

I'm beside you

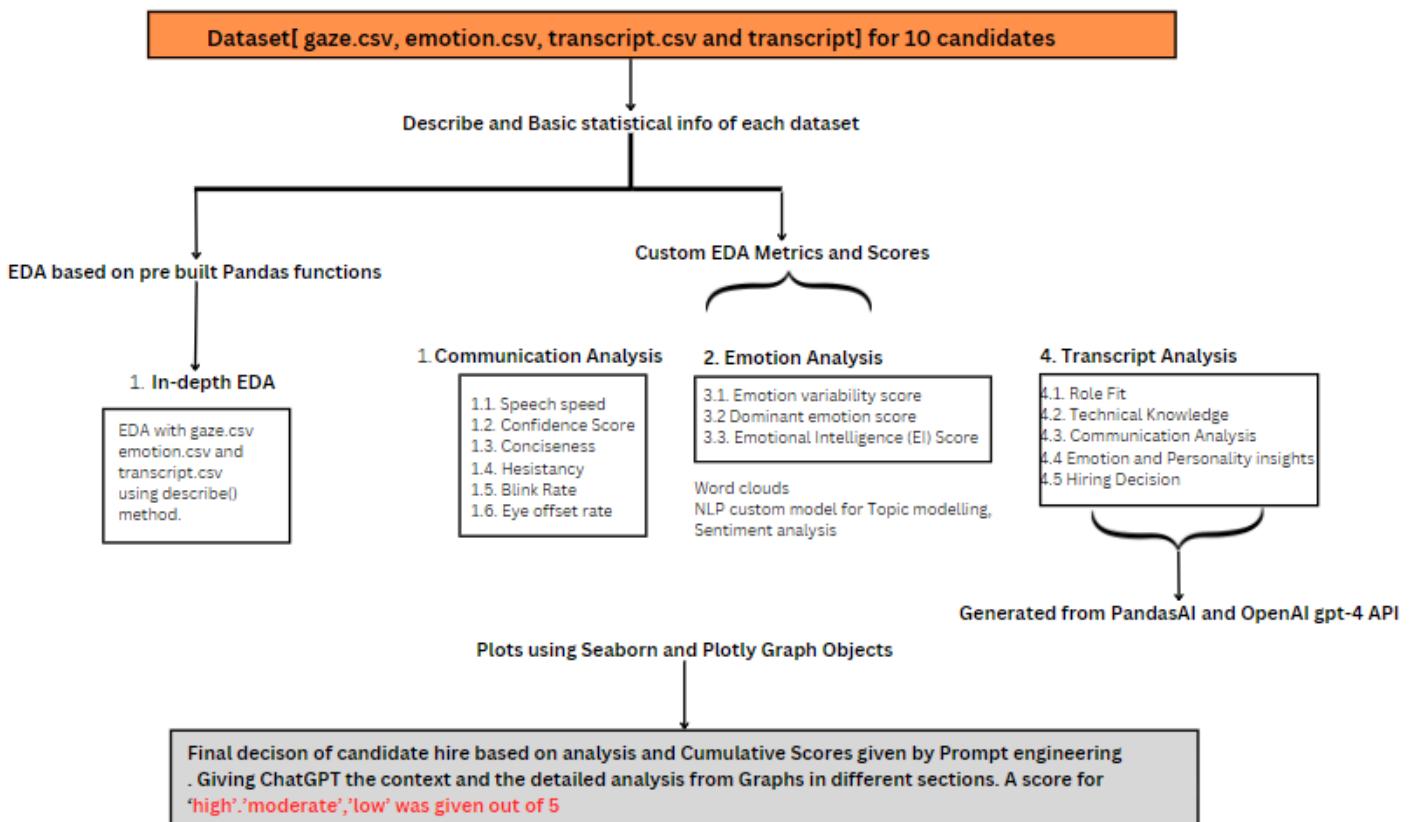
Data Scientist Intern R2

-Agam Pandey
IIT Roorkee

Exploratory Data Analysis

Detailed EDA Notebook can be accessed [here](#)

The documentation on EDA includes the flow that is depicted in the workflow image attached below for reference. 🌟

