
FaleroJr	PrimeCreator2	soldier4usa	Soldier account; average

			mentions per tweet
WeStand4theFlag	andrewmichta	AmericanPatriot	Soldier account; average mentions per tweet
MayorOfLA	CanadianForces	Admiral_Fogga	US Admiral's account; highest superspreader (behind NATO)

4.2 General Users

The following accounts were merged between the COVID-19 and Trident Juncture data sets to create NATO and Military accounts for the game. Some of these account names exist already, while others we made up for the purposes of the game.

COVID Screen Name	Trident Juncture Screen Name	Screen Name for the Game	Comments
Aag_aj	Stefan_Laurell	Joe_McCall	wants to be influencer, uses many mentions per tweet
Aircooledcafe	BaconJoel	JennyP838	average mentions per tweet
Cllrtombruce	JeremyRobards7	CliffRoberts	average mentions per tweet
DamianFog	Ralph_adelphia	PhillyPete	average mentions per tweet
alexander_minh	GorseFires	GirlOnFire	wants to be influencer
realDonaldTrump		USAPres	is a top influencer

4.3 News Bots

4.3.1 Norway News Now (NNN)

Profile: @NorwayNewsNow's Twitter account is a combination of CNN and BCCRussian tweets found in the COVID19 and TJ2018 data sets. In the next iteration when synthetic data is created, most of their tweets will be synthetic

Objective:

- To bring breaking news to the public, and to cover stories fairly
- This news station is the main TV news channel in the country

General Characteristics:

- Tweets are in English most of the time for the sake of the players - some are in Russian
- Most tweets occur during local daytime, in a bell-shaped curve centered around mid-afternoon
- A couple dozen tweets a day
- Original Tweets: 95%, Retweets/Replies: 5%

4.3.2 Other News Bots

These news bots have similar objectives and characteristics as NNN, with some potentially being more or less friendly to NATO:

1. @GlobalNewsCorp - a combination of Reuters and synthetic data
2. @TheNewsPost - a combination of NYTimes and DefenseHQ
3. @TheJournal - a combination of Fox and Friends and a Finland news source
4. @EuropeanPost - a combination of Euro News and BBC Politics

4.4 Other Bots

The following bot accounts were merged between the COVID-19 and Trident Juncture data sets to create bot accounts for the game. We came up with the game account names so that they do not match an existing account.

COVID Screen Name	Trident Juncture Screen Name	New Screen Name for the Game	Comments
Coronabotbr (note: these tweets are in portugese)	StZaryn	BrSainr	Account has a high degree
Osmanmetin (account now suspended)	jb50000	smen3000	Account has a high degree
Ann_neona	GorseFires	anna_banana	Account has a high degree
StraightThinkEd	StrategNL	RealTalkLive	account no longer exists; high degree in quote network
xxICOM7600xx	The_Black_Rats	xyz123abc	uses many mentions

5 Pre-Game Events

5.1 Game Preparation

In May 2021, participants were trained on the various tools and topics needed for the game. Overall training was divided into two types, Command Training and Technical Training. Command Training included the following (Goolsby, 2021a):

- The concepts of the Digital and Social Media Playbook
- Introduction to social network analysis and the “information maneuver”
- The art of influence on social media platforms in the world today
- Live, virtual via WebEx
- Recordings available for review

Meanwhile the Technical Training consisted of:

- “Buttonology”
- Scraawl
- ORAWEB
- Workflows
- Practical assessment measures
- Some available anytime/anywhere while others are live, virtual via WebEx
- Recordings also available for review

5.2 Game Play

The exercise took place from June 21-24th, 2021. The storyline days were broken up as such:

- Training Days:
 - December 5th - normal day, people arrive for exercise
 - December 6th - exercises start, minor protests
- Exercise Days:
 - December 7th - collision, environmental concerns (exercise on June 21st)
 - December 8th - post-collision, virus (exercise on June 22nd)
 - December 9th - misinformation about the virus (exercise on June 23rd)

Two of the five days in the storyline were given to the participants as “training days” in the weeks prior to the exercise. The final three days of data were given to the participants during the exercise, with one day’s worth of data on each of June 21-23. The hotwash took place on June 24th, 2021.

6 Training Day 1 - Introduction to Twitter Analysis

6.1 Overview

6.1.1 Goals

The primary learning objective is to understand the lay-of-the-land. Who are the key actors? What are the key terms? What are the groups? Which of them support or counter

you, if any? Because the December 5th data does not have any major action, the participants noted that many of the groups they found had no clear pro or anti opinion.

To reach this goal, the participants need to learn simple Twitter analysis in Scraawl and ORA and be able to answer these questions:

1. Identify key actors and trending topics
2. Identify and analyze a topic with a pro/anti side
3. Understand what a post would convey about you

6.1.2 Tasks

There are specific tasks associated with answering these questions.

Scraawl

- Q1. Identify key actors and trending topics
- a. Collect data with Scraawl using keywords
 - b. Read and understand reports and filters
 - c. Build and interpret a friendship graph
 - d. Find the top topics
 - e. Share data between Scraawl and ORA
- Q2. Identify and analyze a topic with a pro/anti side
- a. Filter for pro/anti keywords AND/OR
 - b. Identify topics that appear pro/anti then filter

ORA

- Q1. Identify key actors and trending topics
- a. Open ORA and load data into it
 - b. Understand the layout of ORA
 - c. Run a report and interpret its content
 - d. Learn and interpret a data visualization
- Q2. Identify and analyze a topic with a pro/anti side
- a. Visualize network
 - b. Run Twitter Report
 - c. Group algorithm

Q3. Understand what a post would convey about you

Going through the first two questions and understanding the lay of the land should also answer this question.

6.2 Step-by-Step

6.2.1 Scraawl Steps

- Q1. Identify key actors and trending topics
- a. Collect data with Scraawl using keywords
 - On the upper left-hand side of the screen, click on **+New Report**. The following page should appear

Scraawl SocL + My Reports

Create New Report

Basic Search · Premium Search · Premium Advanced Search · Account Monitoring

Data sources

Twitter
 Facebook
 Tumblr (Link Account)
 YouTube
 Other PAI Sources (1000+) (Upgrade)
 My Datasets

Datasets

TRJE Day Later
 TRJE Day Before
 TRJE Crash

Search keywords [Translate keywords](#)

NATO × Trident Juncture × Norway ×

Separate keywords with commas to match multiple keywords (e.g. *twitter, socialmedia*). Separate keywords with spaces to match ALL keywords (e.g. *twitter socialmedia*).

Report name

Search timeline

2018-11-08 00:00 – 2018-11-10 00:00 Time range

Report limit

Current limit: 5,000 – Total dataset quota left in February, 2021: 42,187,600

Sets the limit for the number of posts in the report

▶ Additional Search Options

Preview Search

- Ensure “Premium Report” is selected, then click on “My Datasets”
- Can search by relevant keywords: NATO, Northern Lightning, Norway
- *Preview Search* button will show high-level results before creating the report
- If the results are too broad or too narrow, try changing the keywords
- For this exercise, the data was collected on certain keywords, so type in “*,” to get all data, then *Preview Search*, then *Start Scraawling*

b. Read and understand reports and filters

- After the report is created, the **Basic Statistics** page shows up
- Summary statistics are shown for top users, words, hashtags, mentions, URLs, retweets, languages, and geotags as well as a timeline for when posts were created
- The following is a screenshot of part of the **Basic Statistics** page

Top Users	
@caigengjia	19
@jterheide	14
@jb50000	13
@murphycat2012	13
@yataint	12
1,315 total users	
Details >	

Top Words	
Exercise	602
Nato	545
Juncture	338
Trident	332
Norway	243
2,271 total words	
Details >	

Top Hashtags	
#tridentjuncture	453
#norway	337
#nato	304
#tridentjuncture2018	172
#marines	158
250 total hashtags	
Details >	

Top Mentions	
@nato	341
@usmc	165
@deptofdefense	159
@nukestrat	102
@jfc_naples	73
293 total mentions	
Details >	

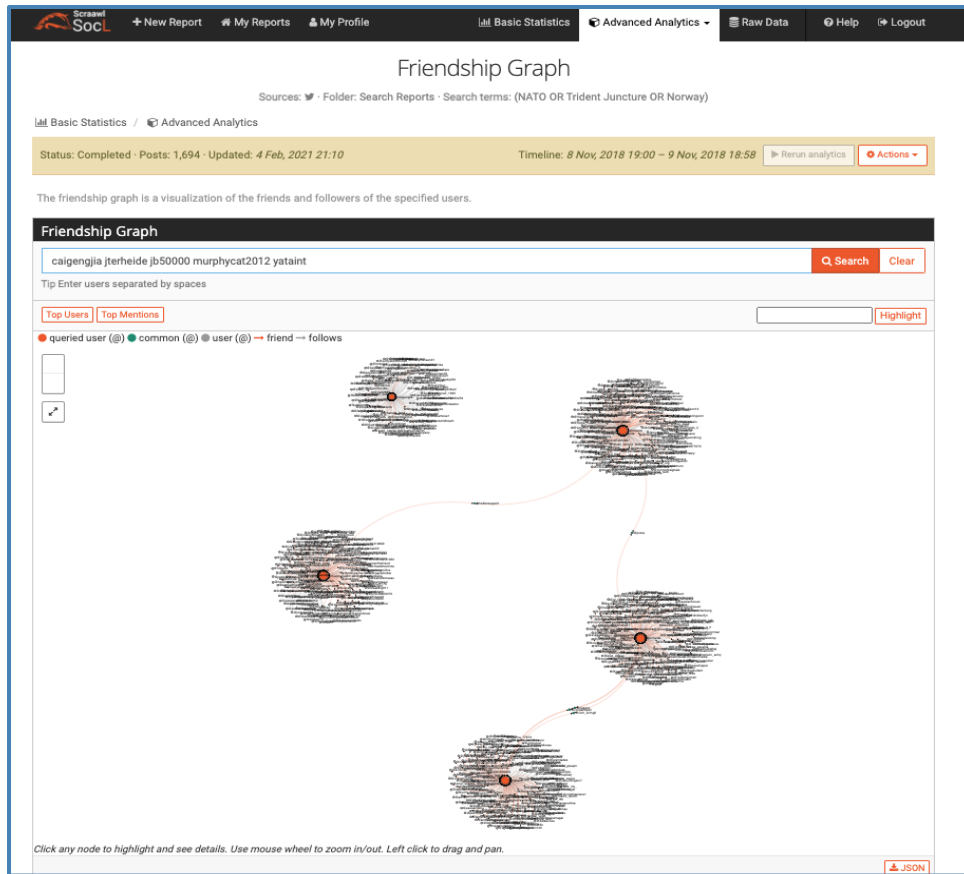
Top URLs	
https://yle.fi/uutiset/3-10498891	101
https://bbc.in/2DvfHvj	32
https://twitter.com/Forsvaret_no/status/10604004112...	14
https://www.bbc.co.uk/news/world-europe-46150048	11
https://twitter.com/nukestrat/status/1060820967423...	10
229 total URLs	
Details >	

Top Retweets	
RT @DeptofDefense: Flying in the skies over #Norway! ...	155
RT @NATO: Exercise 🇺🇸 #TridentJuncture 18 brought t...	154
RT @nukestrat: Extensive GPS signal disruption in nort...	99
RT @HMNBPortsmouth: WAIT FOR IT... What's your jou...	55
RT @JFC_Naples: 31 #NATO and Partner Nations depl...	51
218 retweeted tweets	
Details >	

