



Natural Language Processing

Emotion Classification and Topic Analysis of Political
Communication on Twitter

Master's Degree in Computer Science

Yagiz Tansu

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UNIVERSITÀ
DEGLI STUDI
DI MILANO



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Research Objectives

Guiding our Analysis

This study aims to answer three core questions based on our data:

- **Question 1:** Which emotions dominate political tweets, and how do these emotional profiles differ between the ruling and opposition parties?
- **Question 2:** How do these emotions intensify or change when the topic shifts to critical issues such as the economy, migration, and health system?
- **Question 3:** Can we observe emotional trends over time, particularly how the tone of parties' tweets changes in the weeks leading up to and after a major political event like an election?



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Data Acquisition and Preprocessing

2 Methodology

We collected approximately 20,000 tweets from 24 verified politicians across Turkey's seven main parties using a Python script with the `Twikit` library.

To ensure meaningful content, we performed a thorough cleaning process:

- Removed retweets, replies, user mentions, and URLs.
- Converted hashtags to plain text and removed emojis.
- Eliminated extra spaces, special symbols, and punctuation.
- Excluded tweets with fewer than three meaningful words.



Emotion Classification with Fine-tuned BERT

2 Methodology

We fine-tuned a pre-trained Turkish BERT model (dbmdz/bert-base-turkish-cased) for multi-class emotion detection. The model was trained on an emotion-labeled dataset for 12 epochs with a batch size of 16 and a learning rate of 2×10^{-5} .

Emotion	Precision	Recall	F1-score
Anger	0.95	0.93	0.94
Disgust	0.95	0.95	0.95
Fear	0.94	0.94	0.94
Happy	0.95	0.95	0.95
Sadness	0.91	0.94	0.92
Surprise	0.91	0.88	0.90
Overall Accuracy		0.9349	

Metric	Value
Eval Loss	0.2652
Eval Accuracy	0.9305
Eval Micro F1	0.9305
Eval Runtime (s)	37.4458
Eval Samples/sec	104.124
Eval Steps/sec	13.032
Epoch (Eval)	4.34
Train Runtime (s)	3523.5243
Train Samples/sec	31.346
Train Steps/sec	0.979
Train Loss	0.2685
Epoch (Train)	4.34



Topic Classification with Zero-shot Classification

2 Methodology

Topic classification was performed using a zero-shot learning approach with the multilingual model `MoritzLaurer/mDeBERTa-v3-base-xnli`. This allowed us to categorize tweets into specific political and social themes without needing a labeled training set for those topics. The predefined topics included key themes in Turkish political discourse:

Turkish Label	English Equivalent
göç	migration
ekonomi	economy
eğitim	education
sağlık	health
adalet	justice
dış politika	foreign_policy
enerji	energy



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Emotion Classification with Fine-tuned BERT

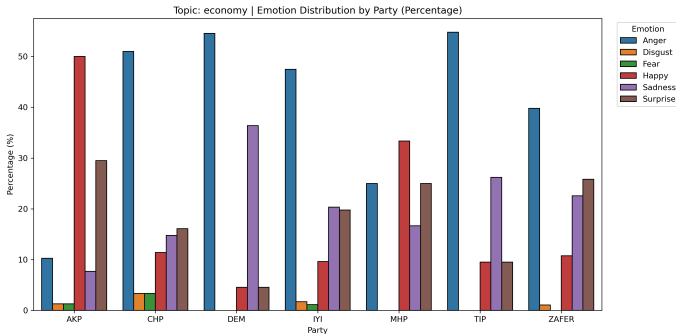
Topic Classification

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Emotions by Topic: Economy

A Clear Divide



- **AKP:** Dominated by **happy** emotions.
- **Opposition:** Consistently dominated by **anger** and **sadness**.
- **MHP:** Shows a mix of **anger** and **happy** emotions.