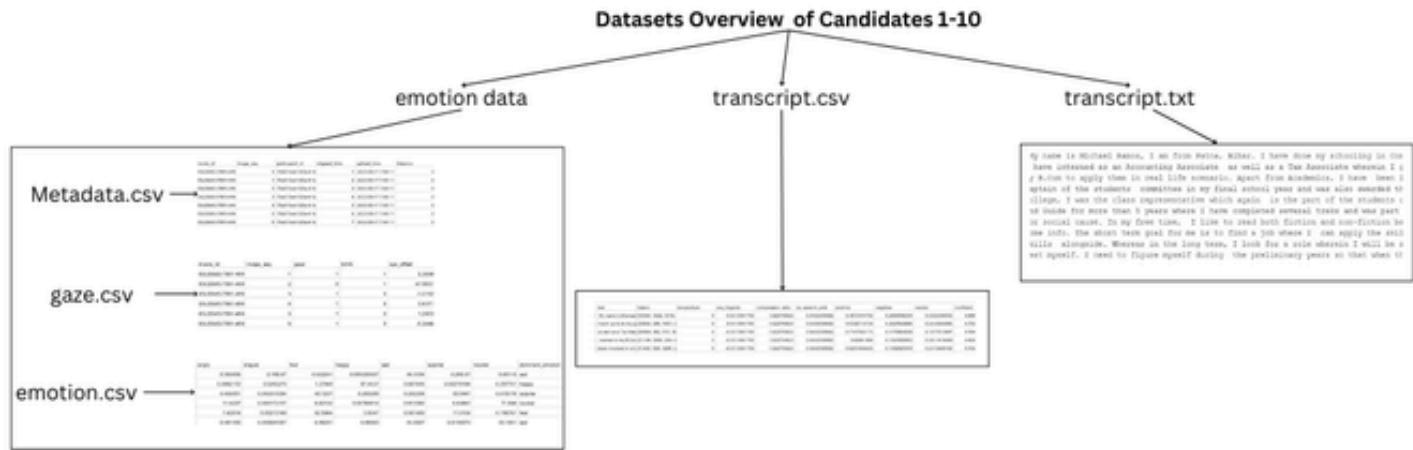


As mentioned, the EDA and final hiring decision process was divided into several steps, which we will cover in detail in this document.

Section-6 contains the conclusion with each candidate Score and Hire Decision Boolean.

Section-1.

1. About the Dataset 📊



The dataset includes three main components: Emotion, transcript.csv, and transcript.txt for 10 candidates. The table below provides a clear overview of the dataset structure and features.

Dataset	Short description	columns
emotion_data 3parts : 1. metadata.csv 2. gaze.csv 3. emotion.csv	This dataset contains emotions of the candidate throughout the video. i. metadata--> keeps track of the video data. ii. gaze--> track eye-related metrics iii. emotion--> analyze emotional reactions	i.movie_id,image_seq,participant_id,e_lapsed_time,upload_time,distance ii. gaze, blink, eye_offset iii. angry ,disgust, fear, happy, sad, surprise, neutral, dominant_emotion
transcript.csv	represent speech analysis or transcription data.	id, seek, start, end, text, tokens, temperature, avg_logprob, compression_ratio, no_speech_prob, positive, negative, neutral, confident, hesitant, concise
transcript.txt	contains interview transcript	words in .txt

[Refer to this ChatGPT link](#). I referred to a ChatGPT session for understanding the dataset analysis process. Though I didn't directly copy prompts, the examples provided were helpful

for a quick overview of the dataset structure



Candidate Scoring will be done for each of the 4 sections below and a cumulative Score will be calculated to rank Candidates for hiring.

The score were generated from ChatGPT.



Section-2.

Basic EDA on the dataset for all 10 candidates:

The screenshot shows a Jupyter Notebook cell with the following code:

```
[1] 1 gaze_all=pd.DataFrame()
2
3 for candidate_id in range(1,candidates+1):
4     gaze_df_idx=gaze_df[candidate_id]
5     df_describe=gaze_df_idx.describe()
6     df_describe.drop(columns=['image_seq'],inplace=True)
7     df_describe['candidate_id'] = candidate_id
8     gaze_all=pd.concat([gaze_all,df_describe],axis=0)
9
10
11 gaze_all = gaze_all.reset_index()
12 gaze_all
13
```

