

# SENTIMENT ANALYSIS OF CURRENT TECH JOB MARKET IN THE US (1500 words)

Akhila Sakiramolla

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## 1. Introduction

The current world events are making everyone wonder about one thing - whether the economy is going into a recession or if we already entered one. There are many indicators that suggest the economy is headed for a recession, including high inflation, consumer sentiment drops, volatile stock markets, rising interest rates and tight housing markets. Unemployment rates are still at a pre-pandemic low of 3.7%, according to the latest jobs report. However, the number of layoffs is increasing. American citizens are already predicting a downturn, according to most polls. Layoffs are definitely a trending topic in recent times. A drop in consumer spending and rising interest rates have led to a significant reduction in job losses, mainly in the tech industry. Many major tech companies have announced downsizing and cutbacks in recent weeks [1]. With this study, I aim to understand the sentiments of tweets with regards to the ongoing events.

## 2. Background

No two recessions are alike but, in most recessions, economic output as well as employment decline simultaneously. Lower revenue compels businesses to cut back on staff, which leads to higher unemployment, which ultimately leads to lower consumer spending and that creates a vicious cycle. If we look at the current scenario, we see that the US GDP has shrunk for two quarters in a row, which is usually considered the textbook definition of a technical recession [2]. But we also see that every month in 2022, about 388,000 jobs are added in the U.S. In July, that number hit 528,000 as unemployment dropped to 3.5% - a half-century low. This came as a surprise as lower numbers were anticipated. So, there is a confusion if this indicates a resilient job market or if it's a final jolt before the deep freeze hits. On the other hand, job cuts and pauses on hiring are beginning to flow across the tech sector, which boasts some of the most valuable companies in the world. Tech giants like Twitter, Oracle, Robinhood, Walmart and Ford have announced large scale layoffs [3].

Twitter is a leading social media platform where people from all walks of life and professions are very vocal about their opinions on various issues. In the last few months, there has been a lot of discussion regarding the job market and how various factors like inflation, interest rates, etc., are affecting it. In a recent interview with CNN, President Biden told "I don't think there will be a recession. If it is, it'll be a very slight recession", which caused quite a stir in public's opinions on twitter. This comes amidst the news of layoffs and slow hiring by many major companies and renowned economists warning about a potential downturn [2]. The study presented in this paper focuses on user engagement on twitter regarding the current tech job market, layoffs and recession discussions.

### 3. Research Question

The research has been conducted to answer the following questions by analyzing the tweets regarding current tech job market and layoffs:

- 1) How are people reacting to the current situation with regards to the tech job market and layoffs?
- 2) Do they agree/disagree with if we may/may not be in a recession?
- 3) How is the layoffs news affecting the sentiments regarding recession?

### 4. Methodology

#### 4.1 Data

For this study, I collected data from twitter using ‘**snsrape**’ package in python, which is a scraper for social networking services (SNS). This package allows the user to scrape data through twitter’s API without time period restrictions and tweet count limits per query, hence I used this instead of ‘**tweepy**’ package. I collected around **900** tweets that contained the words “**tech**”, “**recession**” and “**layoff**” from June 2022 to November 2022. I did this by extracting around 150 tweets per month. The other conditions that I considered for extracting these tweets are they are from USA and are in English. I also filtered tweets that are either retweets or replies and also removed any links present. I extracted tweet information like date, username, source, location, like and retweet counts.