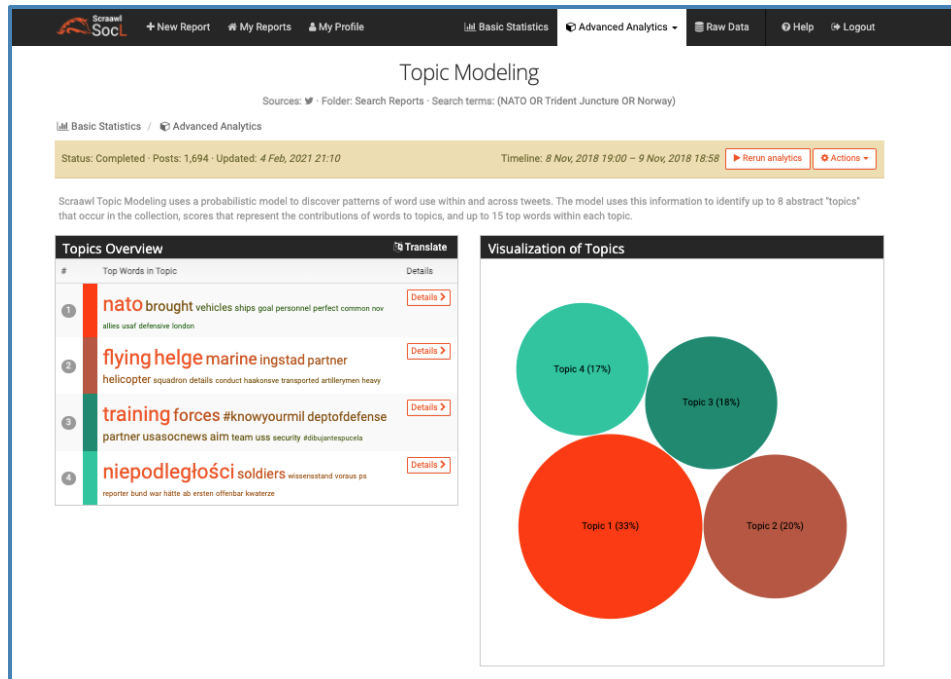
- In each category, can click on the *Details* button to see the Top 50 users - here you can also filter out specific users
- Clicking on specific users will show that user's profile, tweets, and other statistics
- Click on the *Details* button or on the individual user in the "Top Users" section to help answer this question

c. Build and interpret a friendship graph

- Click on *Advanced Analytics* in the menu bar, then click on *Friendship Graph*
- The screenshot below shows the **Friendship Graph** page. You can manually put in users of interest or click on the *Top Users*, which will put in the top 5 users



- This graph shows how the top users are connected to each other by friends and followers
 - At the bottom right-hand side of the screen, there is a *JSON* button to export the data in JSON format so that it can be imported into ORA
- d. Find the top topics
- Click on the *Advanced Analytics* menu item, then on *Topic Modeling*
 - This page finds the top topics and the top words associated with each topic
 - The participants can see how similar or different each of the topics are, and if any are pro or anti-NATO
 - On the first day, there is little controversy but during the exercises there will be more pro/anti topics



- e. Share data between Scraawl and ORA
- Many of the Scraawl pages on the bottom right-hand side allow saving data to a JSON format, which then can be imported into ORA

Q2. Identify and analyze a topic with a pro/anti side

- Filter for pro/anti keywords AND/OR - *Shown in Q1-a*
- Identify topics that appear pro/anti then filter - *Shown in Q1-e*

6.2.2 ORA Steps

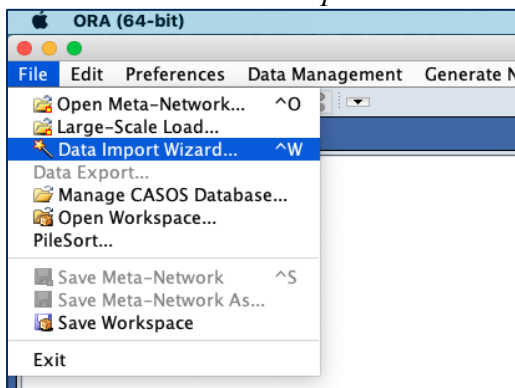
See ORA User Manual for more information (Altman et al., 2020).

Q1. Identify key actors and trending topics

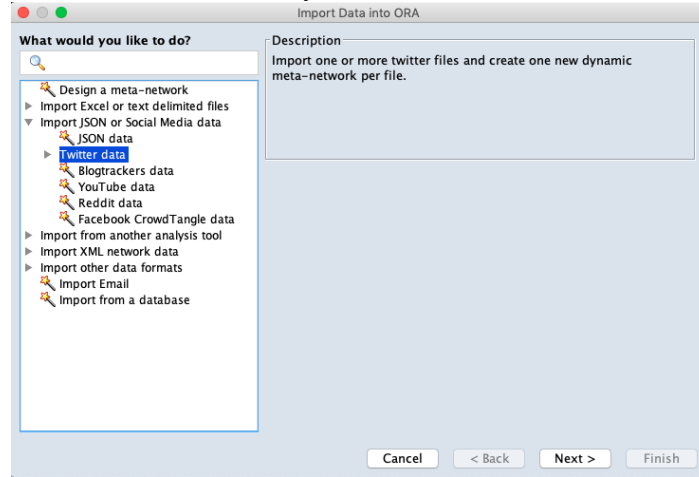
- Open ORA and load data into it
- Understand the layout of ORA

To import data into ORA, follow these steps:

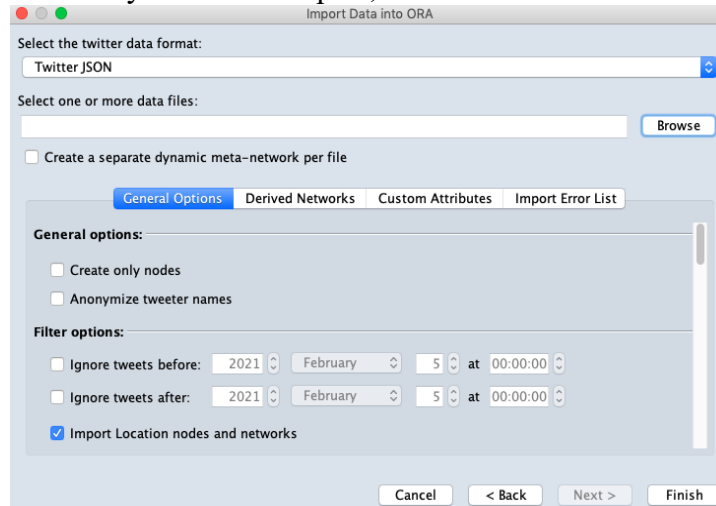
- Click on *Data Import Wizard*



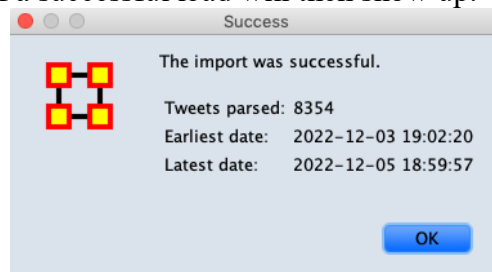
2. Select the type of data to import. Select Twitter JSON if you have the raw JSON file. Otherwise select XML → DyNetML. Then click *Next*.



3. Browse to the file you wish to import, then click *Finish*

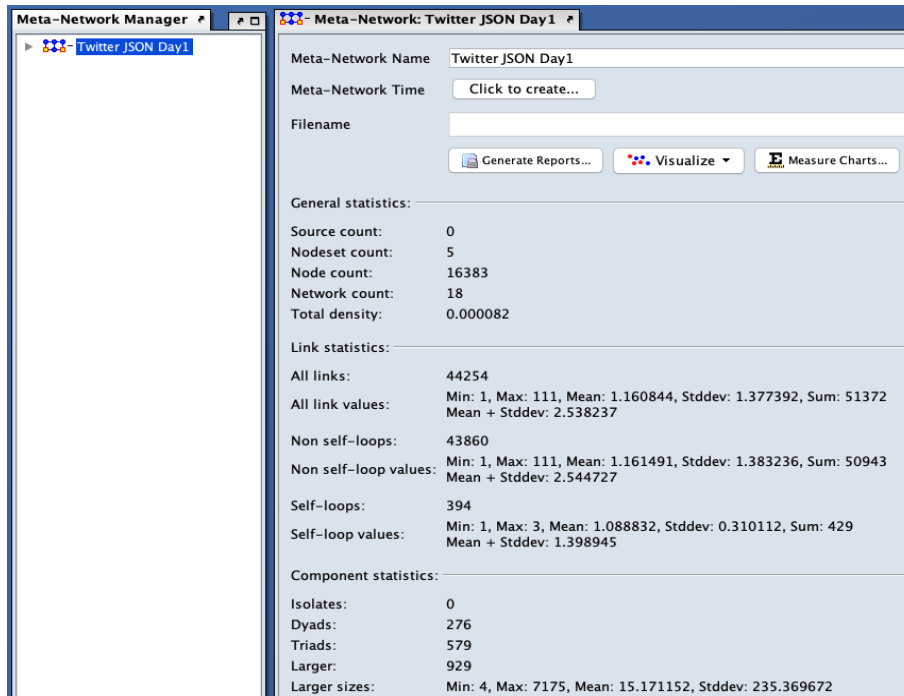


4. A confirmation of a successful load will then show up.

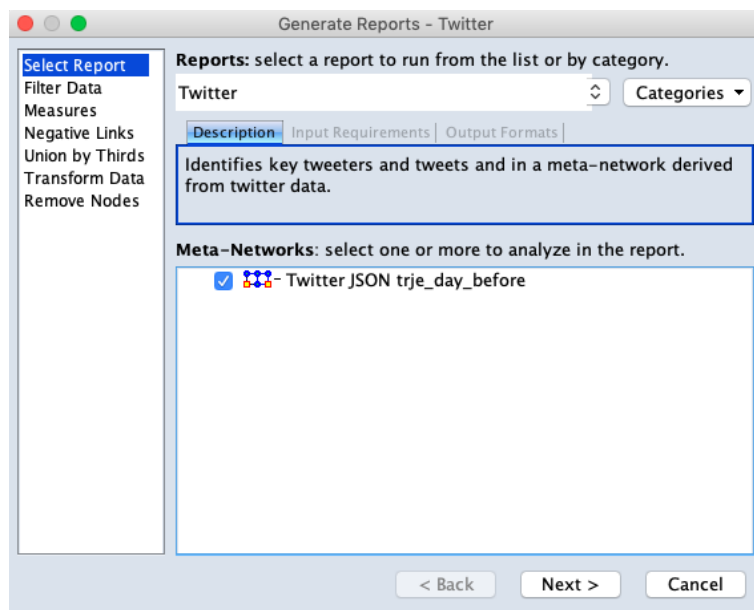


- c. Run a report and interpret its content

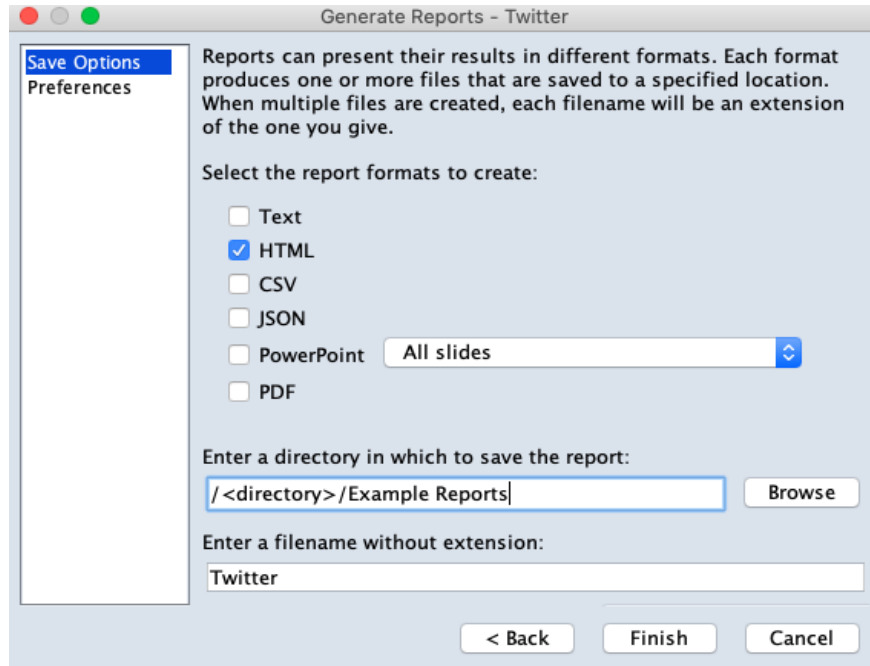
1. To run a report, select on the meta-network of interest on the left-hand side under “Meta-Network Manager”
2. Then click on *Generate Reports*



3. Select the report of interest from the drop-down menu - in this case, select "Twitter", then click *Next*



4. Click *Next* on the subsequent menus, enter the directory and file name then click finish. Once the report is done, it will open in HTML.