Below the code is a screenshot of the resulting DataFrame:

	index	gaze	blink	eye_offset	candidate_id
0	count	88.000000	88.0	88.000000	1
1	mean	0.625000	0.0	15.801362	1
2	std	0.486897	0.0	17.858517	1
3	min	0.000000	0.0	-33.465500	1
4	25%	0.000000	0.0	0.293050	1
...
75	min	0.000000	0.0	-24.969600	10
76	25%	0.000000	0.0	-0.792775	10
77	50%	1.000000	0.0	4.156950	10
78	75%	1.000000	0.0	28.314000	10
79	max	1.000000	1.0	56.914700	10

80 rows x 5 columns

[Refer this link](#) for the prompt and discussion screenshot (as user input chat links can't be directly shared on ChatGPT, so a screenshot is provided)

A basic exploratory data analysis (EDA) was conducted to understand key metrics like mean, count, standard deviation, and percentiles for each candidate's interview data. To compare all the candidates with each dataset's statistical metrics the following code was used:

The screenshot shows a Jupyter Notebook cell with the following code:

```
[11] 1 gaze_all=pd.DataFrame()
2
3 for candidate_id in range(1,candidates+1):
4     gaze_df_idx=gaze_df[candidate_id]
5     df_describe=gaze_df_idx.describe()
6     df_describe.drop(columns=['image_seq'],inplace=True)
7     df_describe['candidate_id'] = candidate_id
8     gaze_all=pd.concat([gaze_all,df_describe],axis=0)
9
10
11 gaze_all = gaze_all.reset_index()
12 gaze_all.to_csv("gaze_describe.csv",index=False)
13 gaze_all
14
```

The comparison across candidates was done using the following code, which generated a combined dataframe of 80 metrics. Similarly, statistical values from all other .csv files were consolidated into a single dataframe. Similarly, all the other .csv's statistical values were

combined in a common dataframe that can be accessed Here.

🌐 1. df.describe() all candidates - Google Drive

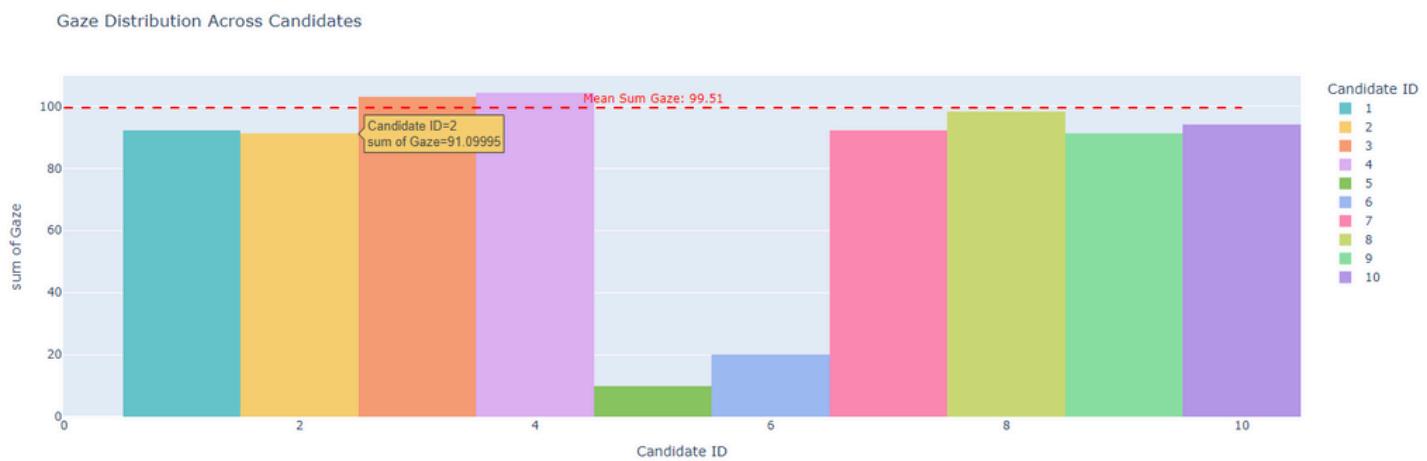
1. gaze.csv
2. emotion.csv
3. transcript.csv

Plots on combined statistical values of each Candidate:

Plots were created using Plotly and Graph Objects (go). Interactive plots can be viewed in the [Colab Notebook](#). 🌐 Google Colab

1. EDA on Gaze combined .csv

i. Mean of Gaze Sum for each candidate



The plot shows the total sum of gaze, indicating how often each candidate looked at the camera during an interview. **Candidates 5 and 6 have notably lower gaze values** compared to others. This suggests that these candidates might not have been focused on the camera, potentially **reading from a device or paper**. Another possibility **could be visual impairment**, though further investigation would be needed to confirm this.

