



Mining Public Opinion about Hybrid Working With RoBERTa

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Abstract

As the businesses recover from the COVID-19 epidemic, a new working paradigm is emerging: the hybrid work arrangement. A hybrid work method is a working approach that enables workers to work from several places, such as at home, on the move, or in the workplace. People are expressing their opinions on different social media outlets about the new work model. Organizations and businesses value public views. Because public perspectives will allow decision-makers to adapt promptly to rapidly transforming cultural, commercial, and social environments. Opinion mining is traditionally used to summarize the quantity of positive and negative responses in a given text using sentiment analysis techniques. Opinionated material from social media sites is used to identify people's enthusiasm or displeasure with a certain issue under debate. This study analyzes the public sentiments (positive, negative, and neutral) on a hybrid work model using Twitter API and the Robustly Optimized BERT Pre-training Approach (RoBERTa). Out of 1 thousand tweets containing the term “hybrid work”, 37 (4.2%), 305 (33.3%), and 658 (62.5%) tweets were classified as negative, neutral, and positive, respectively. We also compared the public sentiments about hybrid work with those of remote work. The RoBERTa classified 8(1.6%), 436 (85.9 %), and 62 (12.5%) tweets as negative, neutral, and positive, respectively. The results showed that The majority of individuals showed favorable sentiment toward the hybrid work arrangement. The findings also demonstrate that “hybrid work” has an affinity with “remote work”, “ai”, “digital transformation” and “future of work”.

Keywords: *Hybrid work, NLP, Sentiment analysis, Twitter.*

Introduction

Hybrid work is a customizable type of employment that enables individuals to divide their time between going to offices and working from home. In some cases, both the company and the employee profit from hybrid working. Organizations may save money on office space, have lower absentee rates, and find it simpler to recruit and retain personnel. Employees may benefit from more independence, a greater work balance, higher attention with fewer distractions, increased flexibility to handle family and other responsibilities, and time and expense savings related from not having to go to work [1].

The large increase in the usage of digital devices, along with ubiquitous internet access, gives unparalleled ground for people's continual connectedness and provides significant possibilities for openly expressing thoughts, attitudes, or responses to many elements of daily human activity [2], [3]. Social network systems are increasingly becoming a vital part of people's life, providing virtual venues for everyday people to exchange thoughts and information while also maintaining and/or expanding their relational network [4], [5]. The widespread usage of online social networks, as well as the vast amounts of data acquired via them, has increased the scientific and corporate communities' interest in them enormously.

The hybrid work approach provides flexibility. A hybrid work paradigm allows an employee to work whenever, wherever, and however he / she wants while yet allowing the boss to monitor their progress. This implies that workers are not restricted to a certain time or place. Workers can work when and where they wish, whether at their home desk at a coworking space, or on a park bench with their laptop.

Hybrid work promotes more effective communication. To successfully adopt a hybrid work paradigm, businesses first establish the sorts of communication that will take place in order to engage with coworkers. For example, based on the occasion, people can choose their preferred style of communication. Some individuals may find it simple to communicate by email, whereas others may find it difficult to respond to emails. Others may prefer messaging, while yet others prefer phone conversations. Employees may utilize meeting rooms at coworking centers or other flexible venues near their residences for face-to-face contact.

The hybrid work paradigm also cut expenses. A hybrid work arrangement may save money because not every staff must be on-site all of the time. businesses will not require as much rooms, desks, devices, resulting in cheaper expenditures for organizations. Utility costs will also be lower since fewer people would be going around consuming power. As a result, workers save money on transportation to and from work.

Employee productivity rises with a hybrid work approach. Workers who have the flexibility to work when / where they choose are more productive. Workers prefer to get more done each day since they are not spending time or energy traveling. Many workers also feel that they are more creative when they do not have predetermined working hours and are allowed to work whenever they feel most productive.

A hybrid work style may provide workers with a higher quality of life. Employees that employ the hybrid work paradigm appreciate the ability to work at home and conversely. It allows individuals to do anything they want without feeling as though employees are being observed or assessed by others. The ability to work whenever and whenever they choose makes life seem simpler.