- Next, learn to interpret the report. The main page of the Twitter report will have summary statistics on the input data and then links to all the other reports. A screenshot of the top of the report is below:

TWITTER REPORT

Input data: Twitter JSON Day1

Start time: Mon Jul 5 12:20:22 2021

[Data Description](#)

Import Summary

This is an overview of the import process that was used to create the dataset.

Twitter file(s) imported	/Users/catherineking/Documents/CMU/CASOS/OMEN/Data/FirstThreeDays/Day1.json
Twitter file format	Twitter JSON
Dynamic meta-network?	No, all tweets are in one meta-network

Import Data Statistics

This is an overview of the tweet activity in the dataset. The dataset contains only one meta-network and all tweets are analyzed.

Network	Twitter JSON Day1
First tweet date	2022-12-03 19:02:20-05
Last tweet date	2022-12-05 18:59:57-05
Number of tweets	6951
Number of tweets with geotag	15
Number of tweets with URL	2954
Number of retweets	2290
Number of tweeters	5653
Number of verified tweeters	304
Number of news agency tweeters	86
Number of mentions	2789
Number of distinct hashtags	980
Number of distinct hashtags used more than once	566
Number of distinct words	0
Number of distinct words used more than once	0
Number of distinct locations	12

- Scrolling down the report, we see links to more detailed reports.

The following links give more detailed statistics by category.

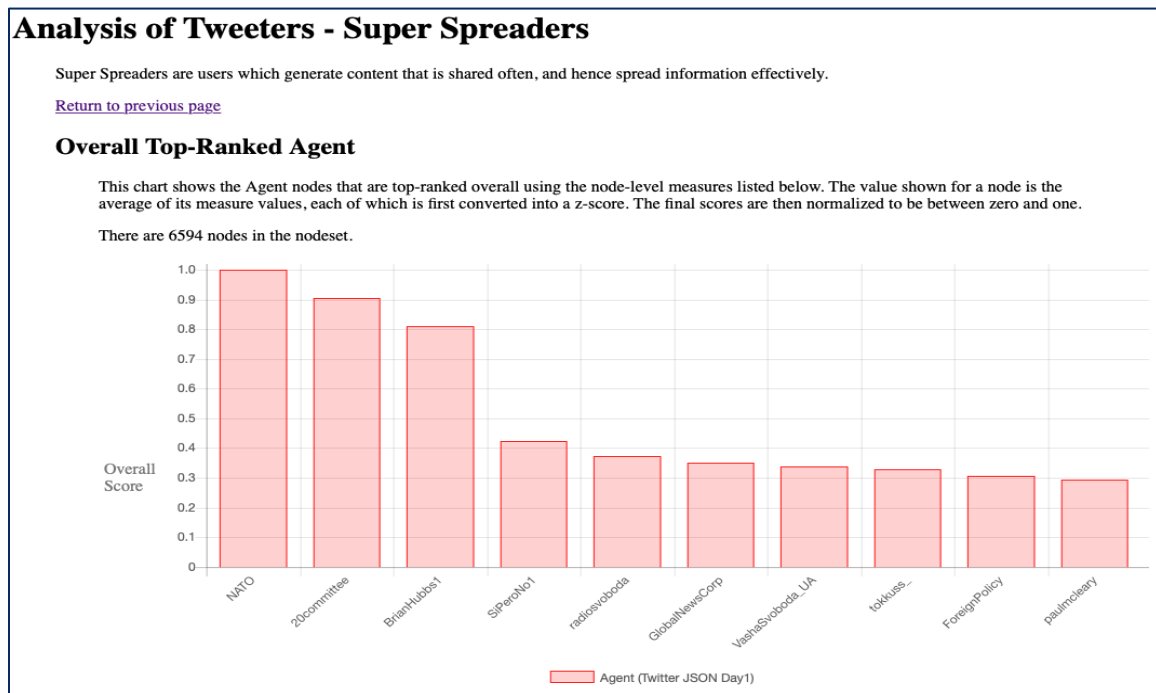
- [Tweet Statistics](#)
- [All Tweeters Statistics](#)
- [Verified Tweeter Statistics](#)
- [News Agency Tweeter Statistics](#)

Available Analyses

Click on an analysis below for detailed results.

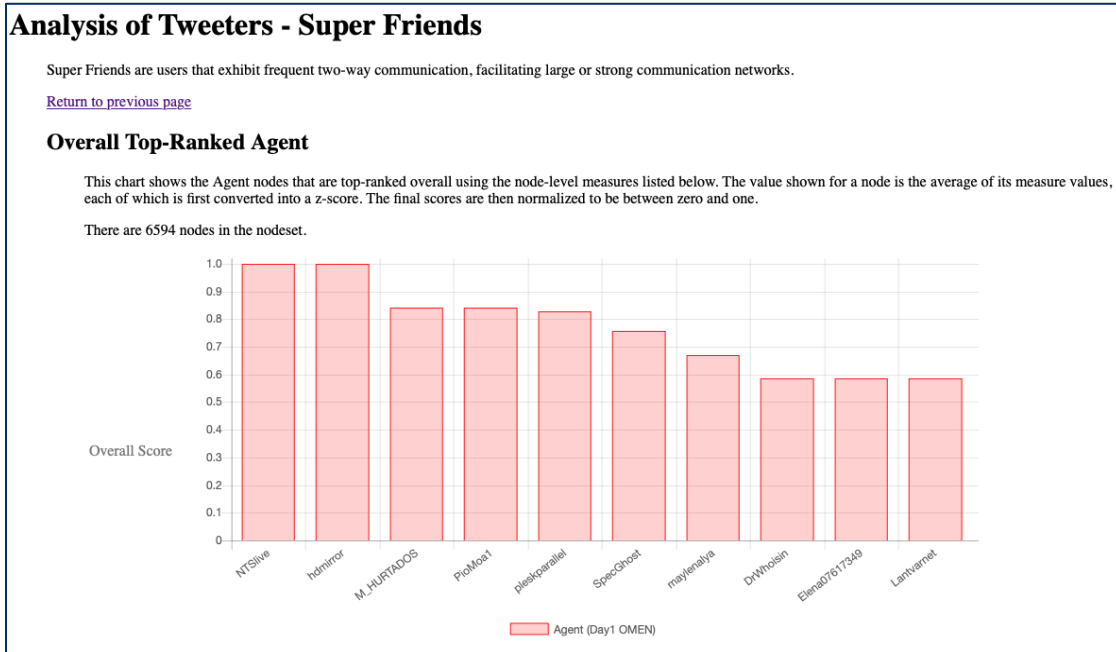
- [Analysis of Tweeters - Super Spreaders](#)
- [Analysis of Tweeters - Super Friends](#)
- [Analysis of Tweeters - Other Influencers](#)
- [Analysis of Tweeters - Attributes](#)
- [Analysis of Hashtags](#)
- [Analysis of Words](#)
- [Analysis of Locations](#)
- [Analysis of Tweets](#)
- [Analysis of Tweets - Attributes](#)

- To find actors of interest, look at these three sub-reports: “Super Spreaders”, “Super Friends”, and “Other Influencers”
- To find trending topics/hashtags, click on the “Analysis of Hashtags” reports
- A screenshot of the top of the “Super Spreaders” sub-report is below:

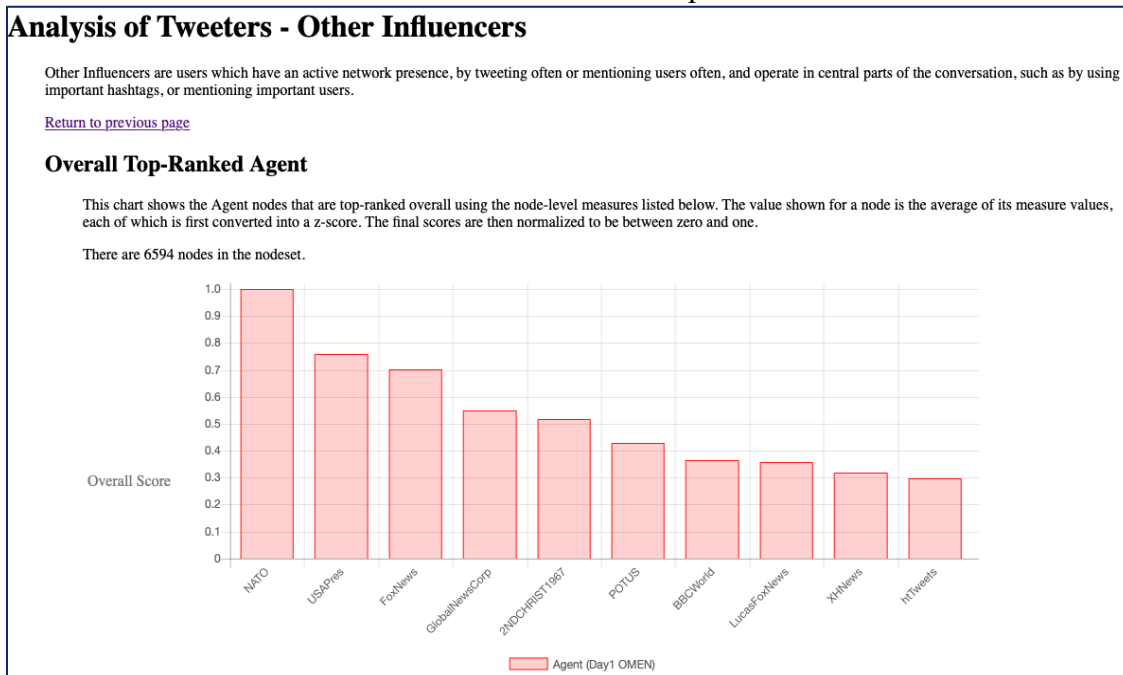


- Super-spreaders are individuals that generate content that is frequently shared - they are effective communicators. Often they are verified accounts with a large follower count.

- This bar chart shows the top 10 superspreaders in the data set. Scrolling down will give more details.
- A screenshot of the top of the “Super Friends” sub-report is shown below:



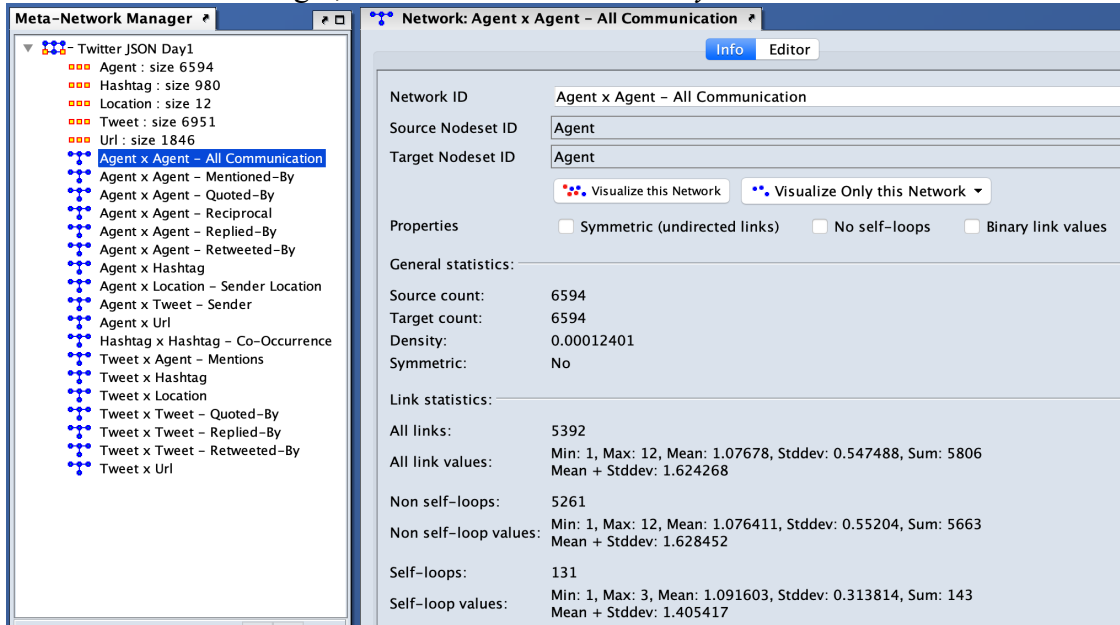
- Super-spreaders are individuals who engage in frequent two-way communication and help facilitate strong networks. Sometimes these are bots.
- The bar chart shows the top ten super-friends
- Later in the exercises when analyzing bots, cross this list with bot scores
- A screenshot of the “Other Influencers” sub-report is shown below:



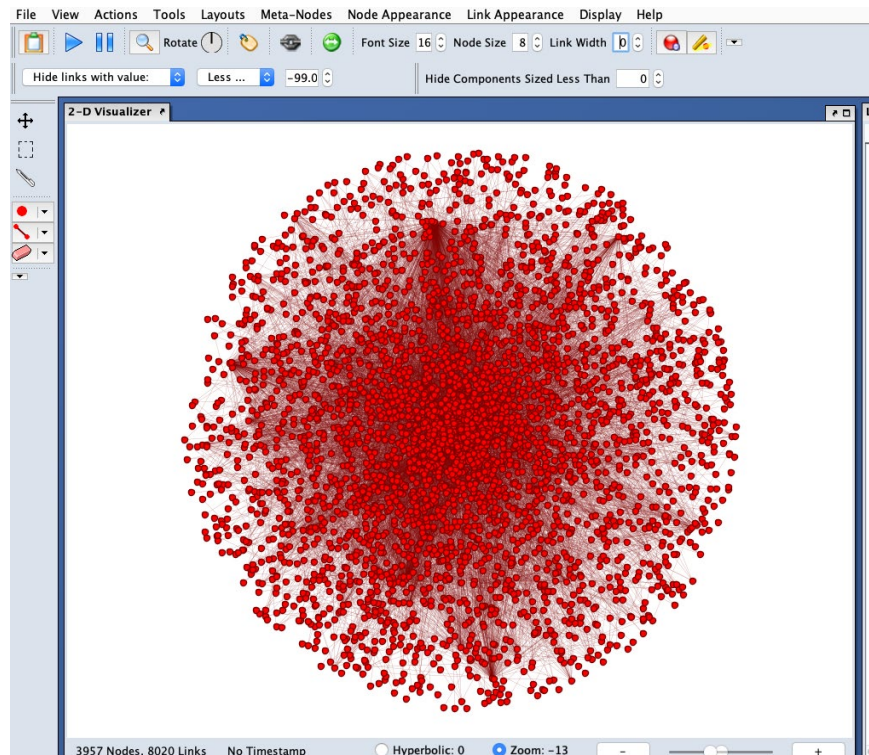
- Other influencers are individuals who in general have a large network presence, either by tweeting or mentioning others a lot.
- This bar chart shows the top 10 other influencers in this day's data set

d. Learn and interpret a data visualization

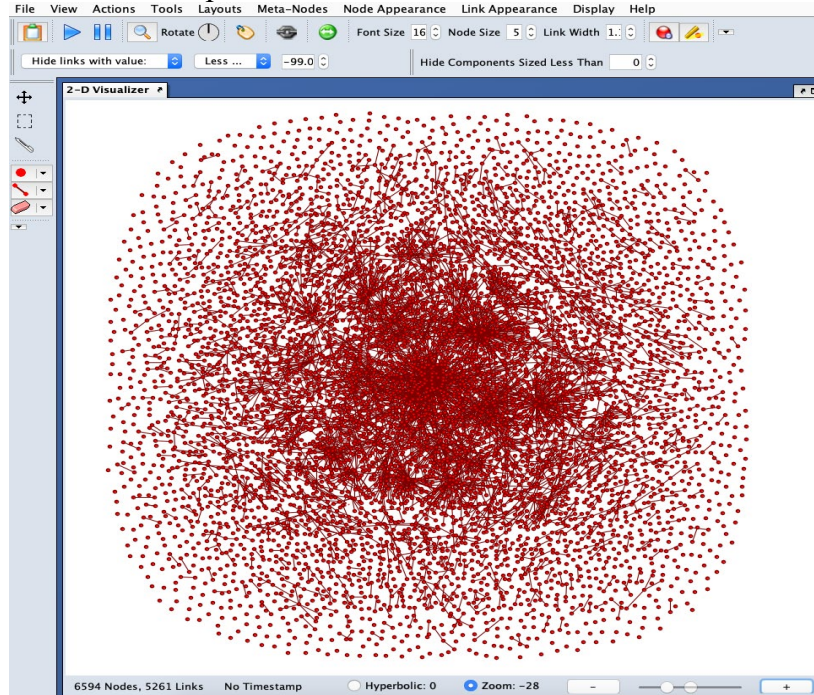
- To visualize a network in ORA, click on the network of interest under the Meta-Network Manager, then click on *Visualize Only this Network*.



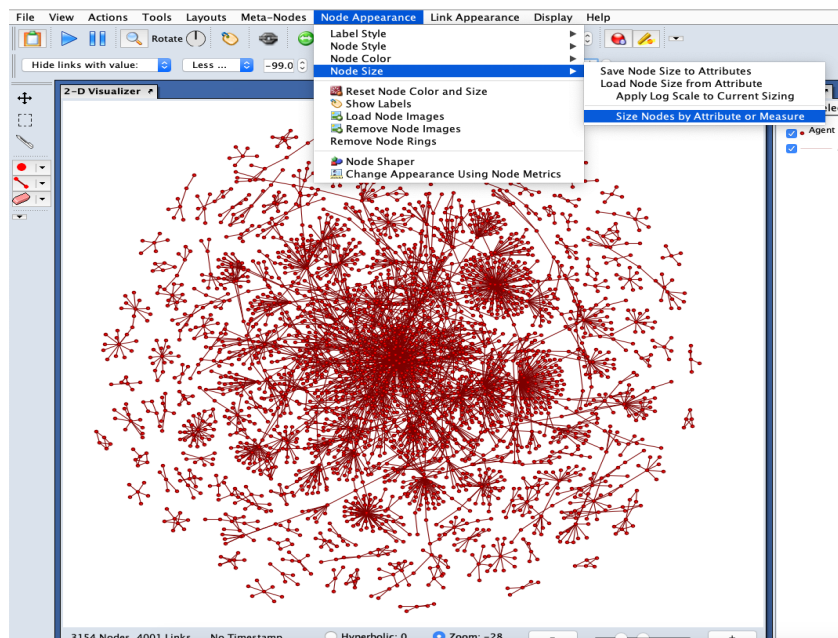
- For a large data set, the initial visualization created is often hard to analyze because of the number of nodes. A screenshot of the initial visualization is below



- At the top of the screen, you can change both “Node Size” and “Link Width” to improve the visualization
- Then clicking on ORA’s *Play* button on the top left-hand corner will smartly space out the nodes to make the visualization easier to understand
- A screenshot of the spaced out visualization is below:



- The visualization is spaced out well, but there are tons of isolates
- On the top, there is an option to “Hide Small Components Less Than” - type in a small number greater than 1.
- Hiding components of size less than **5**, the visualization is much better:



- Note: you can size or color nodes by a measure (like centrality) or attribute (like a grouping algorithm)
- Hovering over the nodes will show which user that node is

Q2. Identify and analyze a topic with a pro/anti side

- Visualize network - *shown in Q1-d*
- Run Twitter Report - *shown in Q1-c*
- Group algorithm - *shown in Q1-d*

6.3 Participant Actions

6.3.1 Notes and Briefing

Throughout the day, participants are taking detailed notes and screenshots so that they can refer to them later. An example of the “Notes Template” for this day is described below.

- Friendship Graph - screenshot, name of users selected
- Top Trending Topics - ex: NATO, training, etc.
- Pro/Anti Topics - if any
- Actors of Interest - from either top users on Scraawl or Super Spreaders/Super Friends/Other Influencers on ORA
- ORA Visualization - screenshot, explanation
- What COA did you take and why?

The teams then combine and condense their notes and analysis into a short end-of-day briefing PowerPoint that they then present to their higher ups.

The end-of-day presentation condenses the teams’ analysis and their COA into a one-slide presentation. This slide should cover:

- Objective
- Key Insights
- Course of Action Taken
- Justification

6.3.2 Course of Action

Tweet

What would you post as an official representative of NATO from the @NATOpres account?

- Post a negative message (criticize the anti-NATO protesters)

“These so-called “peace” activists don’t know what they are talking about. NATO is a force for good in the world!
 __link__ to good article about NATO”
- Post a positive message

“NATO is working hard to ensure the beautiful Norway land is kept unharmed by the exercises.”
- Mention the historic nature of the event to bring positive attention to NATO, using NATO-relevant hashtags

“Today marks the first day of #NorthernLightning2022. This event is bringing together 31 #NATO countries!”

- D. Retweet a news article about the exercises, tag important accounts in your post, and use relevant hashtags

```
"@NATO @NATOMarine @NATODefense We are proud to represent #NATO here in Norway. RT @NorwayNewsNow #NorthernLightning2022 is the largest #NATO exercise since the end of the Cold War with around 50,000 participants."
```

Impact

- A. Post a negative message (criticize the anti-NATO protesters)
- 5 individual soldiers RT this message
 - 5 "protestor" accounts reply or quote this message and add their own negative commentary (ex: "This is a lie - you are tearing up our landscape! #AntiNATO". One of these protestor accounts get at least twice as many retweets as the original message
- B. Post a positive message
- Those who typically retweet this NATO account plus 5 extra RTs
- C. Mention the historic nature of the event to bring positive attention to NATO, using NATO-relevant hashtags
- Those who typically retweet this NATO account plus 5 extra RTs
 - Two additional posts on the topic, also get RTs
- D. Retweet a news article about the exercises, tag important accounts in your post, and use relevant hashtags
- Those who typically retweet NATO plus 10 extra RTs

Best choices in order: C, D, then B is neutral, and then A is actively negative

6.3.3 End-of-Day Presentation

The end-of-day presentation condenses the teams' analysis and their COA into a one-slide presentation. This slide should cover:

- Objective
- Key Insights
- Course of Action Taken
- Justification
- What to Continue Monitoring

7 Training Day 2 - Bots, BEND, and Community Analysis

7.1 Overview

7.1.1 Goals

The primary goal is to continue analyzing key users, learn about bots, and understand communities and BEND maneuvers using December 6th data. This is the day that the exercises begin, and minor protests start forming.

To reach this goal, the participants need to get to an "advanced beginner" level of Twitter analysis in Scraawl and ORA and be able to answer these questions:

1. Identify key actors and trending topics

2. Identify potential bot candidates, and potential cyborgs and trolls
3. Find topic-oriented communities (TOC) in the BEND Report
4. Analyze the stance of these communities

7.1.2 Tasks

There are specific tasks associated with answering these questions.

- Q1. Identify key actors and trending topics
- a. Explore on your own using a combo of:
 - i. Trending Topics in Scraawl
 - ii. ORA Twitter Report
 - iii. Visualizations in both ORA/Scraawl
 - b. For screenshots/instructions for this, see [Training Day 1](#)
- Q2. Identify potential bot candidates, and potential cyborgs and trolls
- a. Run bot detection in Scraawl Socl
 - b. Export Scraawl bot results for ORA
 - c. Run BotHunter and import bot scores into ORA
 - d. Run Twitter report to analyze network measures of bots
- Q3. Find topic-oriented communities (TOC) in the BEND Report
- a. NetMapper: get BEND cues, load into ORA
 - b. ORA: run BEND/Community Report and analyze results
 - c. ORA: identify an echo chamber
 - d. Scraawl: perform topic modeling
- Q4. Analyze the stance of these communities
- a. ORA: run Stance Report
 - b. Scraawl: perform sentiment analysis

7.2 Step-by-Step

- Q2. Identify potential bot candidates, and potential cyborgs and trolls
- a. Run bot detection in Scraawl Socl
 - In Scraawl, clicked on the *Advanced Analytics* menu item, then select *Bot Detection*
 - This report shows the likelihood a particular account is bot or not using ~20 different characteristics (e.g., friend/follower ratio, posting frequency, etc.)

Scraawl Bot Detection uses various statistical, temporal and textual features that are detected in Scraawl search reports and historical user profiles to identify potential bots. The scores of the top users with the most representative bot behavior are shown.