Key Takeaway

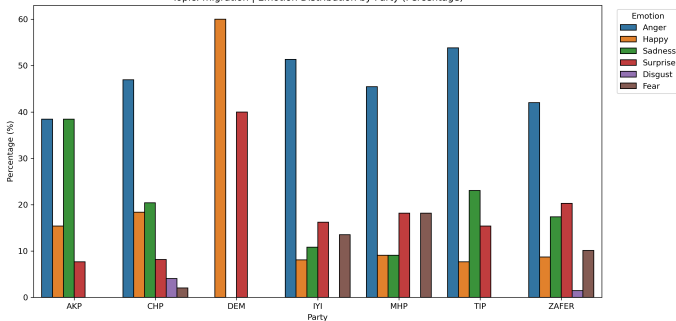
The economy is a highly polarized topic, with opposing emotional responses from the governing and opposition sides.



Emotions by Topic: Migration

A Highly Charged Issue

Topic: migration | Emotion Distribution by Party (Percentage)



- The ruling party, **AKP**, has a mixed emotional profile with high percentages of **happy** and **sadness**, reflecting a complex stance.
- Most opposition parties, including **CHP**, **İYİ**, **MHP**, **TİP**, and **ZAFER**, are dominated by high levels of **anger**.
- The **DEM** party shows a unique profile, with extremely high levels of **disgust** alongside a significant percentage of **happy** emotions.

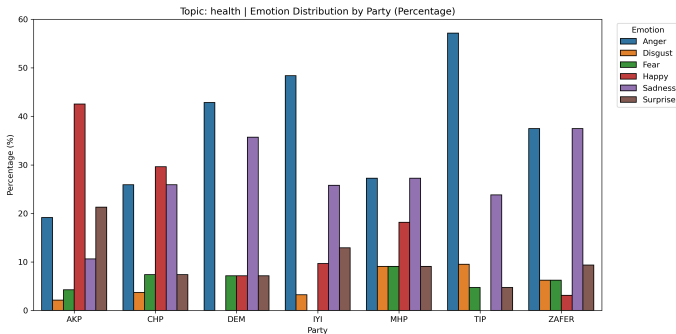
Key Takeaway

Migration is a mobilizing issue that generates widespread negative emotions across many parties.



Emotions by Topic: Health

Widespread Dissatisfaction



- The **AKP** shows a very high percentage of **happy** tweets, indicating a positive outlook and confidence in the health system.
- Parties like **TIP**, **ZAFER**, and **İYİ** are dominated by **anger**, reflecting strong criticism of health policies.
- CHP** has a balanced mix of **happy** and **anger**, while **DEM** has significant **sadness** and **anger**, showing their specific focus on the issue.

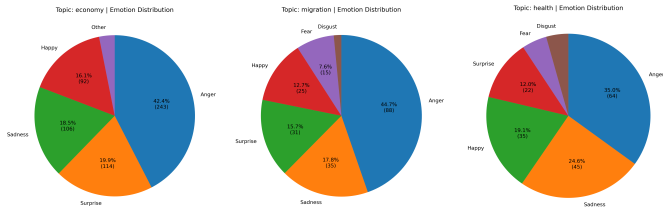
Key Takeaway

The health system is a highly critical issue for the opposition, but they express their dissatisfaction with a mix of different negative emotions.



Overall Topic Distribution

A Look at Key Issues



- **Anger** is the dominant emotion for both **economy** and **migration**, showing high levels of public frustration.
- The topic of **health** is also heavily defined by **anger** and sadness, suggesting widespread dissatisfaction with the system.
- In contrast, **education** shows a more balanced emotional profile, with **happiness** as a significant emotion alongside anger.

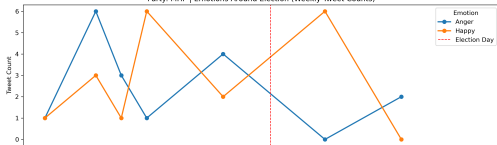
Key Takeaway

While **anger** defines the emotional landscape for most critical topics, the level of other emotions, like happiness or sadness, can vary significantly.