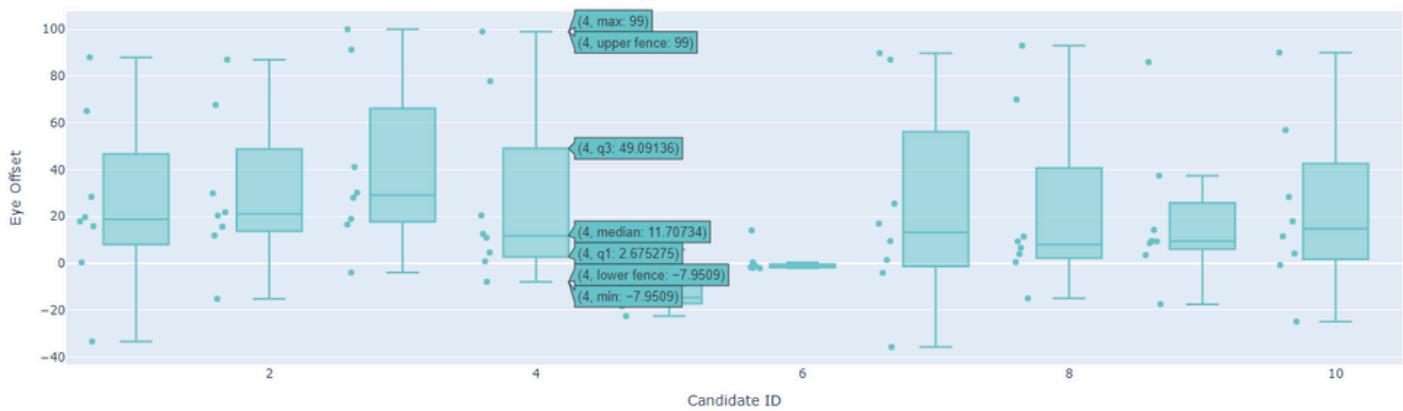
Additional Insights:

1. **Candidate 4:** This candidate has the highest gaze sum, which could indicate strong engagement and focus on the camera during the interview.
2. **Even Distribution:** Most candidates (except 5 and 6) have gaze sums around or above the mean, suggesting consistent engagement across the majority of candidates.
3. **Possible External Factors:** Candidates with lower gaze values might have experienced distractions, technical difficulties, or external factors affecting their eye contact, which could be worth investigating.

[Prompt Engineering Refer Link](#) 🌐 3.Gaze plot1.png

ii. Box plot distribution of Eye-offset of each candidate

Eye Offset Distribution Across Candidates



The plot shows the distribution of **eye offset** for each candidate, which represents the deviation of their gaze from a central point (likely the camera) during an interview.

- High Variability in Eye Offset:** **Candidates 1, 5, 7, and 10 exhibit a wide range of eye offset values, indicating inconsistent focus on the camera.** This might suggest distractions or discomfort in maintaining eye contact, which could be interpreted as a lack of confidence or engagement during the interview.
- Candidates 6 and 9:** These candidates have narrower distributions of eye offset, meaning their gaze was more consistently focused.
- Outliers:** Several candidates show significant outliers (e.g., Candidates 1, 2, and 4). These extreme deviations from central eye contact could be due to distractions, nervousness, or technical issues.

Impact on Hiring:

- Eye Contact and Engagement:** Candidates with **more stable and centered eye contact (e.g., Candidates 6 and 9)** may be viewed as more focused and engaged, potentially leading to a more favorable impression in the hiring process.