Employees who work from or near their homes benefit from the extra time they have to interact with family and friends. In certain circumstances, people may utilize the additional time to do home activities that they normally do not have time for while at work or in travel.

While the advantages of a hybrid work paradigm are evident, there are several things to think about before establishing this sort of arrangement.

Hybrid work, however, is not appropriate for many industries. Certain sectors are not appropriate for this sort of employment paradigm. Manufacturing, health, education, and retailing are among them. Workers almost certainly have to remain with the conventional work arrangement. A mixed work paradigm may do more harm than benefit in these industries.

In hybrid work, there are various security risks. Some businesses are concerned that enabling workers to work at home poses security hazards. It is because working from home makes it more difficult to supervise workers' behavior. They may be exposing themselves to hazards that are mitigated while working at the office. Employees risk losing critical or secret info, having their information damaged, or being vulnerable to cyber hijacking while working remotely if required safeguards are not in place [6], [7].

Employee burnout might result from hybrid work [8], [9]. While some workers like the flexibility of working remotely, others are overwhelmed. They may be concerned about being organized and keeping up with work. Employees may feel compelled to labor past their typical working hours in various instances. Employee burnout and lower productivity may result, both of which are detrimental to the company's profitability and the employee's health.

Sentiment analysis, often known as opinion mining, is a subset of data mining that seeks to gather and derive opinions and sentiments from various sorts of documents [10], [11]. The quantity of data accessible on the internet is increasing at an exponential rate; yet, much of this data is in an unorganized format and hence is neither machine processable or machine interpretable [12]. As a result, graph-mining and natural language processing (NLP) approaches may help to condense knowledge and views from the vast quantity of information available on the internet. Sentiment analysis may improve the abilities of user relationship monitoring and recommendation tools by, for example, determining the aspects consumers are most interested in or excluding from advertisements things that have garnered negative feedback. It may also be used to improve anti-spam systems in social communication. Sentiment research may also improve business intelligence. Because forecasting the public's attitude about a company or a product has become critical for businesses, a growing amount of money has been spent in marketing tactics that include thought and sentiment mining [13].

Employee sentiment analysis offers many useful features, including:

- Assisting firms in taking the required stages toward change when workers express dissatisfaction with how the company handles important problems such as staff performance, productivity, and customer service.
- Promoting transparency and open communication. Transparency, greater communication, and more employee engagement happen when a firm takes remedial steps to ensure workers that their ideas count.
- Providing a true picture of employee sentiment. Former and present workers inform others about the least attractive firms to work for. Employee sentiment analysis may assist firms in determining if these attitudes are founded on incorrect perceptions. If an incorrect view is causing damage to the company's future, human resources employees may take steps to cultivate more favorable perceptions.

Methodology

Linguistics is the scientific study of language in terms of its grammar, rules, semantics, and phonetics. Linguistics research includes developing language rules, strategies for syntax, and semantics [14]. Theoretical linguists' techniques and principles may be handled by computer systems that create natural language that deals with grammar, semantic standards, and so on. This method is known as computational linguistics, and it employs statistical tools in the process of analyzing text/data. However, approaches to analyzing human language may not be restricted to statistics, but may also include the use of sophisticated inference methods such as machine learning and deep learning, that are prominent artificial intelligence methods. Sophisticated technologies may be used to address various challenges related to natural language processing, such as producing dependency graphs, constructing an appropriate terminology, linking various parts of vocabulary, attempting to set the context, retrieving semantic meanings, or converting unstructured information into a structured data [15]–[17].

The idea and concept of NLP have changed throughout time as technology and applications of diverse methodologies for analyzing natural language have evolved. Statistical NLP analyzes data collected according to a probability distribution and draws conclusions. In a broader sense, NLP is able to encompass any kind of computer processing of linguistic form: it might be as basic as calculating word counts to compare various writing styles, or as complicated as interpreting whole human utterances for responding to an input [18].

RoBERTa is an acronym that refers to Robustly Optimized BERT Pre-training Approach. It was proposed by [19]. The purpose of the work was to improve BERT architecture training such that it took less time during pre-training. RoBERTa has a nearly identical architecture to BERT, however the research made some small design adjustments in its structure and training technique to enhance the outcomes on BERT architecture.