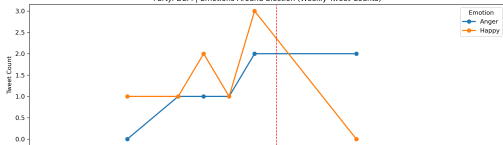


Time Series Analysis of Emotions

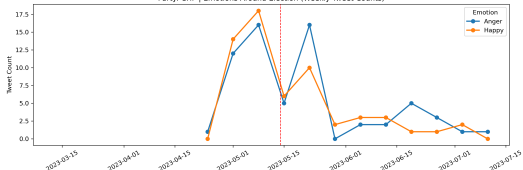
Selected Emotions by Party (\pm Election Window) - Tweet Counts
Party: MHP | Emotions Around Election (Weekly Tweet Counts)



Party: DEM | Emotions Around Election (Weekly Tweet Counts)



Party: CHP | Emotions Around Election (Weekly Tweet Counts)



- **MHP:** Happiness peaked before the election, then both happiness and anger dropped sharply after.
- **DEM:** Happiness rose before the election, but anger increased afterwards.
- **CHP:** Both emotions peaked before the election, but anger rose significantly after the results, showing dissatisfaction.

Key Takeaway

Emotional trends in political communication are not random; they are a direct response to a major political event like an election, with feelings shifting dramatically before and after the results.



Model Explainability with SHAP

Anger

İsrail, mahalle kabadayısı gibi davranıyor. Kabul edilemez.

English: Israel acts like a neighborhood bully. Unacceptable.



Interpretation

Words in red push the prediction towards *Anger*, while blue words push it away.



Model Explainability with SHAP

Fear

Deprem, ülkemizin kaçınılmaz gerçeği. Akyurtta kurduğumuz Afet Eğitim ve Lojistik Merkezinde incelemelerde bulunduk. Afet gelmeden önce hazırlıklı olmak, gecikmeden harekete geçmek zorundayız.

English: The earthquake is the inevitable truth of our country. We made examinations in the disaster education and logistics center we established in Akyurt. We have to be prepared before the disaster arrives and take action without delay.



Interpretation

Highlighted tokens reveal how the model associates certain words with *Fear*.

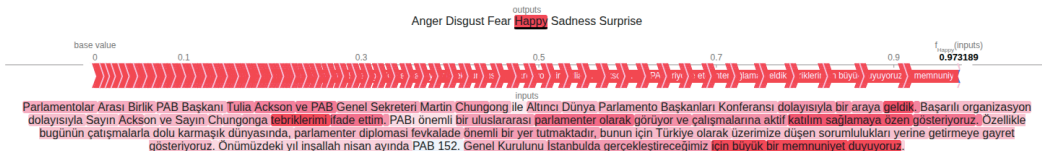


Model Explainability with SHAP

Happiness

Parlamentolar Arası Birlik PAB Başkanı Tulia Ackson ve PAB Genel Sekreteri Martin Chungong ile Altıncı Dünya Parlamento Başkanları Konferansı dolayısıyla bir araya geldik. Başarılı organizasyon dolayısıyla Sayın Ackson ve Sayın Chungonga tebriklerimi ifade ettim. PABı önemli bir uluslararası parlamenter olarak görüyor ve çalışmalarına aktif katılım sağlamaya özen gösteriyoruz. Özellikle bugünün çatışmalarla dolu karmaşık dünyasında, parlamenter diplomasi fevkalade önemli bir yer tutmaktadır, bunun için Türkiye olarak üzerimize düşen sorumlulukları yerine getirmeye gayret gösteriyoruz. Önümüzdeki yıl inşallah nisan ayında PAB 152. Genel Kurulunu İstanbulda gerçekleştireceğimiz için büyük bir memnuniyet duyuyoruz.