[Prompt Link here.](#) 4.Gaze plot2.png

“

Gaze.csv EDA Candidate Scores

Overall Candidate Scores (Based on both Gaze Sum and Eye-Offset):

Here is the overall score for each candidate based on both metrics:

Candidate	Gaze Sum Score (Out of 5)	Eye-Offset Score (Out of 5)	Overall Score
Candidate 1	4	3	3.5
Candidate 2	4	4	4
Candidate 3	4	4	4
Candidate 4	5	4	4.5
Candidate 5	2	3	2.5
Candidate 6	2	5	3.5
Candidate 7	4	3	3.5
Candidate 8	4	4	4
Candidate 9	4	5	4.5
Candidate 10	4	3	3.5

”

1. EDA on emotion combined.csv

This dataset was analyzed on metrics like sum of Happiness, fear and Neutral feeling scores and error box plot of sadness variability.

i. Plot of Happiness distribution among candidates:



This plot shows the distribution of happiness across multiple candidates, with each bar representing the sum of happiness for a specific candidate (identified by Candidate ID). The red dashed line indicates the average happiness across all candidates, which is about 245.93.

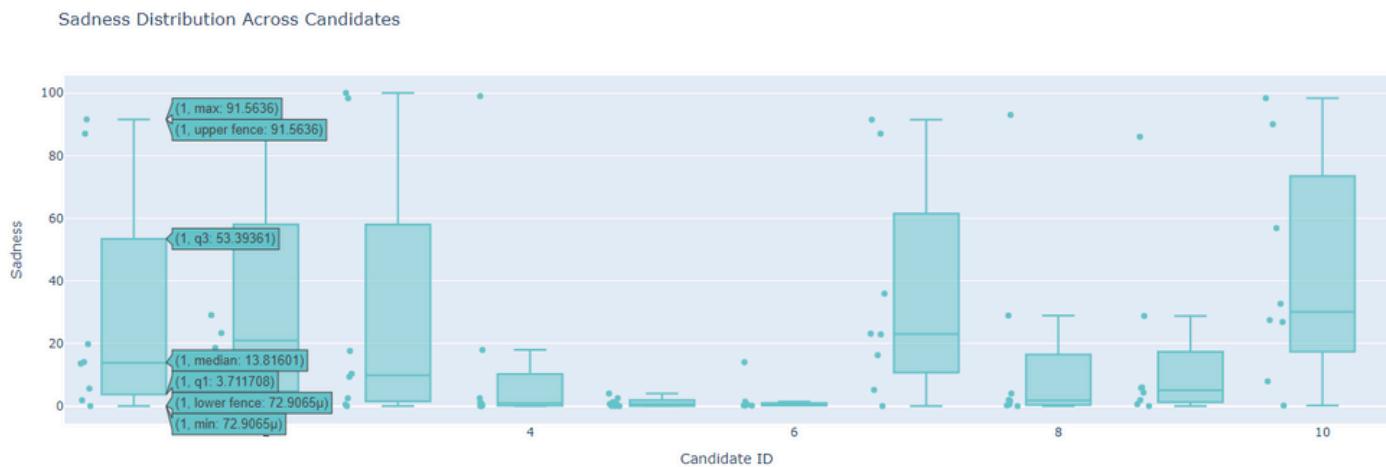
Insights:

- Candidate Performance in Happiness:** Candidates 2 and 3 exhibit the highest levels of happiness, both exceeding the average. This suggests they could potentially be better suited for roles that require a positive disposition or team collaboration.

2. Below-Average Candidates: Candidates 1, 4, 6, and 5 fall below the average happiness level. This could indicate areas for concern if happiness is an important trait for the role in question. These candidates might need further evaluation or support in increasing their engagement or satisfaction.

The plot suggests that candidates with happiness above the average line should be considered for roles that benefit from higher emotional engagement. However, deeper analysis should be done in conjunction with other metrics (like skill set, experience, etc.) to make more informed hiring decisions.

ii. Box Plot distribution of Sadness emotion of candidates:



This plot displays the **sadness distribution** across different candidates, represented as box plots for each Candidate ID. Each box plot shows the range of sadness scores for individual candidates, with key statistical values marked (e.g., minimum, maximum, quartiles, median, and outliers).