In next sentence prediction, the model is developed to guess whether the observed document segments are from the same or other documents using an extra Next Sentence Prediction (NSP) loss. The authors tested multiple versions by removing and adding NSP loss and determined that deleting the NSP loss equals or significantly improves downstream job performance.

Originally, BERT was trained for 1M stages with 256 sequences in a batch. The research trained the model using 125 stages of 2K configurations and 31K stages of batch size 8k configurations in this work. This has two benefits: big batches enhance perplexity on the masked language modeling goal and end-task accuracy. Large batches may also be parallelized more easily using distributed parallel training.

Modifying the masking pattern dynamically: In the BERT architecture, masking is done just once during data preparation, resulting in a singular static mask. To avoid utilizing a singular static mask, training data is replicated and masked ten times across 40 epochs, each time using a different mask strategy, resulting in four epochs with the same mask. This method contrasts with dynamic masking, in which new masking is produced each time input is sent into the model.

Results

1. Sentiments about hybrid work

Table 2. first few tweets about hybrid working (before processing)

	Tweet	Sentiment
	How to boost connection and #productivity in #hybridwork models? Start by understanding your org's current culture—and then linking it to the "critical few" behaviors you want to see people doing more often	Positive
	OK, so if I told you one action would boost hybrid work productivity, make it easier to get new employees up to speed and lower your risks you'd jump at it wouldn't you?	Positive
	Customers are looking to build their futures on #HybridWork, so take advantage of our new Fast Track promotions on selected #Cisco Collaboration solutions including, #Cisco #Webex Desk, #Cisco #Webex Room Navigator	Positive
	Many business leaders like you have discovered the benefits of hybrid working – especially in terms of cost and time savings.\n\nHave you made the switch as well? What difference has it made to your business?\n\nLet me know in the comments	Positive
	Is #HybridWork doomed? The numbers, workers, and the country of the Netherlands disagree. Learn more from @Upwork's community blog. https://t.co/Rgv7f8b5i4	Neutral
	Meeting the security needs of #hybridwork is not easy. In fact, 61% of organizations have struggled to evolve security to support hybrid work. 🗝️\n\nSee how #CitrixDaaS & #ChromeOS help implement multi-layered security solutions to meet these needs	Neutral
	#HIRING\n\n#Splunk / Log Specialist for a project in Stockholm (#hybridwork). 12 Month Contract, start ASAP.	Neutral
	#Hybridwork isn't working: Here's a better approach https://t.co/Y23HMcb9w	Negative
	Did you know that last year, corporations experienced a 50% increase in #cyberattacks? Amping up #security is imperative as #hybridwork expands network perimeters and risks associated with theft, data breaches, and cyberattacks increase. #WeAreLenovo https://t.co/G71a2wljhB	Negative
	Given a once in a lifetime opportunity to revolutionise work, most employers instead opted for a lazy solution that satisfies no-one https://t.co/QY0zI1kVEV #futureofwork #hybridwork #remotework #wfh https://t.co/XukSPdIrOX	Negative

Sentiment counts

NEG 37

NEU 305

POS 658

The results show that out of 1 thousand tweets, 37, 305, and 658 tweets have expressed negativity, neutrality, and positivity about hybrid work. Thus, approximately, 65.8 percent tweets were positive about hybrid work. Only 3.7 percents tweets were negative. These results indicate that the majority of people have positive attitude towards hybrid work model.