Date	username	source	location	tweet	num_of_likes	num_of_retweet
2022-06-02 13:14:37+00:00	LukeDonay	Twitter for iPhone	runningwiththemoney.eth	Jamie Dimon warning, Microsoft cutting guidanc...	19	3
2022-06-08 16:34:03+00:00	Clayton34276863	Twitter Web App	Arkansas, USA	Small data point - friend in silicon valley te...	1	0
2022-06-03 16:03:20+00:00	rsg	Twitter Web App	Miami	Bullish signals:\nJobs report better than expe...	24	0
2022-06-03 19:55:15+00:00	_LoveAshh	Twitter for iPhone		I never would've thought that tech jobs give l...	0	0
2022-06-10 14:56:23+00:00	neutraidoghotel	Twitter Web App	Fort Worth, TX	If I ever get canned in a mass layoff from my ...	2	0
2022-06-04 18:32:05+00:00	romangrows	Twitter for iPhone	Austin, TX	Let these tech layoffs be a healthy reminder t...	18	5
2022-06-13 15:20:35+00:00	frs91129111	Twitter for Android	Indonesia	Pheww the market gonna be worse than the last ...	0	0
2022-06-10 01:23:23+00:00	WlizOnTheMove	Twitter for iPhone	Atlanta, GA	Today, I am one of many affected by the recent...	0	0
2022-06-20 15:51:30+00:00	tkerbavaz	Twitter Web App	Sacramento, CA	Hearing about lots of layoffs / downsizing in ...	5	0
2022-06-15 04:05:36+00:00	anitaisalska	Twitter Web App	San Francisco	Every day I see more people in my network affe...	4	0

Fig 1 – Sample tweets data

For data preprocessing, below are the steps I have followed to get the tweet content:

1. Converted text to lowercase
2. Removed emojis and special characters
3. Removed links/URLs
4. Removed punctuation marks

## 4.2 Sentiment Analysis

Generally, sentiment refers to the way a text expresses positivity or negativity. In order to determine if an expression is favorable, unfavorable, or neutral, and to what degree, a sentiment analysis is an effective method for analyzing written or spoken language. VADER (Valence Aware Dictionary and Sentiment Reasoner) is a lexicon and rule-based sentiment analysis tool that is specifically attuned to sentiments expressed in social media. Compounded scores are calculated by summing the valence scores of each word in the lexicon, adjusting them according to the rules, and normalizing them to be between -1 (most extreme negative) and +1 (most extreme positive) [4]. Typical threshold values are:

1. **positive sentiment:** compound score  $\geq 0.5$
2. **neutral sentiment:** (compound score  $> -0.5$ ) and (compound score  $< 0.5$ )
3. **negative sentiment:** compound score  $\leq -0.5$

I installed **vaderSentiment** module from **nltk.sentiment** library available in python. Each tweet is analyzed by the **SentimentIntensityAnalyzer** method. This gives a compound score between -1 and 1 for each tweet. Based on these scores, I created a new column with sentiment type. We observe that on the whole majority of the users have a positive sentiment towards these tweets that talk about recession or layoffs in the tech industry (Fig 2). We also observe that there are more tweets with positive sentiment compared to tweets with negative and neutral sentiments over months (Fig 3). The polarity scores are not extreme and are around the 0.5 and -0.5 indicating that the sentiments are not extremely positive or extremely negative.

