Automatic Detection of Cybersecurity Events from Turkish Twitter Stream and Turkish Newspaper Data

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Outline

Motive

FIGURE – *Tweets in Turkish After the Turktrust Vulnerability Announcement on 3 January 2013. Retrieved June 28, 2019, from https ://twitter.com.*

Objectives

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- Design and develop a software system for **real-time cyber security event detection using Turkish texts**.
- Design the system as a **framework** for further research.

Routine Tasks of an Information Security Analyst

- Take **countermeasures** for **protecting organizational-level, mission-critical and sensitive information**, as well as being prepared for **cyber attacks**.

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- **Analyze data** and **recommend changes** to managers.

Challenges of being an Information Security Analyst

FIGURE – *Research results of IBM Security Lab about Cyber Security Analysts*

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Challenges of being an Information Security Analyst

Is it really sustainable ?

FIGURE – *Research results of IBM Security Lab about Cyber Security Analysts*

What is Natural Language Processing and Text Mining ?

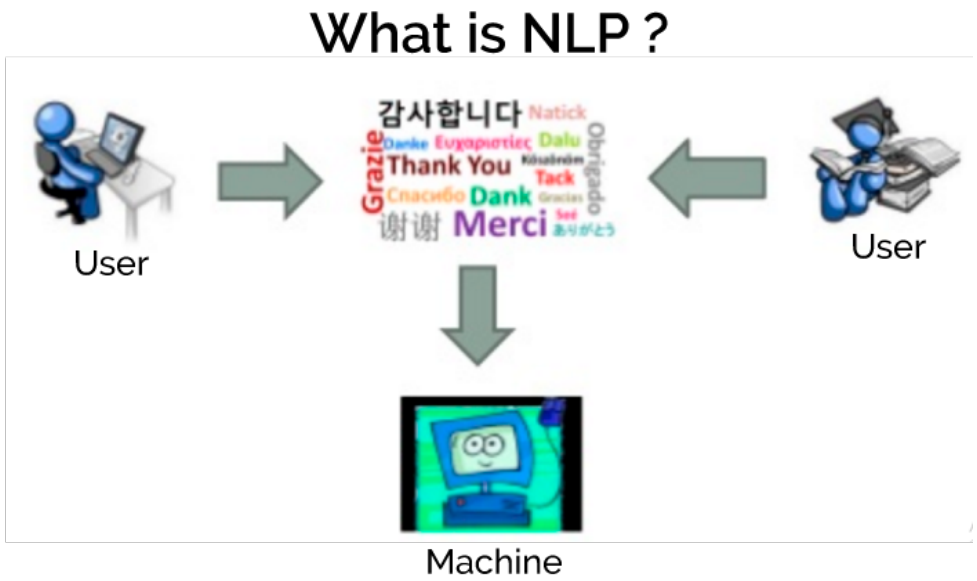

FIGURE – *A Simple diagram to explain what Natural Language Processing does.*

- **Natural Language Processing** is ability of machines to understand and interpret human language the way it is written or spoken.

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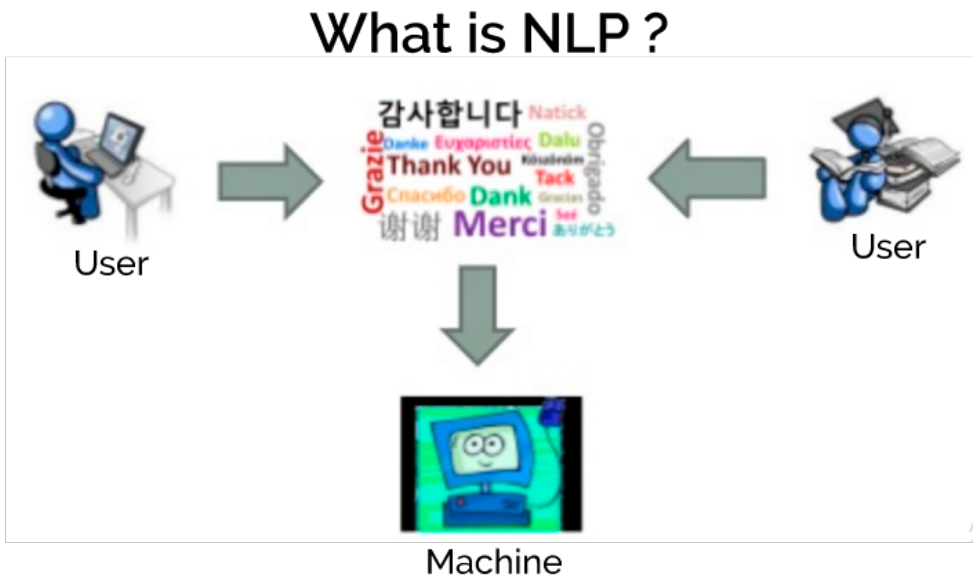

FIGURE – *A Simple diagram to explain what Natural Language Processing does.*

- **Natural Language Processing** is ability of machines to understand and interpret human language the way it is written or spoken.
- **Text mining** is the process or practice of examining large collections of written resources to generate new information. In this thesis, we used **keyword-based analysis** and **statistical techniques**.