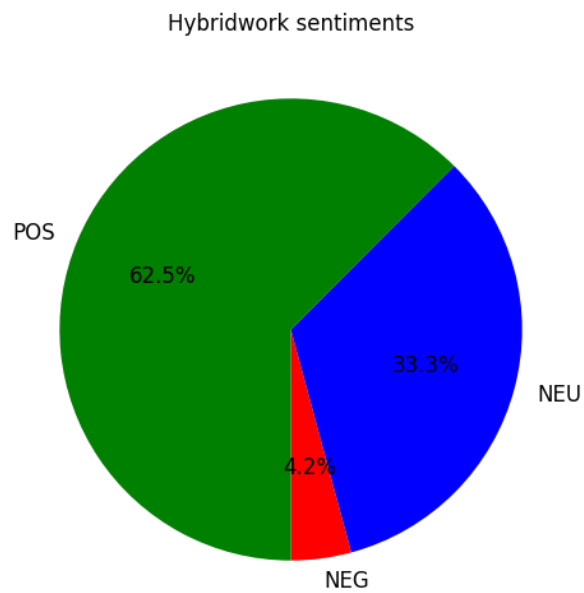


Figure 1

Mining Public Opinion about Hybrid Working With RoBERTa

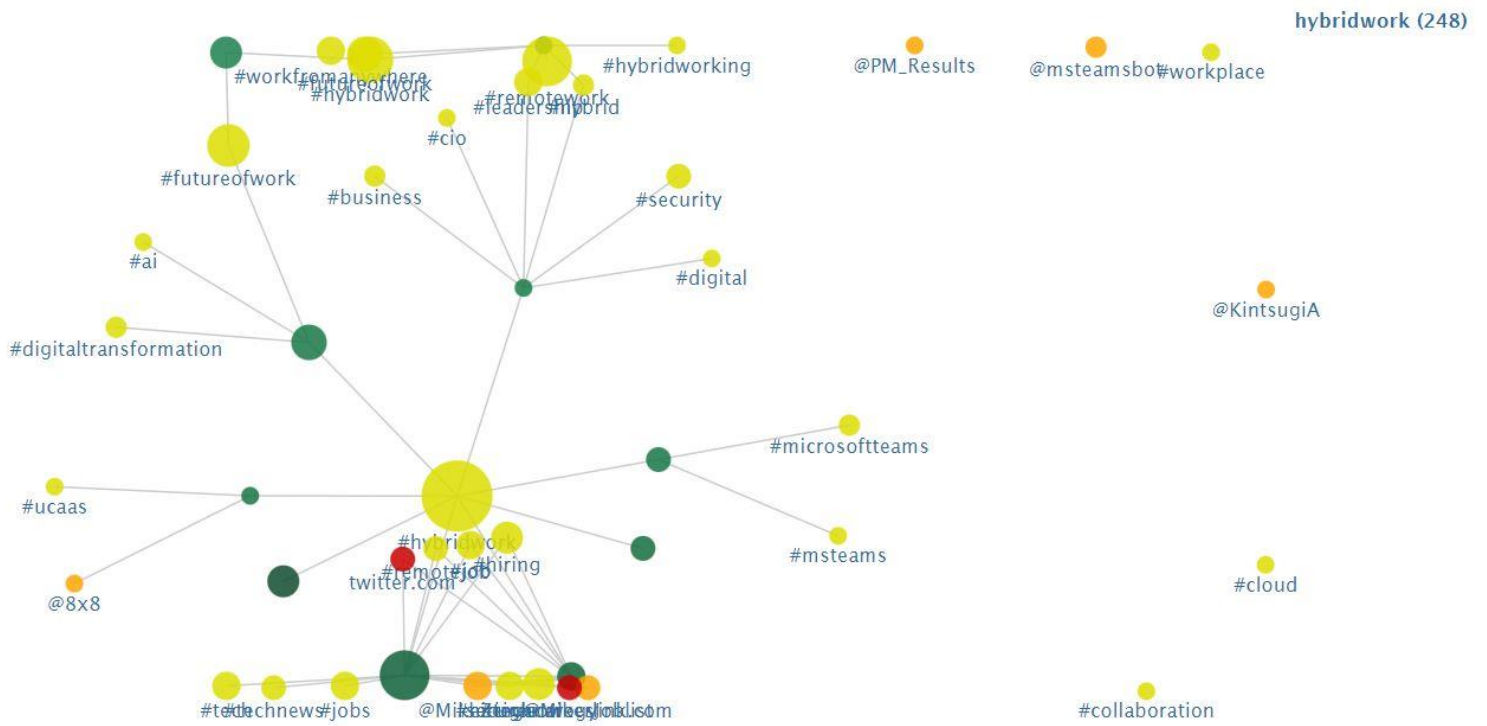


Figure 3

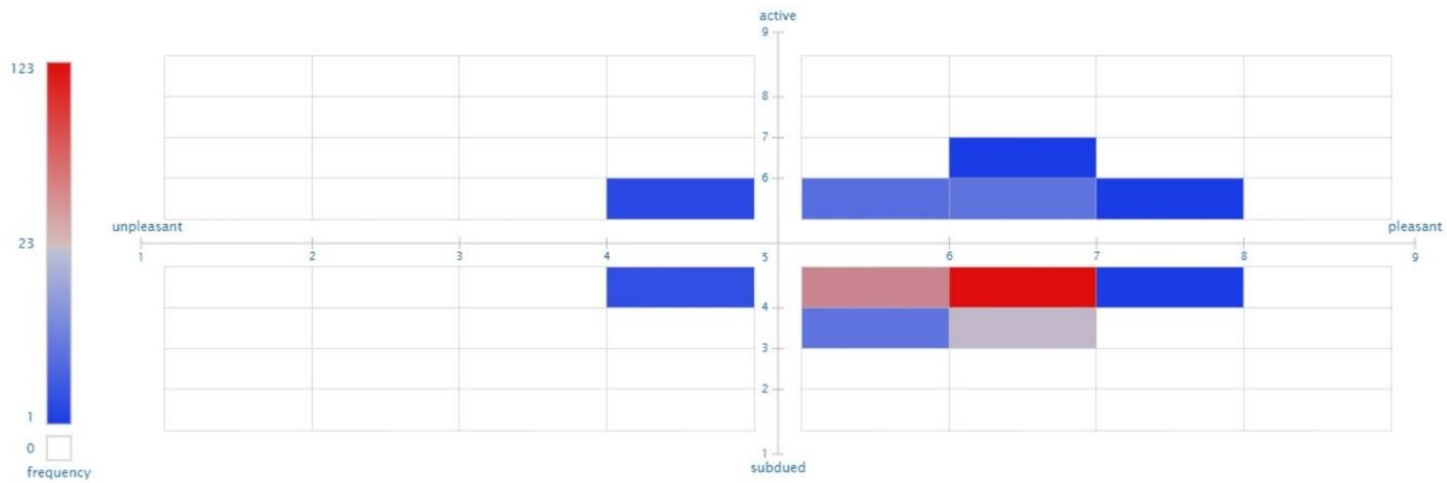






Figure 4


Affinity graph is constructed that includes frequent tweets, persons, hashtags, and URLs. The purpose of this graph is to illustrate prominent things in the tweet collection, as well as any connection or affinity they may have with one another. The affinity curve in figure 3 shows that “hybridwork” has affinity with “remote work”, “ai”, “digital transformation” and “future of work”.

A grid of eight-by-eight cells is created using pleasure and arousal as the dividers. It was possible to color each grid cell based on the number of tweets that are included inside it. The cell will be colored red if it contains a greater number of tweets than the mean and blue if it contains a smaller number of tweets than the mean. Tweets are not present in white cells. It is shown in the figure 4 that most of the tweets were pleasant because most of the blue and red are on the right grids.

2. Sentiments about remote work

Table 2. first few tweets before processing
Sentiment

Tweet	Sentiment
I am just now thinking of #remotework as a way to give citizens safety from predatory laws and uphold bodily autonomy. Until we #codifyRoe having those with a uterus work remotely in states that put their care first can save their lives.	Positive