Insights:

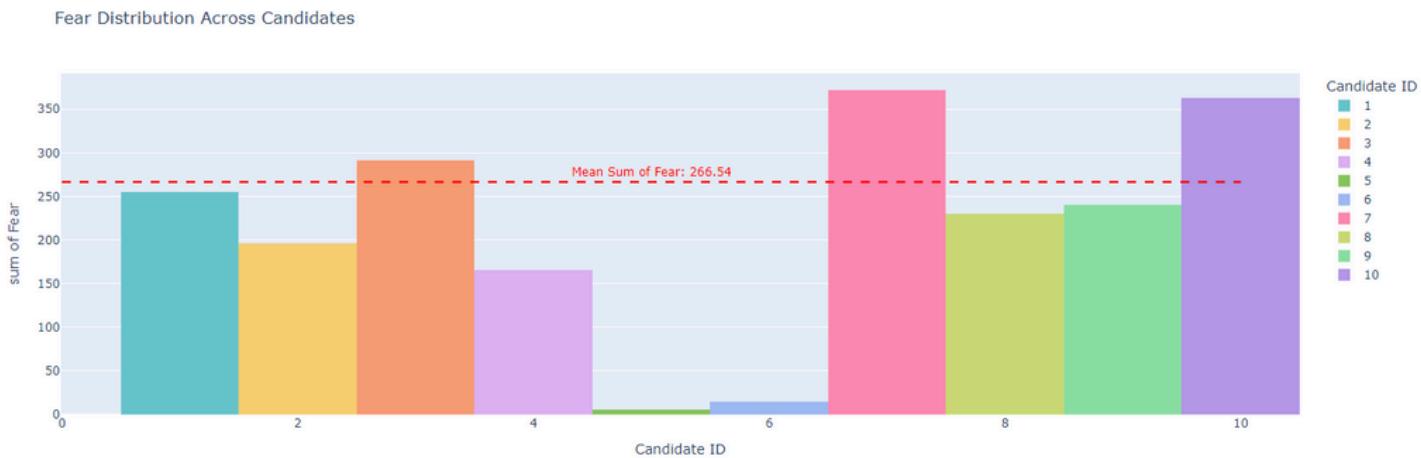
- High Sadness Variability:** Candidates 1, 3, 8, and 10 display large spreads in their sadness levels, indicating variability in how they experience sadness. For example, Candidate 1 has a maximum sadness level of around 91, and a median of about 13, which suggests there are moments of intense sadness even though the median sadness is relatively low.
- Lower Sadness Variability:** Candidates like 4, 6, and 9 show very narrow distributions, with relatively low sadness levels across the board. These candidates may experience less frequent or less intense sadness, indicating greater emotional resilience or stability.

Impact on Candidate Hiring:

- High-Variance Candidates:** Candidates with a wide range of sadness (e.g., Candidates 1, 3, 8, and 10) may experience more emotional ups and downs. If the role requires emotional stability or constant performance under pressure, this may raise concerns. However, they may also be more emotionally in tune and empathetic, which can be advantageous in certain roles.
- Low-Variance Candidates:** Candidates with low sadness levels or little variance (e.g., Candidates 4, 6, 9) might be better suited for roles that require steady emotional

composure, as they appear to maintain lower sadness levels with fewer fluctuations.

iii. Plot of Fear distribution among candidates:



This plot shows the **fear distribution** across different candidates, with each bar representing the sum of fear detected for each candidate (identified by Candidate ID). The red dashed line represents the mean sum of fear (266.54) across all candidates.

Insights:

- Above-Average Fear Levels:** Candidates 7, 10, 3, and 1 have fear levels above the average. If fear is associated with stress or anxiety in a work context, these candidates may require further exploration to understand how they manage fear or stressful situations. This could be particularly important for roles involving high pressure or decision-making.
- Below-Average Fear Levels:** Candidates 4, 5, and 9 display lower levels of fear. These candidates might be seen as more resilient or confident in handling challenges, which could be an advantage in demanding roles where managing fear and stress is critical.
- Balance of Fear and Performance:** Depending on the nature of the job, moderate levels of fear could indicate a healthy awareness of challenges, while extreme levels (either high or low) might require more investigation into how the candidate deals with pressure.

iv. Plot of Neutral emotion distribution among candidates:



This plot shows the **neutral emotion distribution** across different candidates, with each bar representing the sum of neutral emotions for each candidate (identified by Candidate ID).

The red dashed line represents the average sum of neutral emotions (519.17) across all candidates.