Why do we need Natural Language Processing and Text Mining ?

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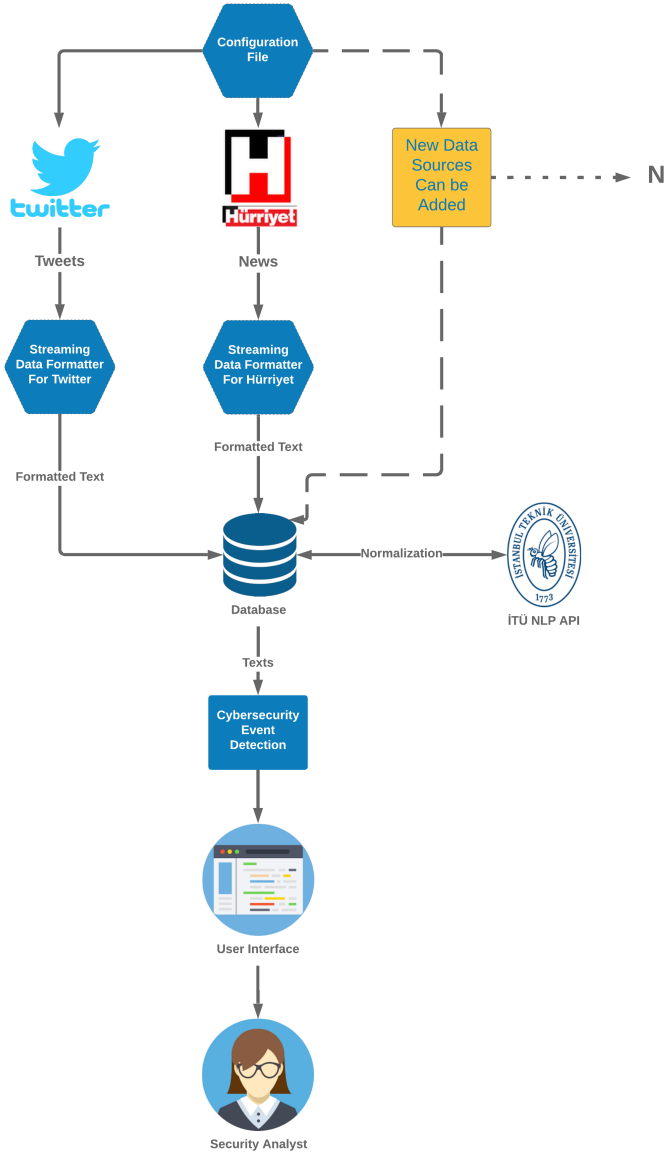
- “Crowdsourcing Cybersecurity : Cyber Attack Detection using Social Media”. (Khandpur et al., 2017)

Pipeline


Configuration File
twitter
Hürriyet
New Data Sources Can be Added
N
Tweets
News
Streaming Data Formatter For Twitter
Streaming Data Formatter For Hürriyet
Formatted Text
Formatted Text
Normalization
İSTANBUL TEKNİK ÜNİVERSİTESİ 1773
Database
İTÜ NLP API
Texts
Cybersecurity Event Detection
User Interface
Security Analyst

Data Collection and Data Processing

Data Collection

- **Hürriyet API** and **Twitter API**
- We can get up to **%1 of the Twitter stream**, which is approximately one million Tweets per day due to Twitter API limitation, which is **limited by Twitter**.
- We can get up to **12,000 request per day** in Hürriyet newspaper API, which is **limited by Hürriyet**.

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Data Processing

- Filter selected keys from JSON streams of Twitter API and Hürriyet API.
- Filter consecutive non-ASCII characters from the fetched data.
- Sent the raw data to ITU NLP API to **normalize** them.

Multi-Process and Microservice Architecture

The Processes Developed as a Framework in This Thesis :

- Twitter API Stream to Database
- Hurriyet API Stream to Database
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Microservices :

- **Resilient :** Failure in one service does not impact the other services of our project.
- **Scalable :** if our database technology becomes insufficient for our software, we can easily change the database technology with a more suitable one.
- **Less dependency** and **easy to modify** its code and test them.