TeamFeePay seeks employees for 8 positions. This company scores an excellent 88 WFH score in #careersaas #teamfeepay #jobsearch	Positive
he view from my office this week, in the #Pyrenees in #Catalonia. Very tempted to consider #remotework :) I dream of a decentralized world where everyone is able to work from wherever they want. #SummerVibes https://t.co/oQPkCJL6YS	Positive
I'm loving this article and have seen it bore out in my own life. Plus, I've been doing more of my part around the house. It's more balanced. #remotework https://t.co/TAyRPA1Y56	Positive
GAMURS Group is hiring Remote Writer (Video Games)\n •\n GAMURS Group\n GAMURS Group\n\nApply Now  \n https://t.co/7JCRPbXafE \n#remotejobs #remotework	Neutral
Whether you're looking for flexible work in education or are starting your own business, it's important to get clear on who you ideally want to work with  \nUse these  steps  https://t.co/QmTWuMqVug \n\n#EduTwitter #TeacherTwitter #Teachers #Teaching #Entrepreneur #RemoteWork https://t.co/qS8XFASWEe	Neutral
Check out the current issue of the "Remote Workforce Keweenaw Newsletter" titled "Estivant Pines" at this link on Substack: \n https://t.co/iFHa1HcAjc Get a feel for day-to-day	Neutral