Insights:

- **High Neutrality:** Candidates 4, 5, and 8, with higher neutrality, might be ideal for roles requiring calmness under stress, impartial decision-making, or situations where maintaining neutrality is crucial.
- **Low Neutrality:** Candidates who exhibit lower levels of neutrality may either be more passionate or emotionally expressive, which can be beneficial in roles that require strong emotional engagement (such as leadership or creative roles).

“

emotion.csv data Candidate Scores from ChatGPT based on the analysis done above

Overall Candidate Scores (Based on emotional stability, fear handling, and happiness):

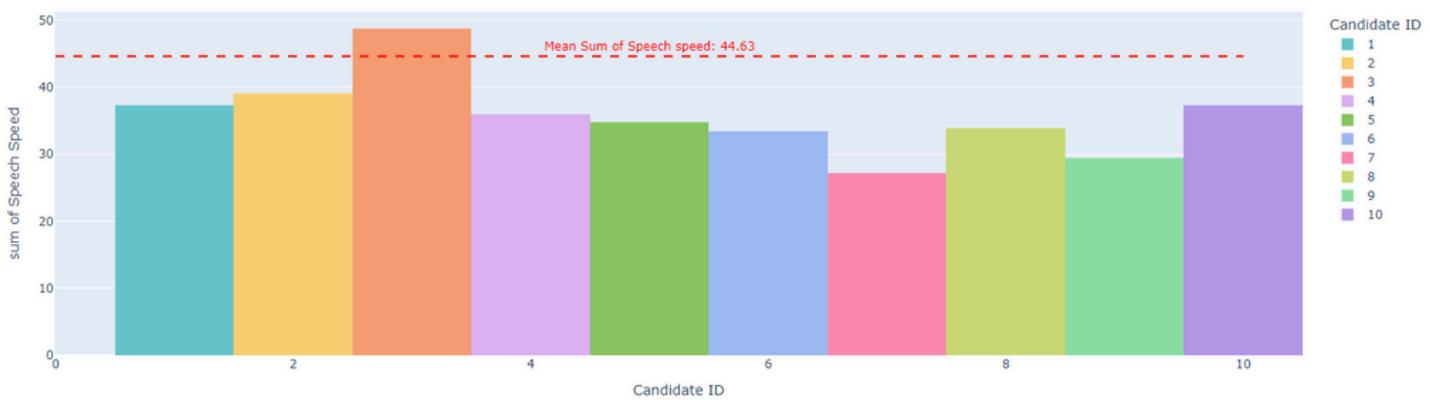
Candidate	Happiness Score (Out of 5)	Sadness Score (Out of 5)	Fear Score (Out of 5)	Neutrality Score (Out of 5)	Overall Score
Candidate 1	3	3	3	3	3
Candidate 2	5	3	3	3	3.5
Candidate 3	5	3	3	3	3.5
Candidate 4	3	5	5	5	4.5
Candidate 5	3	5	5	5	4.5
Candidate 6	3	5	5	3	4
Candidate 7	4	3	3	3	3.5
Candidate 8	3	3	4	5	3.75
Candidate 9	4	5	5	3	4.25
Candidate 10	3	3	3	3	3

”

1. EDA on Transcript_combined .csv

i. Speech Speed distribution of all candidates:

Speech speed Distribution Across Candidates



This plot shows the **speech speed distribution** across candidates, with each bar representing the sum of speech speed during interviews. The red dashed line indicates the average speech speed (44.63) across all candidates.

Insights:

- Above-Average Speech Speed:** Candidates 3 and 2 exhibit higher speech speeds than the average, with Candidate 3 having the highest value. Excessively fast speech can sometimes be difficult to follow, particularly in roles that require clear communication.
- Below-Average Speech Speed:** Candidates 7, 8, and 9 show slower-than-average speech speeds. While slow speech can be perceived as a sign of calmness and careful consideration, if it's too slow, it may also suggest hesitation or lack of confidence, depending on the context.
- Balanced Speech Speed:** Candidates like 4, 5, and 6 are closer to the average, indicating a more neutral or balanced pace. This might be desirable in roles that require clear communication and an ability to articulate thoughts at a reasonable speed.

ii. Confidence distribution of all candidates:

Confident Emotion Distribution Across Candidates



This plot represents the **confidence emotion distribution** across 10 candidates, with each bar indicating the sum of confidence detected from the transcript of each candidate's interview. The red dashed line indicates the average confidence level across all candidates (26.66).