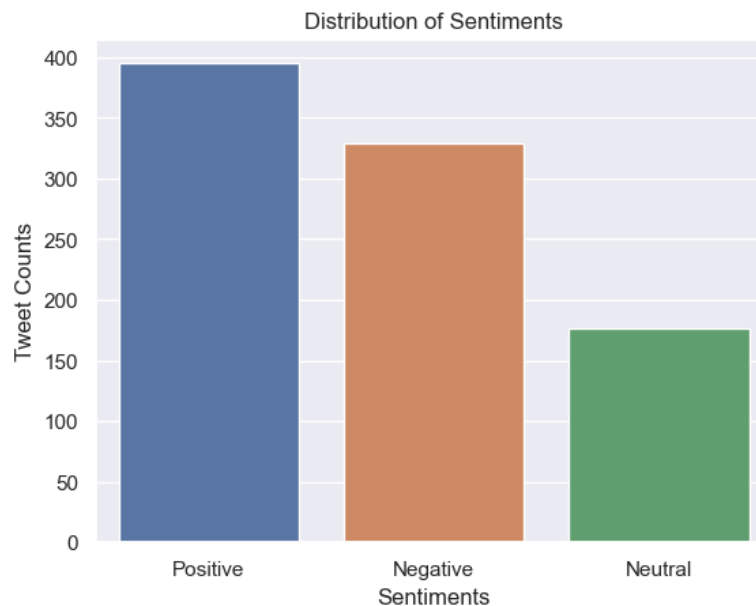


Fig 2 – Overall distribution of sentiments

tweet				score			
sentiment	Negative	Neutral	Positive	sentiment	Negative	Neutral	Positive
Month				Month			
6	55	36	59	6	-0.44	-0.0	0.53
7	60	26	64	7	-0.40	-0.0	0.47
8	51	31	68	8	-0.48	0.0	0.46
9	55	26	69	9	-0.43	0.0	0.50
10	49	33	68	10	-0.52	0.0	0.43
11	59	24	67	11	-0.50	-0.0	0.57

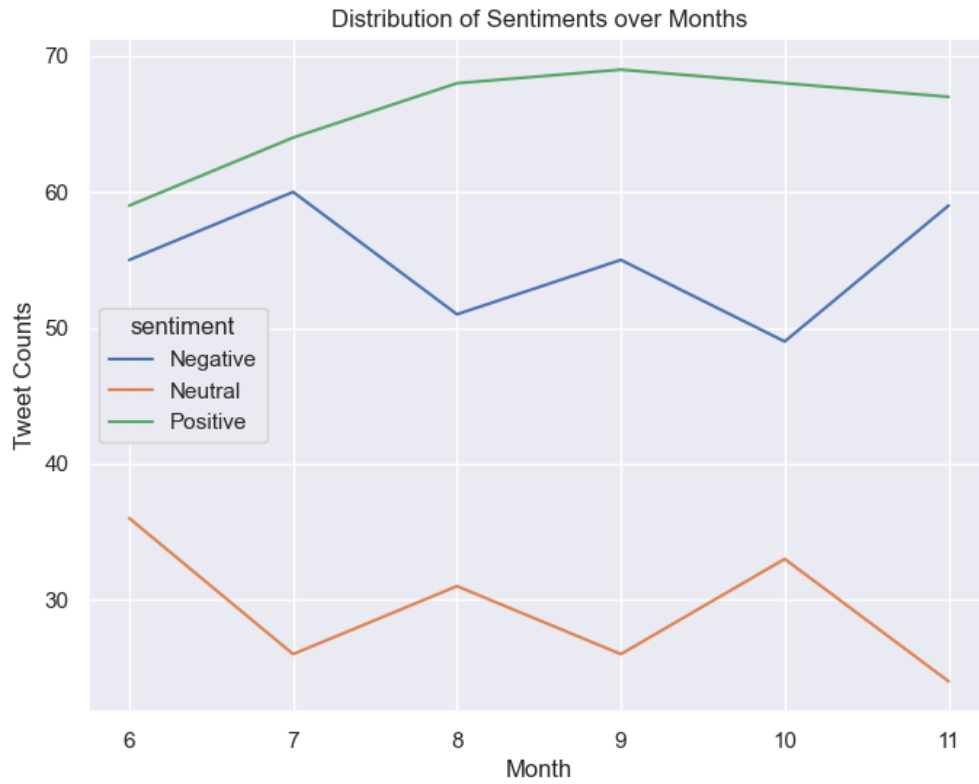
**Fig 3 – Distribution of tweets with negative, neutral and positive sentiments over months and their average compound scores**

I further wanted to observe how these sentiments varied month over month due to ongoing events i.e., layoff announcements by major companies or any government announcements. Below are some of the major tech company layoff announcements over months:

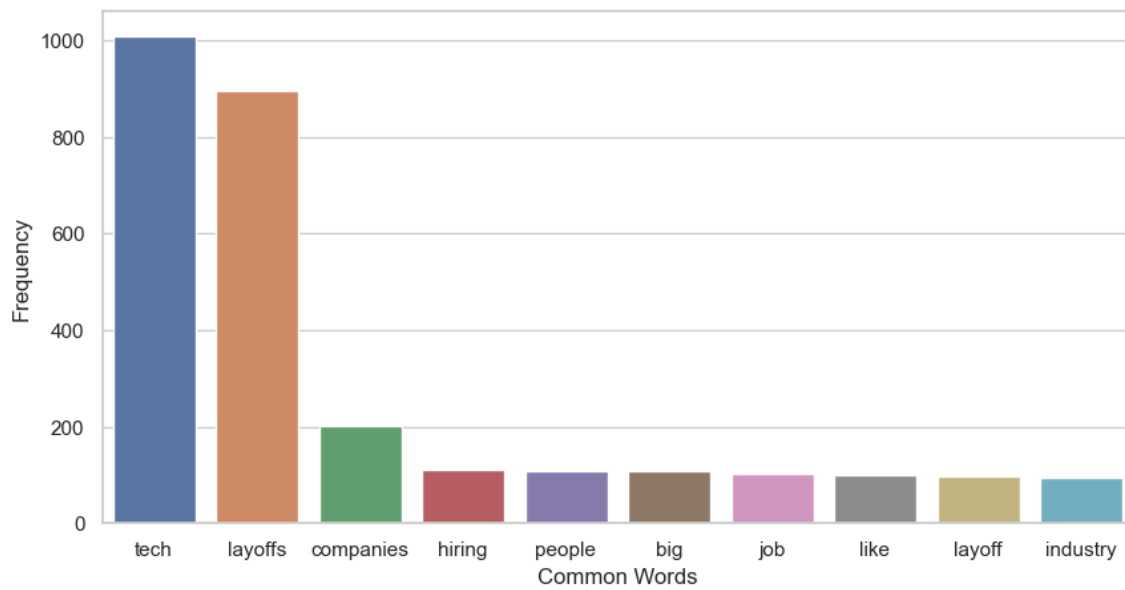
1. June – Coinbase, Netflix, Niantic, etc., (Total = 112)
2. July – Twitter, TikTok, Lyft, Rivian, etc., (Total = 102)
3. August – Robinhood, Stripe, Wayfair, etc., (Total = 100)
4. September – Netflix, Twilio, Instacart, etc., (Total = 47)
5. October – Peloton, Udacity, Salesforce, etc., (Total = 61)
6. November – Twitter, Stripe, Lyft, Chime, etc., (Total = 28)

We can see that the number of tweets with positive sentiment shows an upward trend over months (November has till date data) as opposed to tweets with negative sentiment which doesn't have a specific trend over months (Fig 4) I assumed that as the number of companies laying off employees reduces, the positive sentiment also reduces but that doesn't seem to be the case as there may be many factors at play as to why people have positive sentiment towards topics like recession and layoffs.

I further performed Tokenization, which is the process of breaking down the given text in into the smallest unit in a sentence called a token, to fetch all the unique tokens in the tweets. Then performed Lemmatization, which is used to reduce the words to their base words, followed by removal of stop words. Stop words are the words which do not contain any significance in search queries. After this, I was able to visualize the top 10 most frequent words in the tweets (Fig 5). Words like tech, layoff, companies, hiring, people, etc., are observed to be the most common words used by users in these tweets. I also performed bigram tokenization, which is a process of breaking down text into sequence of two adjacent tokens, and visualized top 10 bigrams in the tweets (Fig 6)



**Fig 4 – Distribution of sentiments over months**



**Fig 5 – Distribution of top 10 common words**





## 6. References

1. <https://www.cnet.com/personal-finance/is-the-us-job-market-still-strong-answers-to-your-questions-about-employment/>
2. <https://www.yahoo.com/video/3-big-reasons-why-2022-170000617.html>
3. <https://www.forbes.com/sites/forbestechcouncil/2022/09/06/the-recession-is-here-and-there-but-not-everywhere-getting-and-staying-hired-in-2022/?sh=7182b4ec1be6>
4. [GitHub - cjhutto/vaderSentiment: VADER Sentiment Analysis](#)
5. <https://layoffs.fyi/>