life in the Keweenaw by taking out a free subscription! #remotework #Keweenaw #upperpeninsula	
What are experts calling "one of the hardest business problems to solve" in the #remotework era? Find out  https://t.co/73zOUv2czU	Negative
There's always time for what matters.\n\n#Cheating #capitec #BadDecisions #BibleBuild #ronaldo #crypto #nfts #remotework	Negative
Given a once in a lifetime opportunity to revolutionise work, most employers instead opted for a lazy solution that satisfies no-one https://t.co/QY0zI1kVEV #futureofwork #hybridwork #remotework #wfh https://t.co/XukSPdIrOX	Negative

sentiment

NEG 8

NEU 426

POS 62

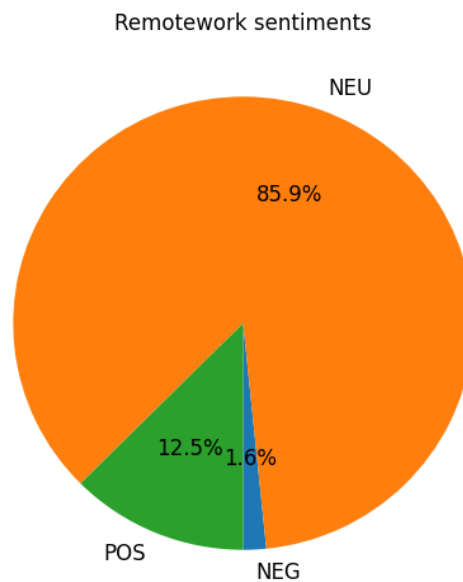


Figure 5

Mining Public Opinion about Hybrid Working With RoBERTa

The results show that out of 496 tweets, 8, 436, and 62 tweets have expressed negativity, neutrality, and positivity about remote work. Thus, as shown in the figure, approximately, 12 and half percent tweets were positive about remote work. 85.9 percent tweets were neutral. However, only 1.6 precents tweets were negative. These results indicate that the majority of people have neutral attitude towards remote work model. It is also important to mention here that a large portion of the neutral tweets contain remote job offers. Nonetheless, the positive attitudes towards remote work have surpassed the negative sentiment.