Demonstrative Video

User Interface of The System

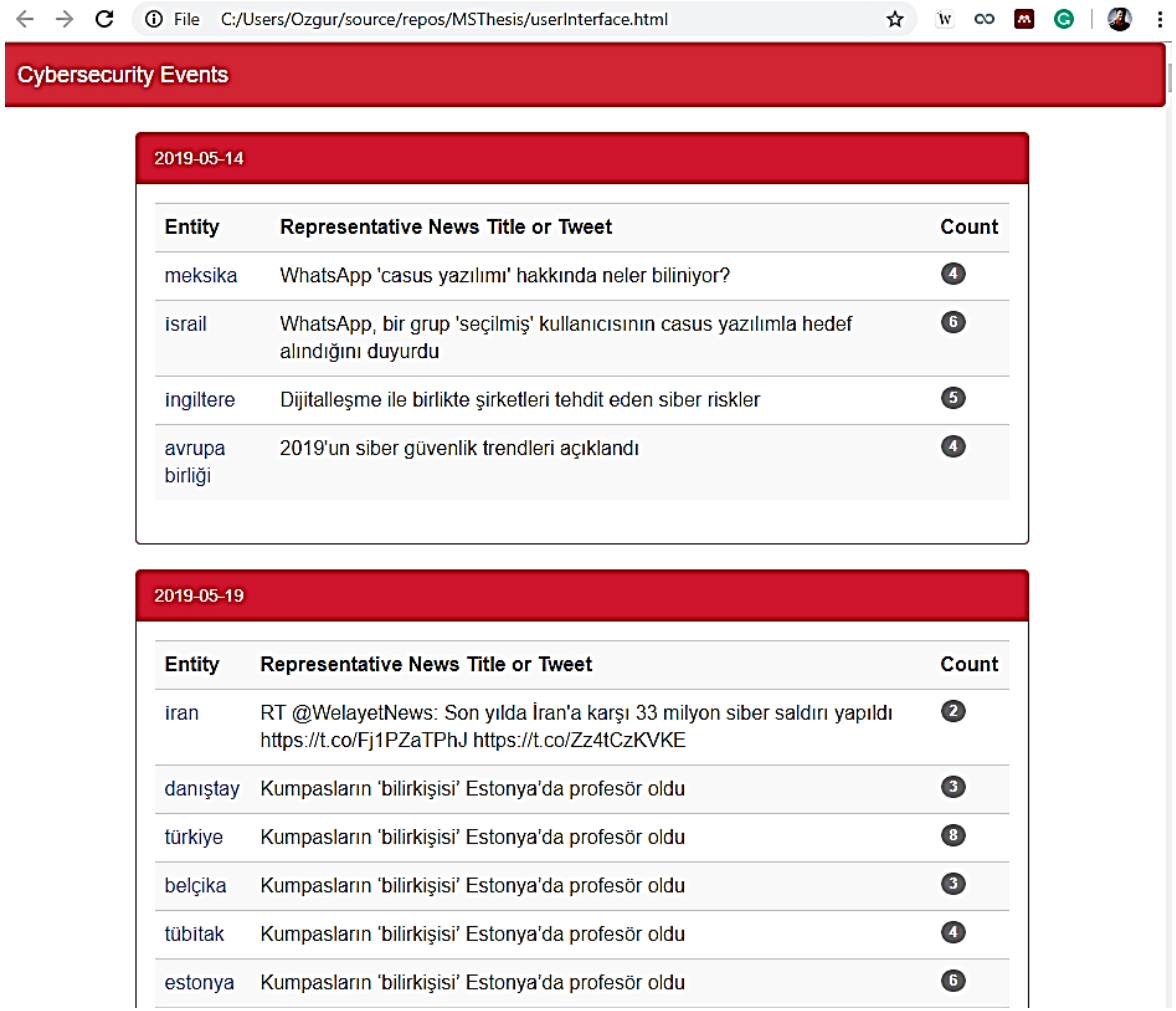

FIGURE – *User Interface of the Cybersecurity Detection Software*

Successful Cybersecurity Event Detection Samples

2019-05-14

Entity	Representative News Title or Tweet	Count
meksika	WhatsApp 'casus yazılımı' hakkında neler biliniyor?	4
israil	WhatsApp, bir grup 'seçilmiş' kullanıcısının casus yazılımla hedef alındığını duyurdu	6

FIGURE – *WhatsApp Spyware Attack Detection*

2019-04-26

Entity	Representative News Title or Tweet	Count
stm	Uzaktan Hasta Takip Sistemi uygulamalarında tehlike	5

FIGURE – *STM Warns about Remote Patient Tracking System Applications*

Unsuccessful Cybersecurity Event Detection Samples

ant	@omerturantv72 Ömet bey inanamiyorum; gercekten bunlari siz mi yaziyorsunuz yoksa hesabiniz mi hacklendi?	4

FIGURE – *Sample False Positive Cybersecurity Event Detection*

çin	Beni takip eden bütün takipçilerime duyurumdur: Twitter hesabım hacklendiği için abuk sabuk reklam, ilan ve de tele... https://t.co/8njVtCkfNQ	7

FIGURE – *Sample Indirectly Useful Cybersecurity Event Detection*

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On a Sample Test Run :

- The database of the software includes **437** entries. **186** of them are **Twitter Tweets**, and **251** of them are from **Hürriyet Newspaper**.

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- Success rate is **dependent external factors** like selected time frame, selected keyword vector, selected named entity vector, number of data in dataset and so on. The success rate may increase or decrease according to these factors.
- These statistics show that this methodology works in the detection of cybersecurity events from Turkish texts with an acceptable success rate.

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- Even if our software system detects few false positive cybersecurity events, it was often able to detect useful cybersecurity events.
- Our software system can detect cybersecurity events such as WhatsApp Spyware, MuddyWater Attack, the Remote Patient Tracking System Applications vulnerability, Pirate Matryoshka Virus, Zombie Cookies threat.

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- Detect cybersecurity events that have not yet taken place by processing streaming data using Turkish.
- Add malicious URL detection to our software system.

References

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Thanks for Listening