Bot Users Statistics											On Twitter			
Avatar	Username	Confidence	Source	In This Report					On Twitter					
				Tweets	Hashtags	Mentions	Likes	Tweets/Day	Tweets	Likes	Followers	Friends	Tweets/Day	
	@murphyscat2012	Low	SYS	13	0	0	1	14	295,451	3,851	1,601	3,626	91	
	@AnatolyVlasov87	Low	SYS	2	0	1	49	2	66,640	12,872	15,593	844	27	
	@aifonline	Low	SYS	3	0	0	38	3	101,743	1	144,465	36	27	
	@AileenTwitt	Low	SYS	9	22	2	2	9	58,832	2,767	10	171	25	

- The confidence options are “Low”, “Medium”, or “High”. If a user is not included it means they are not a suspected bot
- Click on a specific user to drill down
- Filter - keep only matching or exclude selected
- Sort by confidence by clicking on the Confidence header

b. Export Scraawl bot results for ORA

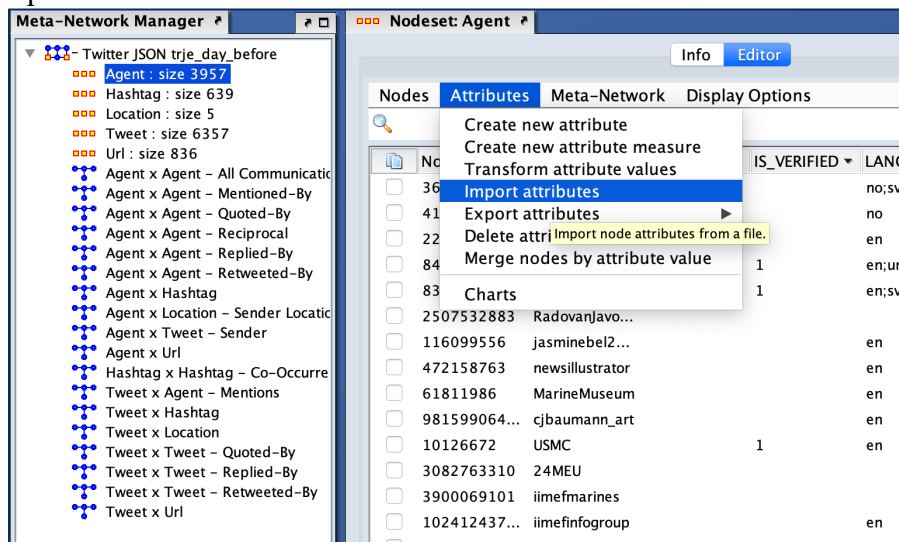
At the bottom of the Bot Detection page, can save these results to CSV or JSON file to export to ORA.



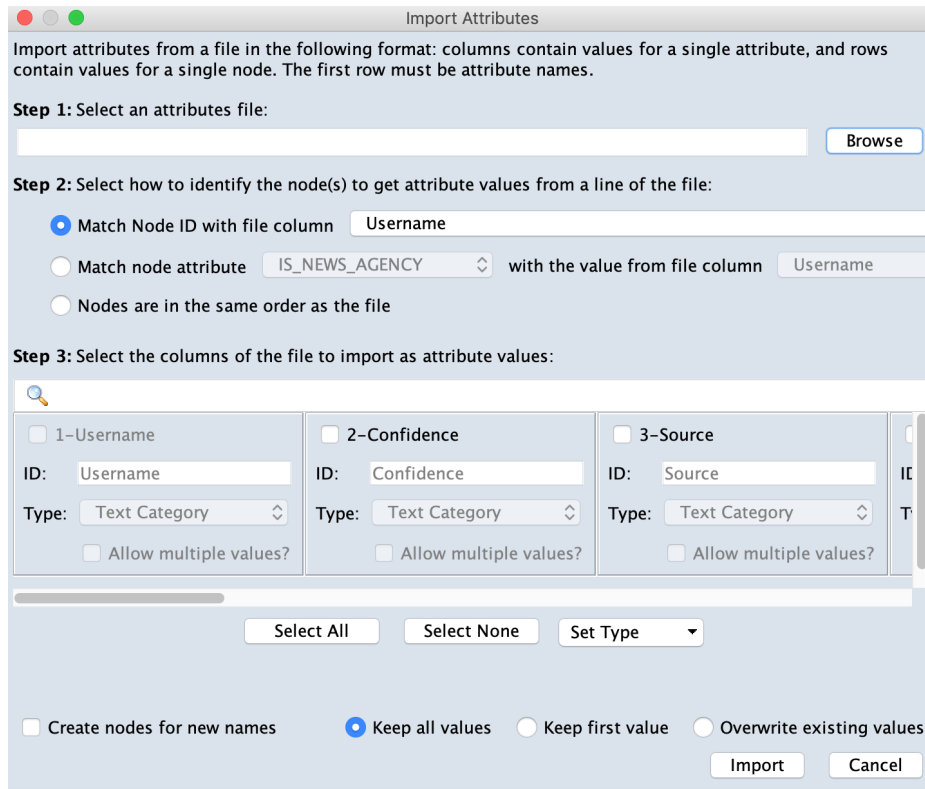
c. Run BotHunter and import bot scores into ORA

In the exercises, the participants were given an XML file that included bot scores to save time. However, in the future, they will be given the bot scores and other attributes, and they will need to learn how to import attributes into ORA.

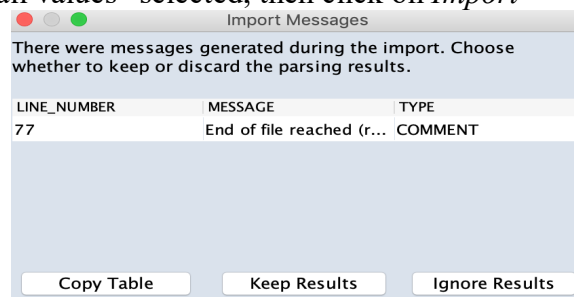
- With the Agent nodeset selected, go to the “Editor” tab → “Attributes” → “Import Attributes”



- To import the bot scores, Browse either to the Scraawl bot detection output or the BotHunter file



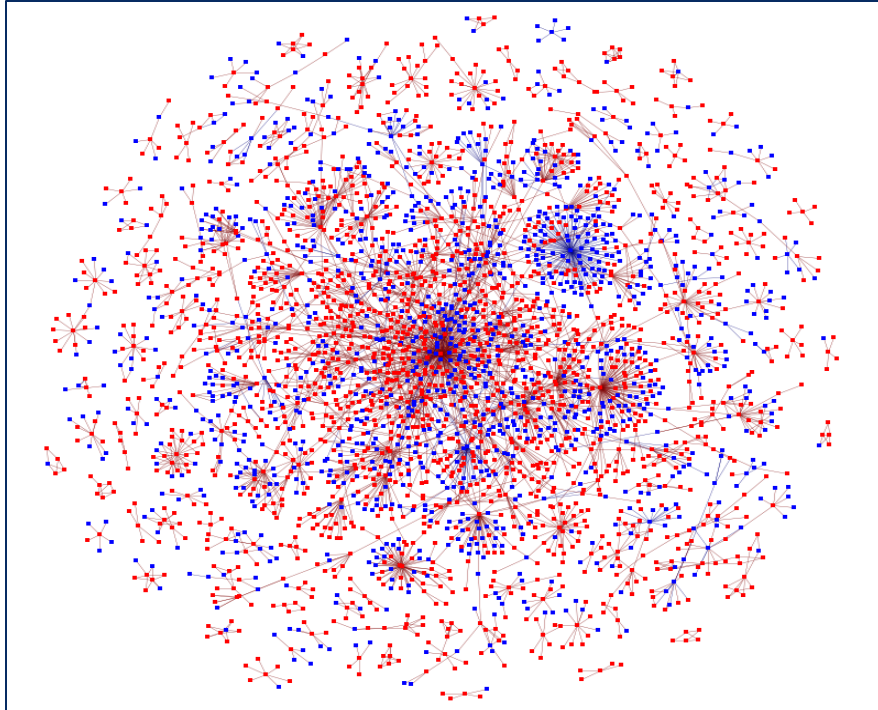
- Match Node ID with the appropriate file column
- Select the columns from the file to import
- Leave “Keep all values” selected, then click on *Import*



- This warning message indicates that not all accounts had a bot score. Click *Keep All Results* → *OK* to finish loading the attributes
- Next step is to analyze the bot scores
- Look up key users in the ORA editor

Node ID	Node Label	IS_BOT	IS_NEWS_...	IS_VERIFIED	LANGUA...	LOCATION	NUMBER_...	prediction	probability	screen_n...	TWEET_C...
124418093	NATOpres	0	1	1	en	Brussels, Bel...	41630	FALSE	0.017538	NATOpres	10
3087599830	M_HURTADOS	1			es	España	1130	TRUE	0.833462	M_HURTADOS	2

- You can color nodes by bot probability
- In the following screenshot, the red nodes are not bots, and the blue ones have bot probability greater than 0.5



- d. Run Twitter report to analyze network measures of bots
- Re-run the Twitter report after the bot scores have been loaded and look at the “Analysis of Tweeters - Attributes” sub-reports
 - It shows the min, mean, and max bot score overall and in certain groups like news agencies, top ranked, and verified

Continuous Attribute probability by Tweeter Group

Show entries Search:

Group	Size	Min	Mean	Max	Std.dev
News Agencies	86	0	0.213	0.980	0.309
Top Ranked	10	0	0.280	0.833	0.279
Verified	304	0	0.051	0.563	0.111

Showing 1 to 3 of 3 entries Previous Next

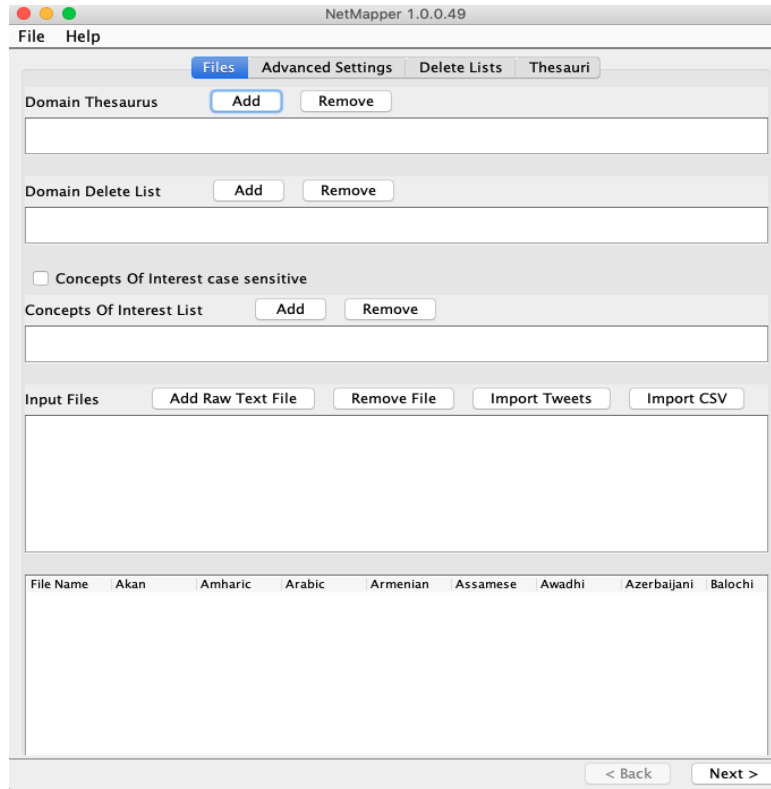
	Size	Min	Mean	Max	Std.dev
All nodes	6594	0	0.360	0.992	0.369

Q3. Find topic-oriented communities (TOC) in the BEND Report

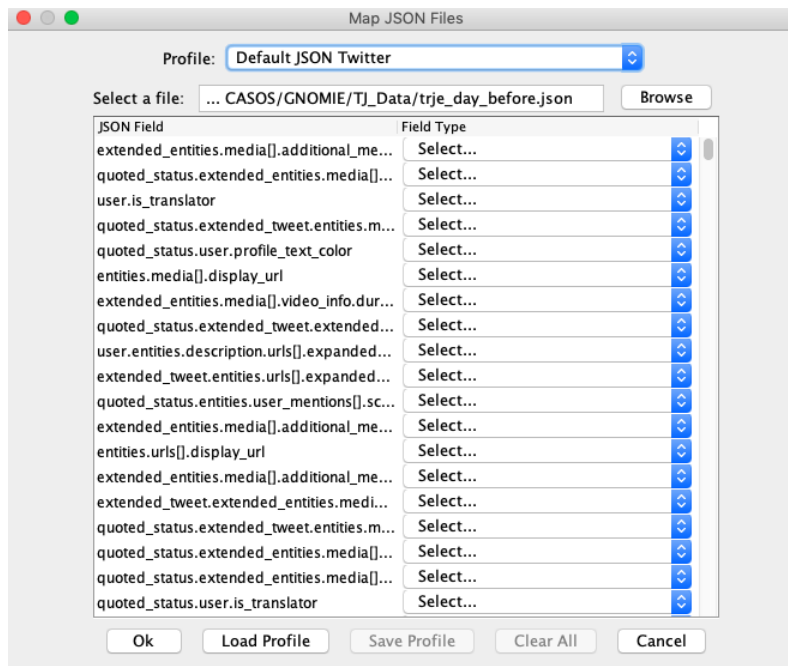
- a. NetMapper: get BEND cues, load into ORA

For more information on NetMapper, please see the user guide (Malloy and Carley, 2020). During the June exercises, the BEND cues were pre-loaded into their data XML file. However, the participants will use NetMapper in future iterations.