English: We came together with the Parliamentary PAB President Tulia Ackson and PAB Secretary General Martin Chungong and the Sixth World Parliamentary Presidents Conference. I expressed my congratulations to Mr. ACKSON and Mr. Chungon for successful organization. We see the PAY as an important international parliamentary and take care to active participation in its work. Especially in today's complex world full of conflicts, parliamentary diplomacy has an exceptionally important place, for which we strive to fulfill our responsibilities as Türkiye. I hope next year, we will be pleased to hold the Pab 152th General Assembly in Istanbul in April.



Interpretation

Positive emotional markers strongly contribute to the classification of *Happiness*.



Sadness

English: My doors who knock on the doors one by one. I can't appear to your eyes. It's about a year. I'm a seven -year -old daughter, dead children. Nazım Hikmet continues to be called a massacre cursed in the common conscience of humanity despite the last year, despite the last year, the atomic bomb thrown into the city of Hiroshima during the Second World War of Hiroshima. I share the pain of the lives of the lives and the lives of the lives lost on the anniversary of the Hiroshima disaster, which is a black stain in history. We know and believe that those who were killed in Hiroshim are not only the Japanese but also all humanity. Likewise, in front of the eyes of the whole world for nearly two years, Israel's Zionist administration has been experiencing a Hiroshima drama by Netanyahu and its gang. In Gaza, innocent civilians, children and women die every day in the grip of a brutal savagery. If Israel changes the location, shape and technology of the massacre today, the victims are still women, children, elderly and innocent civilians. History didn't forget Hiroshima, she won't forget Gaza. We, as the witnesses of the moment, have not forgotten any massacre, we will not forget.



Kapıları çalan benim kapıları birer birer. Gözünüzde görünemem göze görünmez ölüler. Hiroşimada **öleli oluyor bir yıl kadar**. Yedi yaşında bir kızım, büyümez ölü çocuklar. Nazım Hikmet Japonyanın Hiroşima kentine İkinci Dünya **Savaşı sırasında ABD tarafından** atılan atom bombasının yaşattığı insanlık dramı, üzerinden geçen yılı rağmen insanlığın ortak vicdanında lanetlenen bir katliam olarak anılmaya devam ediyor. Tarihe kara bir leke olarak geçen Hiroşima felaketinin yıl dönümünde yitiren canlarını, yok edilmiş hayatların acısını tüm kalbime paylaşıyorum. Hiroşimada öldürülenlerin sadece Japonlar değil bütün insanlık olduğunu biliyor ve inanıyoruz. Aynı şekilde yaklaşık iki yıldır tüm dünyanın gözü önünde, İsrail'in siyonist yönetimi, Netanyahu ve çetesi tarafından Hiroşima benzeri bir insanlık dramı yaşanıyor. Gazze'de, her gün masum siviller, çocuklar, kadınlar gözü dönmüş bir vahşetin pençesinde yaşamını yitiriyor. İsrail bugün katliamın yerini, şekli ve teknolojisini değiştirse madurları hala kadınlar, çocuklar, yaşlılar ve masum sivillerdir. Tarihi, Hiroşimayı unutmadı. Gazze'yi unutmayacak. Bizler, anın sahiti olarak hiçbir katliamı unutmadık, unutmayacağız.

Interpretation

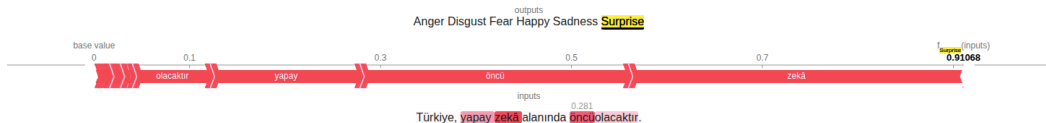


Model Explainability with SHAP

Surprise

Türkiye, yapay zekâ alanında öncü olacaktır.

English: Türkiye will be a pioneer in the field of artificial intelligence.



Interpretation

Unexpected or unusual words increase the likelihood of *Surprise*.



Natural Language Processing

Thank you for

listening!

Any questions?