Positive Tweets - Wordcloud



Negative Tweets - Wordcloud



Figure 6

Mining Public Opinion about Hybrid Working With RoBERTa

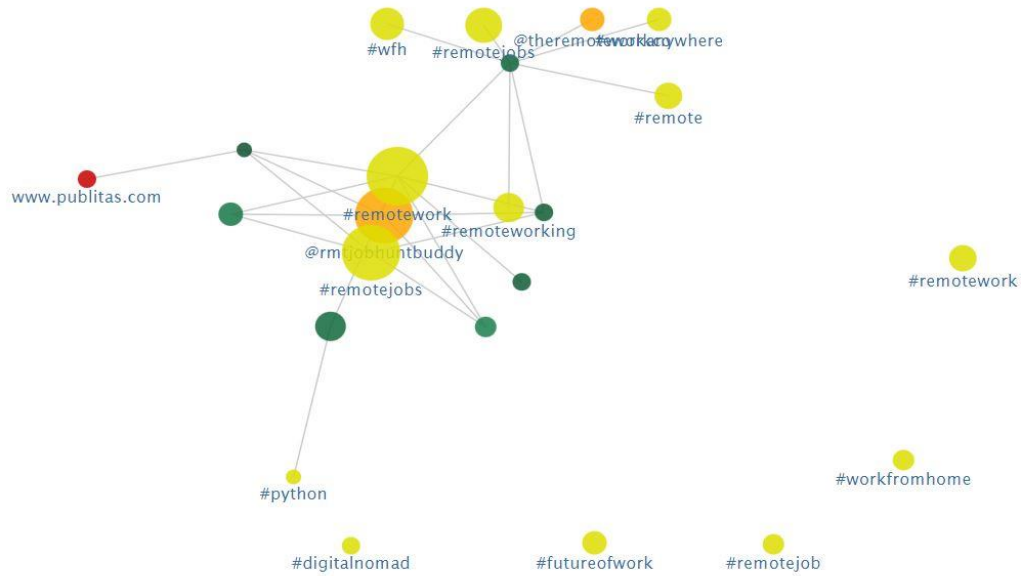


Figure 7

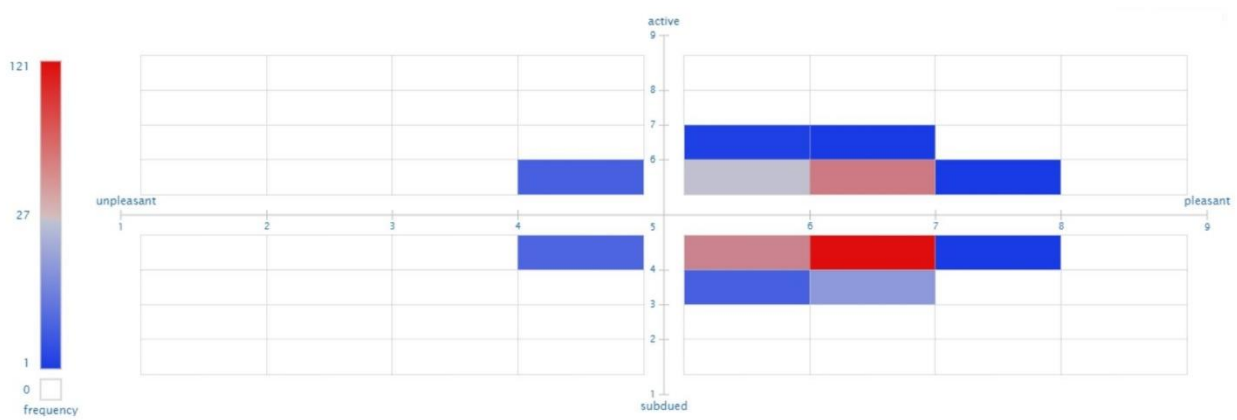


Figure 8

Affinity graph is shown in figure 7. The affinity curve shows that “remotework” has affinity with “remote jobs”, “python”, and “future of work”.

Figure 8 shows the heatmap. It is shown in the figure that most of the tweets were pleasant because most of the blue and red are on the right grids. There are, however, two blue rectangles on the negative side.

Conclusion

Organizations should adopt the following approaches to develop a hybrid work paradigm that supports efficiency, engagement, and seamless communication among workers working from multiple locations. First, Changing the work environment to accommodate the hybrid workstyle allows employees to work more effectively and productively. Integrating a flexible desking strategy, for example, in which workers reserve their workstation before arriving at the workplace, might promote efficient use of space. Second, organizations should create a hybrid office policy. Perhaps a company can run more effectively if some teams work in-house while some others work remotely. Alternatively, they may elect to spread out employees' in-house hours all day long. Employee input may help with alignment with their particular requirements and preferences. Third, business may allow for virtual interactive cooperation. Though hybrid workers may not contact with coworkers on a regular basis, social media style cooperation allows workers to make announcements, acknowledge coworkers for outstanding job performances, and poll team members on critical issues that occur. Videoconferencing, in particular, is an important component of cooperation because technology allows individuals to benefit from the subtleties of seeing one another face to face. Finally, firms should provide hybrid workers with equivalent benefits. Hybrid working employees may believe they are losing out on in-house advantages that their coworkers enjoy.

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