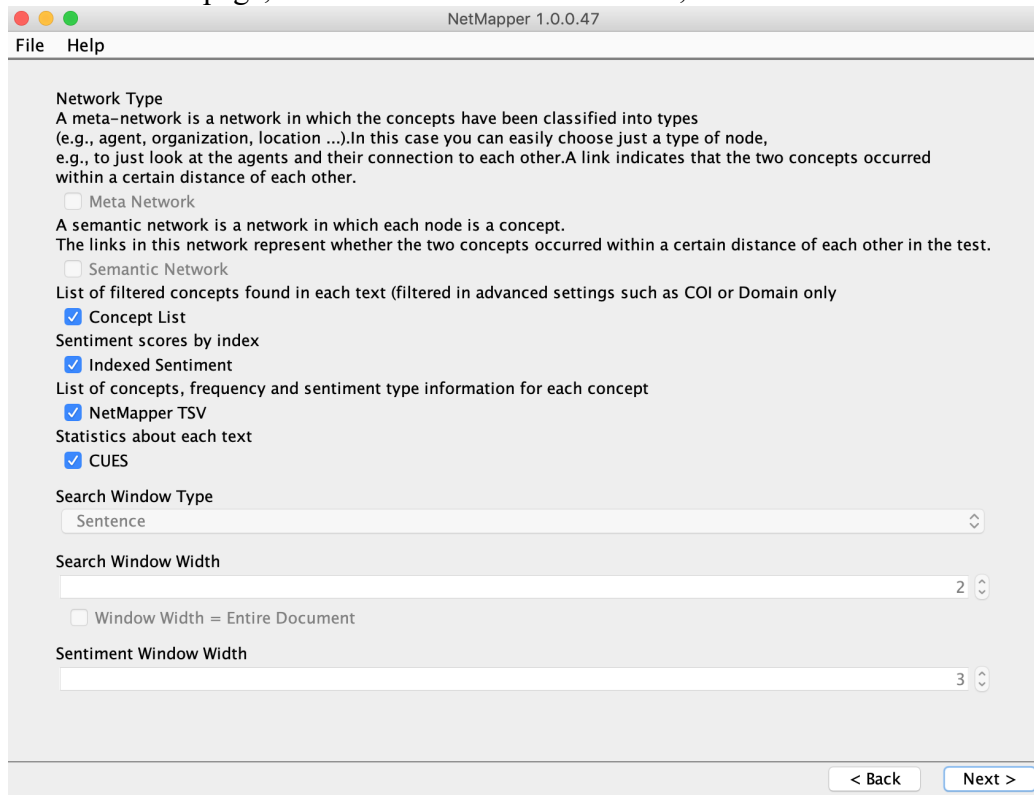
First, load the Twitter data into NetMapper. Click on *Import Tweets*



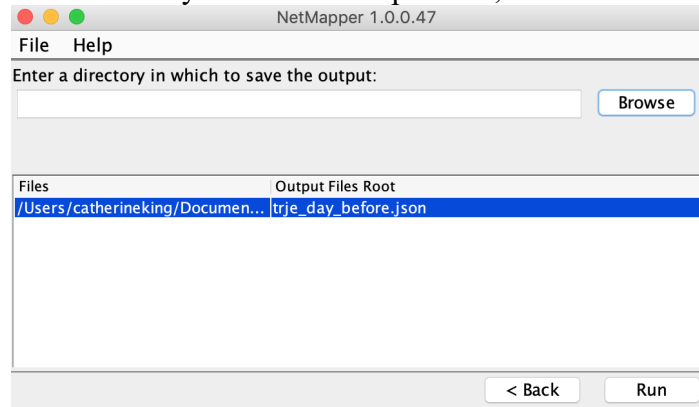
- On the next page, *browse* to the Twitter data and leave the Profile as “Default JSON Twitter”, then click *OK*



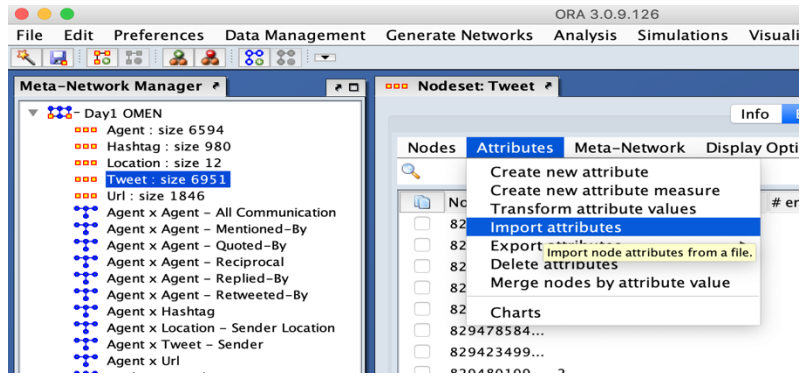
- On the next page, ensure that “CUES” is checked, then click *Next*



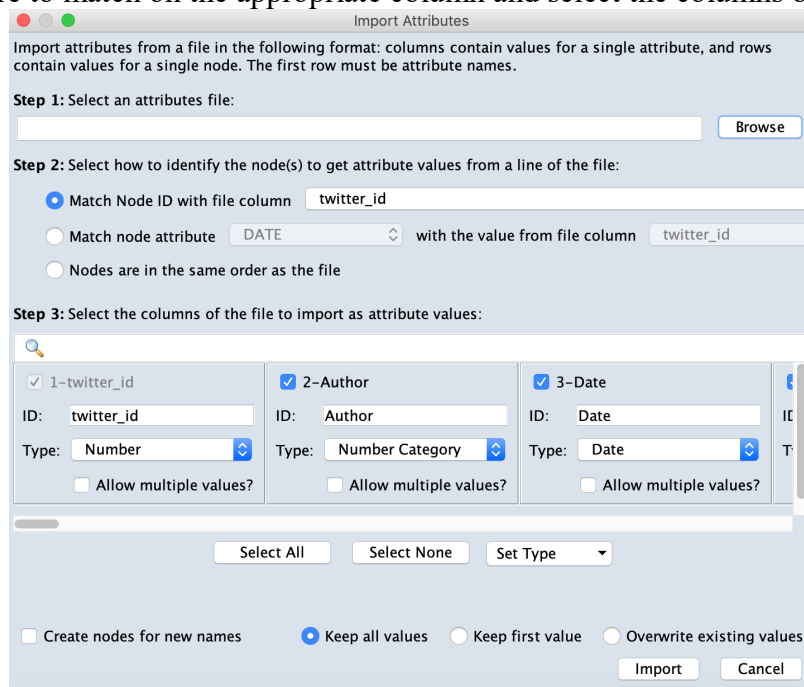
- Finally, enter a directory to save the output files, then click on *Run*



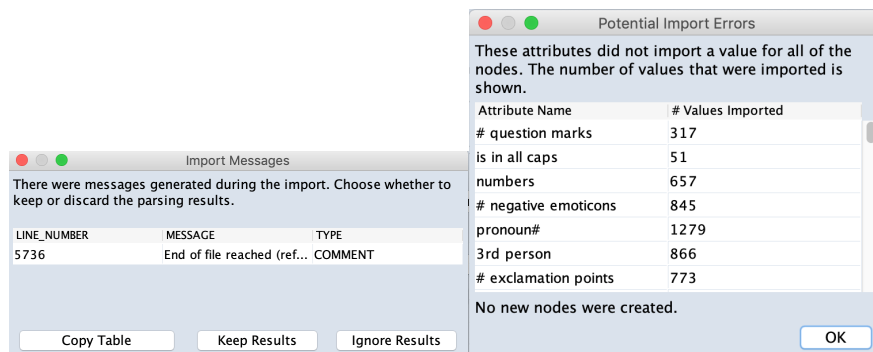
- Next, import NetMapper cues into ORA as attributes. Use the same steps as when loading the bot scores
- Tweet Nodeset → Attributes → Import Attributes from a file



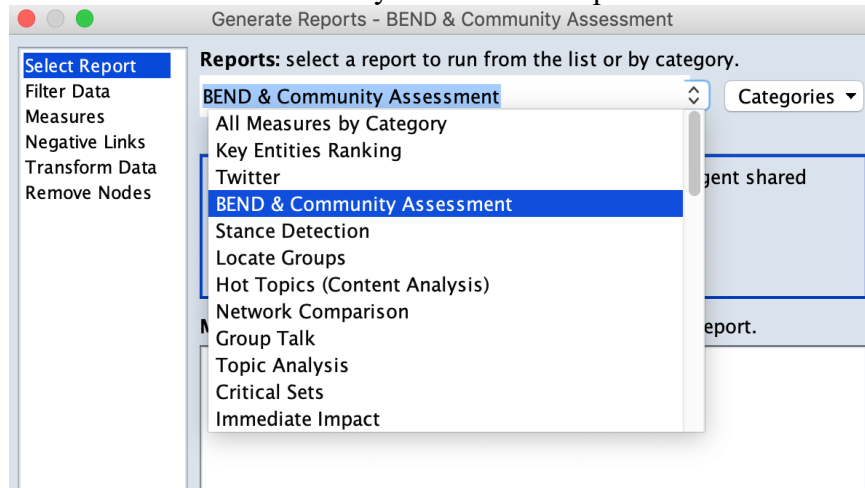
- Browse to the file with the Cues
- Ensure to match on the appropriate column and select the columns of interest



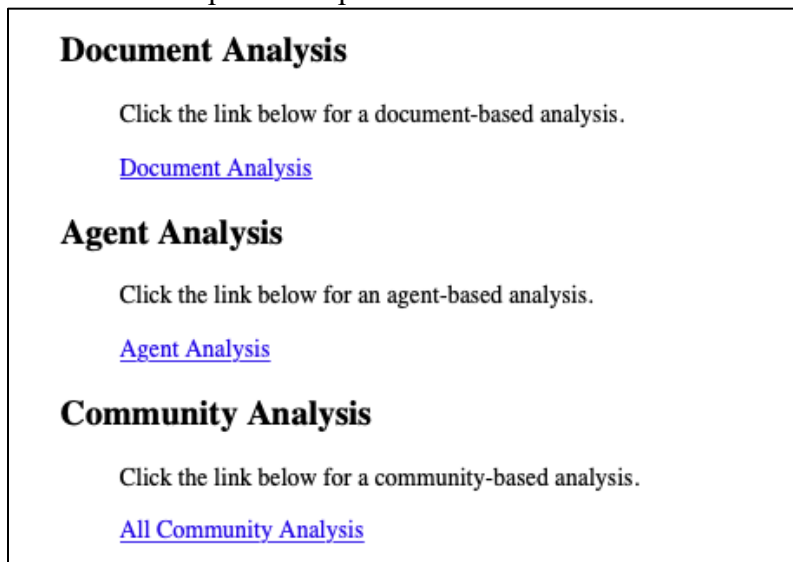
- Select “keep all values”, then click on *Import*
- There may be a warning message since not all tweets with have all cues. Click on *Keep Results* then *Ok*



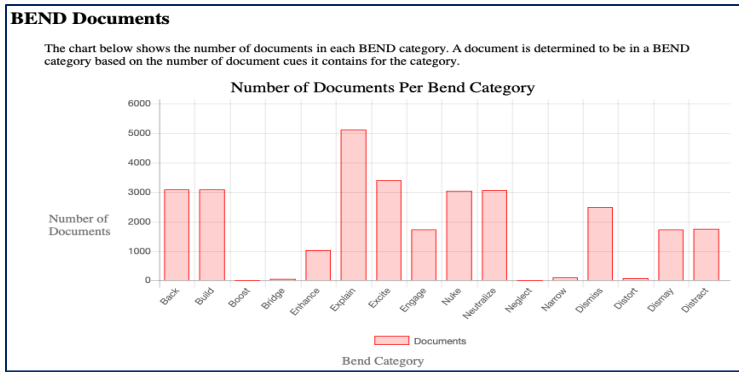
- b. ORA: run BEND/Community Report and analyze results
 - Having loaded the CUES, run the BEND report in the same way as running Twitter Report earlier
 - Select the “BEND & Community Assessment Report”



- In Agent Communities, select the minimum number of agents per community and maximum number of communities (for example 3 and 50)
- Click Next then run the report
- A screenshot of the top of the report is shown below



- The Document Analysis subreport shows number of tweets in each BEND maneuver. A screenshot of the top part of this report is shown below. It is a bar chart that shows the total number of documents with each BEND maneuver.



- The Agent Analysis shows the agents maneuvering and being maneuvered upon. It looks like the Document subreport.
- The Community Analysis shows summary statistics and various statistics for each of the communities. A snippet of the Community Analysis for 3 communities is shown below.

Community	Degree Centralization	Density	E/I Index	Echo Chamberness	Reciprocity	Specialty Concepts	Total Agent	Total Hashtag	Total Tweet	Total Url
37	0.833	0.333	0	0	0	ЕС, ШАРЖИПЕРО, Карикатуры, Россия, Эстония	3	6	5	1
38	1.667	0.222	-0.333	0	0	amici16	3	1	5	0
4	2.933	0.139	0.881	0	0	https://goo.gl/tHzfgq , https://youtu.be/TDOFWLZqwEU , Ukraine, russia, NATO	6	3	22	2

c. ORA: identify an echo chamber

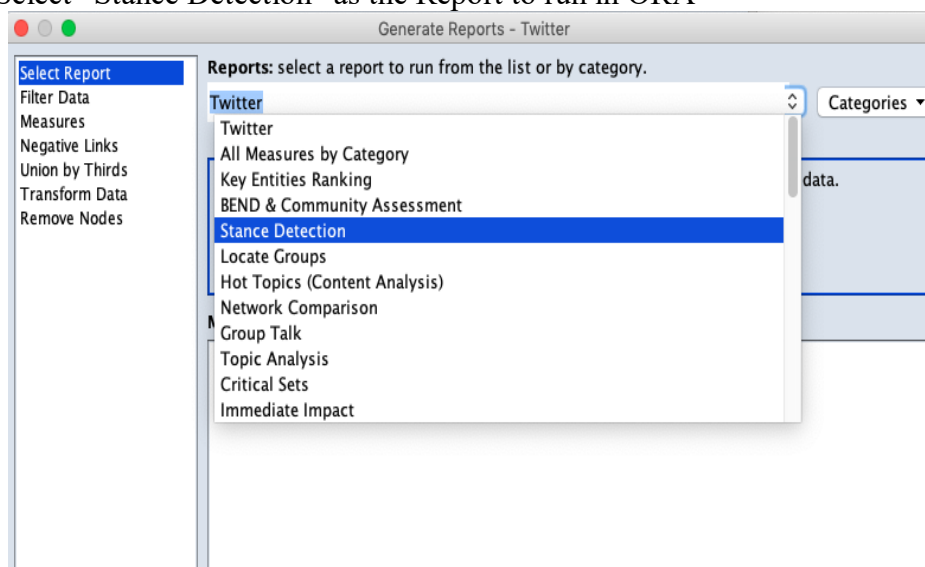
The Community Analysis subreport of the BEND & Community Assessment Report gives an “Echo Chamberness” score per community.

d. Scraawl: perform topic modeling - *done in section* Training Day 1 Q1

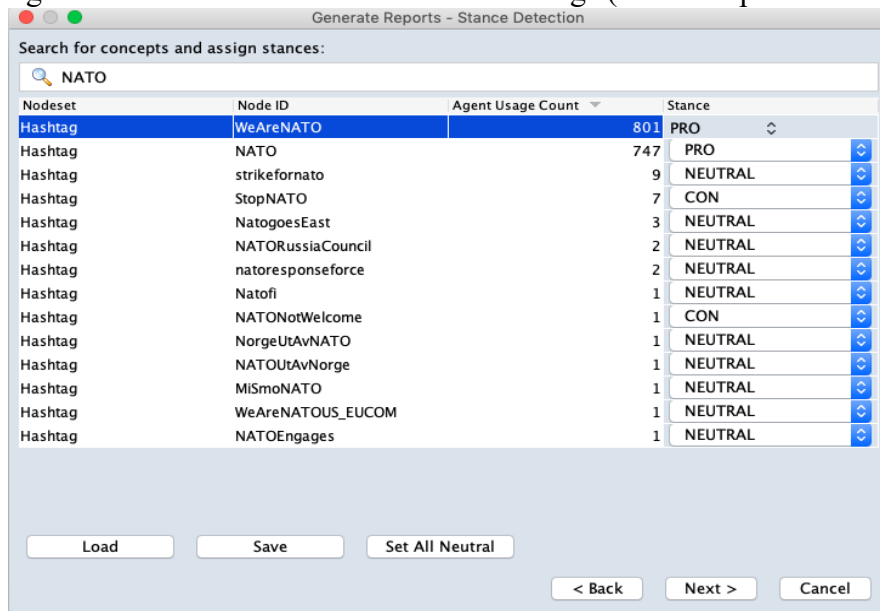
Q4. Analyze the stance of these communities

a. ORA: run Stance Report

- Select “Stance Detection” as the Report to run in ORA



- Assign stance values to a selected set of hashtags (at least 2 pro and 2 anti)



- The report shows how many agents ended up in each category

Agent Stance Summary		
	Number of nodes	Mean node confidence
Pro Nodes	518	1
Con Nodes	1784	0.364
Not Assigned	1655	
Controversy	Controversy ranges from 0 to 1 and indicates the degree to which Pro and Con nodes interact with nodes of the opposite stance. A score near 1 means that nodes predominantly interact with the main opinion leaders of their own side.	0.935

- It also shows the top pro and con users

Agent Con Stance

The con-stance Agent nodes ranked by the confidence of the stance calculation.

If the node of interest has a higher than normal value (greater than 1 standard deviation(s) above the mean) the row is colored red. The row is green if the node is within 1 standard deviation of the mean. Finally, the row is colored blue if the node has a lower than normal value (less than one standard deviation(s) below the mean).

Show (10) entries Search:

Rank	Agent	Confidence
1	2011arvyk	1
2	4aChangePL	1
3	ABDIstanbul[+]	1
4	ALitvinow	1
5	AndreaMaini_Nor	1
6	AramShabanian	1
7	ArmadaTweetuje	1
8	ArmyVehicleClub	1
9	AsysScs	1
10	BDSV_Berlin	1

Showing 1 to 10 of 100 entries Previous 1 2 3 4 5 ... 10 Next

Agent Pro Stance

The pro-stance Agent nodes ranked by the confidence of the stance calculation.

If the node of interest has a higher than normal value (greater than 1 standard deviation(s) above the mean) the row is colored red. The row is green if the node is within 1 standard deviation of the mean. Finally, the row is colored blue if the node has a lower than normal value (less than one standard deviation(s) below the mean).

Show (10) entries Search:

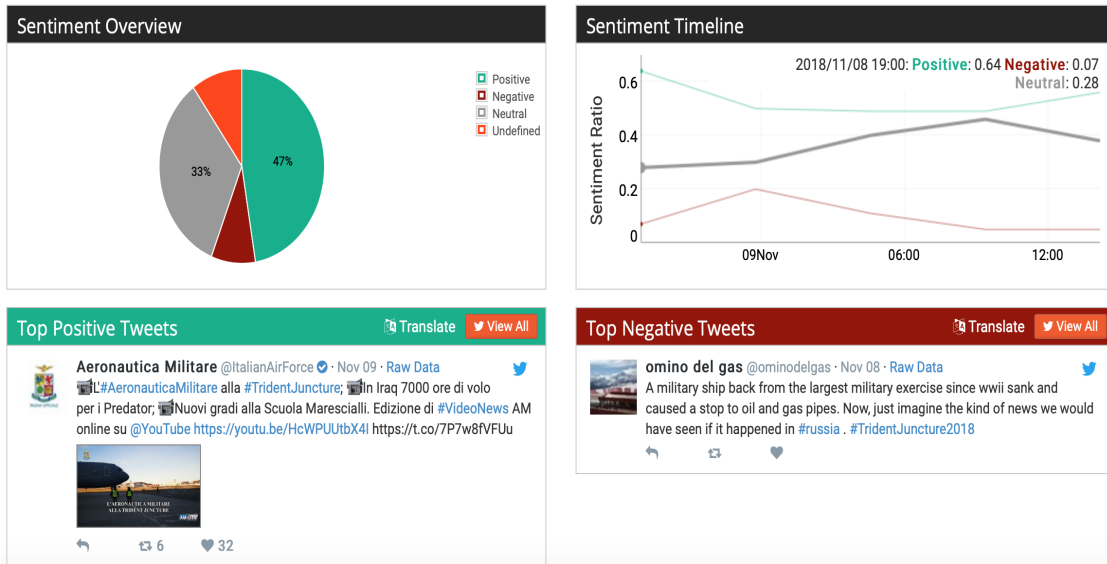
Rank	Agent	Confidence
1	15thSMA[+]	1
2	1denmadrid	1
3	2017Coup	1
4	2017_itstime	1
5	4ngl3rf1sh	1
6	4thClassOfficer	1
7	62RINARINA	1
8	715reb	1
9	9Joe9	1
10	ADESyD2011	1

Showing 1 to 10 of 100 entries Previous 1 2 3 4 5 ... 10 Next

- Lower on the report, a similar analysis categorizes hashtags and top pro and top con hashtags.

b. Scraawl: perform sentiment analysis

- With your Report open, *Advanced Analytics* → *Sentiment Analysis*



- “View All” under Top Positive Tweets and Top Negative Tweets shows example tweets in those categories

7.3 Participant Actions

7.3.1 Notes and Briefing

Throughout the day, participants are taking detailed notes and screenshots so that they can refer to them later. An example of the “Notes Template” for this day is described below.

- Friendship Graph - screenshot, name of users selected
- Top Trending Topics - ex: NATO, training, etc.
- Pro/Anti Topics - if any
- Actors of Interest - from either top users on Scraawl or Super Spreaders/Super Friends/Other Influencers on ORA
- ORA Visualization - screenshot, explanation
- Bot candidates - from both Scraawl and ORA
- Most interesting bots and why
- What COA did you take and why?

The teams then combine and condense their notes and analysis into a short end-of-day briefing PowerPoint that they then present to their higher ups.

7.3.2 Course of Action

What account should NATO report to Twitter to have suspended? Whichever account is chosen will be suspended for the rest of the game (and will not show up in the data going forward).

- A. A high centrality news bot (@ukranews_life)
- B. An account that always retweets RT (@brsainr)
- C. An amplification bot (@libertad717)

8 Exercise Day 1 - Collision

8.1 Overview

The primary goal is to continue analyzing key users, bots, and communities using December 7th data. This is the day that the collision occurs.

To reach this goal, the participants need to use the techniques they learned during the two training days. These are the main questions:

1. Identify key actors and trending topics
2. Identify bots, cyborgs, and trolls in the dataset
3. Identify and analyze a topic with a pro/anti hashtag
4. Identify topic-oriented communities and BEND maneuvers
5. Perform sentiment analysis
6. Take an action

8.2 Participant Actions

8.2.1 Course of Action

Tweets

How would you respond to accounts tweeting about Lightning Dolt/memes? What maneuver would you use?

- A. Bridging - Make a joke about #LightningDolt, try to change narrative by thanking Norway; tag important people/organizations:
@NATO "We came to Norway expecting #NorthernLightning not #LightningDolt...We are grateful for everyone on our team and locals who stepped up and ensured that no one was critically injured and that we could minimize the environmental damage. These people truly went above and beyond! Thank you, Norway!"
- B. Explain - Retweet a negative news article about the damage NATO is doing from the main news media, NNN, and tag important accounts in your post trying to aggressively push back on the narrative by fact-checking it:
"We are proud to represent #NATO here in Norway and thankful that the situation was not worse. Unfortunately, this article does not show the full story. We are in the process of repairing the environmental damage and there will be no long-term consequences. RT--NEWS ARTICLE LINK--"

Impact

- A. Bridging - Make a joke about #LightningDolt, try to change narrative by thanking Norway, tag important people/organizations:
 - a. Around 5-7 retweets (from @NATO, @AdmiralFogga, and the rest from bots, soldiers, and general user accounts). Around 3-5 replies to this tweet from general users and soldier accounts. The soldier accounts are positive, confirm no one was injured, and/or congratulate leadership in some way. At least one of the general user replies is negative (ex: How could this have happened?!? You are damaging our country).
- B. Explain - Retweet a negative news article about the damage NATO is doing from the main news media, NNN, and tag important accounts in your post trying to aggressively push back on the narrative by fact-checking it:
 - a. Around 3-5 retweets, exclusively from NATO accounts like @NATO, @NATODefense, etc.

8.2.2 Notes and Briefing

Throughout the day, participants are taking detailed notes and screenshots so that they can refer to them later. They then put their analyses together into a short, end-of-day briefing.

9 Exercise Day 2 - Post-Collision/Viral Outbreak

9.1 Overview

The primary goal is to continue analyzing key users, bots, and communities using December 8th data. This is the day after the collision occurs and when the viral outbreak grows.

To reach this goal, the participants need to use the techniques they learned during the two training days. These are the main questions:

1. Identify key actors and trending topics (virus-related)
2. Identify bots, cyborgs, and trolls in the dataset
3. Identify and analyze a topic with a pro/anti hashtag
4. Identify topic-oriented communities and BEND maneuvers
5. Perform sentiment analysis
6. Take an action

9.2 Participant Actions

9.2.1 Course of Action

Tweets

- A. Neutralize, Nuke adversary and Excite NATO:
 - a. Report the biggest detractors (@rianru; bbb) and spreader of negative information and misinformation to Twitter and have them suspended.
 - b. Send out a flurry of tweets with positive information, stating the success of the NATO exercise.
 - c. Send out a few tweets stating no environmental damage
- B. Enhance Build
 - a. Messaging from NAVYmed:
 - i. NATO to leave NAVYmed personnel to support NATO personnel who contracted virus and local community
 - ii. USA to leave naval hospital ship - where all NATO personnel who contracted virus will be quarantined
 - iii. There was no virus on the frigate
 - b. Have Col Ficta coordinate with the PAO in the coordinate commands to amplify the positive release by all NATO groups
 - c. Send out a flurry of tweets stating the success of the NATO exercise

Impact

- A. Impact of Neutralize, Nuke adversary and Excite NATO:
 - a. The biggest detractor/spread of misinformation is removed from the data set for the following day
 - b. Both sets of tweets get several responses and retweets
- B. Impact of Enhance, Build campaign:
 - a. See many tweets containing misinformation since you did not choose option A where that account would have been suspended

- b. Get many tweets from NavyMed account, retweets from general users and official users

9.2.2 Notes and Briefing

Throughout the day, participants are taking detailed notes and screenshots so that they can refer to them later. They then put their analyses together into a short, end-of-day briefing.

10 Exercise Day 3 - Virus Misinformation

10.1 Overview

The primary goal is to continue analyzing key users, bots, and communities using December 9th data. Misinformation on the virus continues to spread on this day.

To reach this goal, the participants need to use the techniques they learned during the two training days. These are the main questions:

1. Identify key actors and trending topics (virus-related)
2. Identify bots, cyborgs, and trolls in the dataset
3. Identify and analyze a topic with a pro/anti hashtag
4. Identify topic-oriented communities and BEND maneuvers
5. Perform sentiment analysis
6. Take an action

10.2 Participant Action

10.2.1 Course of Action

There is no course of action on the last day of exercise. Instead, the participants were asked to analyze the differences in the data between options A and B from the previous day. They were given both sets of data.

10.2.2 Notes and Briefing

Throughout the day, participants are taking detailed notes and screenshots so that they can refer to them later. They then put their analyses together into a short, end-of-day briefing.

11 Test Run

11.1 Objectives

The objective of this test run was to test the following:

- Test the ability to realistically simulate potential information conflicts
- Test the hybrid learning environment developed because of COVID-19 conditions
- Get data and feedback from real analysts at ONR to help improve the training

11.2 Example Reports

Example Daily Report from Test Run (Alpha Team, 2021):

COA Recommendation

Where is Norway in this?

- Host nation of the exercise, Norway, is not being hashtagged often. Norway is not present as a top hashtag in any community, as it is less noisy. Team assesses that mention of Norway are being drowned out by other top communities
- Team then explored what other competing communities might be interacting in the information space
- Only 1 original tweet about Norway (12 other retweets)



Explain (Orient) what's going on that the general should

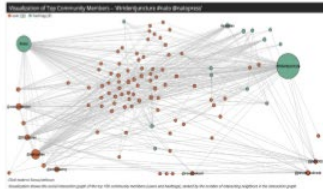
Boost - Retweet a neutral news article about the exercises from the main news media, NNN, tag important accounts in your post, and use relevant hashtags

Recommend COA & Justify Choice (Decide/Act) Option D

Current IE is neutral with limited narratives being spread. Adversary is keeping pace with NATO's social media footprint; indicating an opportunity to BOOST other sources that the exercise.

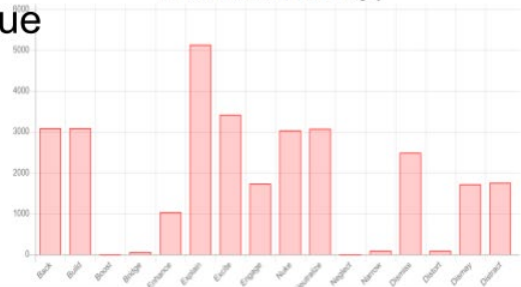
Quad Chart Example for Critique

OBSERVE: NATO official accounts are doing extremely well. They are top influencers* and have strong superspreader characteristics**



On the whole, NATO messages need to be increased. Competitor messaging is keeping pace with NATO messaging on the whole.

Number of Documents Per Bend Category



Recommend COA & Justify Choice (Decide/Act) Option X

Raise level of messaging in terms of total quantity. Official messaging has strong traction, there isn't enough of it.

11.3 Overall Assessment

The participants accomplished some aspects of each of the following learning objectives. This assessment comes from the "After Action Review" PowerPoint presentation that took place on July 1st, 2021 right after the exercises (Goolsby, 2021b).

- **Diving Deep**
 - Participants searched on different words, hashtags
 - Participants visualized the space, found related hashtags
 - Sometimes did not use all possible capabilities to see the forest above the trees, including merging hashtags, filtering etc.

- But often only looked at the top 10 actors, hashtags, etc. - sometimes adversarial activity can start deeper
- **Hashtag Latching**
 - Some participants closely examined messages, used sentiment analysis, and understood sentiment and hashtag mismatch can be a sign of adversarial activity
 - Most did not use the sentiment features and did not find the hashtag latching
- **Confirmation Bias**
 - Participants started with an open mind
 - Sometimes were not aware of their own biases - would find one bad guy and be done or assumed Russian bots would not tweet out positive content
- **Documentation**
 - Participants did a good job of screen grabbing important information
 - However, they spent little time adding documentation to those pictures, which made it difficult to later go back and understand their thought process
- **Bot Identification and Disinformation**
 - Participants found bots in Scraawl and ORA, ran sphere of influence around them
 - Participants found many bots that were spreading disinformation
 - However, many participants thought they could recognize bots directly in the data - bots are very difficult to spot without tools
 - They did not start by visualizing the network and coloring by bot or not, and missed many bots
 - Many also assumed bots were the only spreaders of disinformation (not accurate), and assumed all bots would spread disinformation (so thought those not spreading disinformation must be data errors)
- **Recognizing BEND Maneuvers**
 - Participants ran and interpreted the BEND report accurately
 - But did not always identify the target of the maneuver, or differentiate actors by maneuver they used
- **Choosing which BEND Maneuver to use**
 - Participants did a great job in discussing the COAs in terms of which BEND maneuver would be most effective in that case (for example, if a COA would increase NATO's superspreader status or not)
 - However, they were less effective at thinking about how BEND maneuvers could be used together
- **Finding Impact**
 - Participants would analyze their choice in the next day's data, recognized that one choice backfired
 - However, they assumed the impact would be immediate and did not look beyond the first day after their COA

Overall, participants actively went back and forth between tools themselves or were very strongly collaborating with someone using the other tool and asking for

confirmation or elaboration or additional information. The team faced a complex scenario but were able to recognize more of the events and more nuance than was typical for even much simpler scenarios. Using Scraawl and ORA synergistically, these teams generated insights in 4 hours that would have taken a team with only Twitter API access 2-7 days to analyze.

11.4 Lessons Learned

The main lessons learned include:

- Make days one and two of the exercise a flipped classroom design, highlighting all the useful functions of the software that are of value for later days and value of the BEND metrics.
- Encourage participants to continue to find more than one or two bots in the daily datasets.
- Direct more effort into documenting the performance and justifications of each teams' COAs.
- Provide more guidance for elements of the storyline to do a deep dive into during the exercise.

Throughout the process, we also learned about issues with the data or aspects of the data that were confusing the participants. For example, President Trump's account name was changed from @realDonaldTrump to @USAPres. However, Trump himself was talked about quite a bit in both the Trident Juncture and COVID-19 datasets. There are also many accounts in the data that mention Trump in their own username. This confused participants since Trump is no longer president and would not be president in a hypothetical 2022 exercise.

There were also other references to individuals who are no longer in power or have passed (ex: John McCain), and it may be difficult to manually find all instances of this in such a large dataset. Once the synthetic generator is complete, ideally these data issues will be more easily solved.

12 Scoring System

During the exercises, participants were not formally scored. The following scoring system is a general guide for how participants could be scored in future iterations of the game.

12.1 High-Level

12.1.1 *Training Day 1*

These are the high-level learning objectives and points earned for the first day of the storyline.

Learning Objective	Points
--------------------	--------

Scraawl: Collect data using keywords; understand main report and filters	10 points
Scraawl: Create and interpret a friendship graph	5 points
Scraawl: Find and interpret top topics	5 points
Share data between Scraawl and ORA	5 points
ORA: Load data, understand the layout	10 points
ORA: Run and interpret the Twitter Report	10 points
ORA: Create and interpret visualizations	10 points
Identify three actors of interest and explain why they are important	5 points per actor
COA: Choose and justify which course of action you selected	20 points
Presentation	10 points

12.1.2 *Training Day 2*

These are the high-level learning objectives and points earned for storyline day 2, which is the start of the exercise, minor protests, and initial reports of an illness. Participants should be using both Scraawl and ORA:

Learning Objective	Points
Identify key actors	5 points
Identify key topics	5 points
Run and analyze bot detection in Scraawl	15 points
Load BotHunter scores into ORA and analyze	15 points
Run NetMapper to get BEN CUES, load into ORA	5 points
Run and interpret ORA BEND/Community Report	10 points
Run and interpret ORA Stance Report	10 points
Scraawl Sentiment Analysis	5 points
COA: Choose and justify which course of action you selected	20 points

Presentation	10 points
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12.1.3 *Exercise Days 1 - 3*

These are the high-level learning objectives and points earned during each of the exercise days. Participants use a combination of visualizations and reports from both ORA and Scraawl.

Learning Objective	Points
Identify key actors and trending topics	10 points
Identify bots, trolls, and cyborgs	10 points
Identify topics with a pro/anti side using stance, sentiment analysis etc.	15 points
Identify communities and BEND maneuvers	20 points
Find other key insights (changes over time, compare different COAs, etc.)	15 points
COA: Choose and justify which course of action you selected	20 points
Presentation	10 points

13 Summary

We designed and implemented an initial version of the OMEN game that helps train analysts on social media analytics and misinformation detection. During this exercise, participants were able to quickly analyze large amounts of data using the software tools they were given. On each exercise day, they found useful insights during the 4-hour event that would have likely taken them up to a week to complete using just the Twitter API. The skills participants learned apply to their everyday jobs and can also be applied to other types of social media data.

The June exercises provided us feedback on the game. It showed us which training was sticking or not sticking for the participants, and any data or scenario issues that may cause players confusion. Even in its initial version, this game could be administered as is to other groups with minor data and scenario tweaks and fixes. While this scenario works as is, it is likely we will create new scenarios on a regular basis so individuals can repeat the training if they wish or take a more advanced version of it. This version of the game will also be improved upon in the future by adding synthetic data, a more advanced learning system, and a formal gaming platform.

14 Summary

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