Insights:

1. **Above-Average Confidence:** Candidates **3 and 2** show confidence levels above the average, with Candidate 3 exhibiting the highest confidence. These candidates might be suitable for roles requiring leadership, decision-making, or client-facing responsibilities.
2. **Below-Average Confidence:** Candidates **7, 8, and 9** show lower-than-average confidence. These candidates might be more reserved or unsure in their responses, which may suggest they are less comfortable under pressure or need more development in assertiveness for roles that demand confident communication.
3. **Balanced Confidence:** Candidates like **4, 6, and 10** have average confidence levels. This balance may indicate that they are not overly assertive but can express confidence when required, which might be desirable in roles requiring collaboration and adaptability.

v. Hesitant Emotion distribution of candidates:



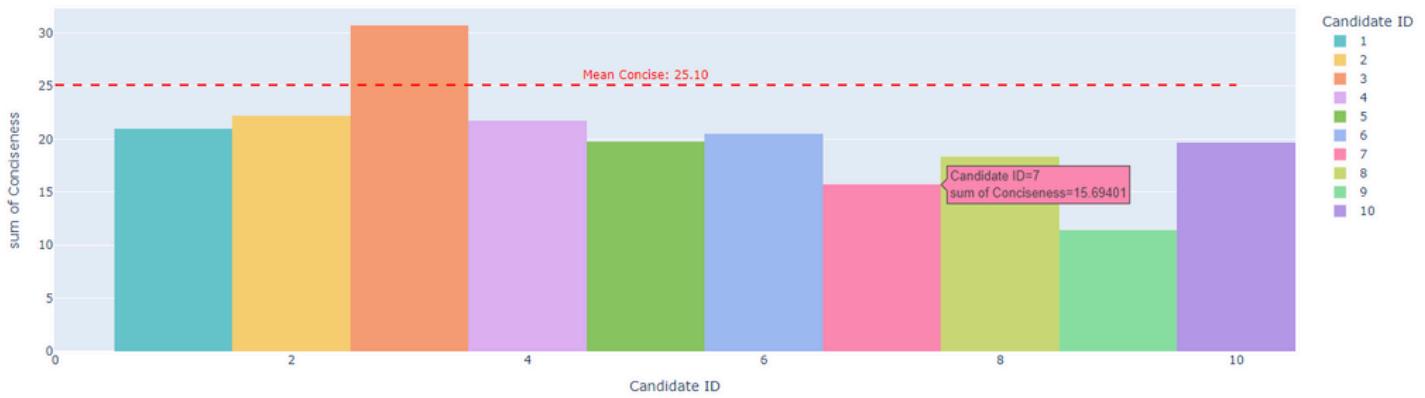
This plot shows the **hesitant emotion distribution** across candidates, with each bar representing the sum of hesitation detected during each candidate's interview responses. The red dashed line indicates the average hesitation level (25.86).

Insights:

1. **Above-Average Hesitation:** Candidates **3 and 2** exhibit higher-than-average hesitation, with Candidate 3 having the highest level. **A high level of hesitation may indicate uncertainty, lack of preparation, or nervousness during the interview.** These candidates may require further evaluation to determine whether the hesitation is a result of interview anxiety or a deeper issue in decision-making or confidence.
2. **Below-Average Hesitation:** Candidates **7, 8, and 9** show lower-than-average hesitation. This suggests they may have answered questions more confidently and directly, without much pause. Lower hesitation can be a positive trait, especially in roles that require quick thinking, decisiveness, and confidence in communication.
3. **Balanced Candidates:** Candidates **4, 5, 6, and 10** exhibit hesitation levels close to the average, indicating that they may have a healthy balance between taking time to think and responding promptly. This might be desirable in roles that require both careful consideration and timely decision-making.

vi. Conciseness distribution of candidates:

Concise Emotion Distribution Across Candidates



This plot shows the **conciseness emotion distribution** across candidates, with each bar representing the sum of conciseness detected in each candidate's interview responses. The red dashed line indicates the average conciseness score (25.10).

Insights:

- Above-Average Conciseness:** Candidates **3 and 2 stand out with higher-than-average conciseness**, with Candidate 3 scoring the highest. These candidates may **have provided clear, direct, and to-the-point answers, which can be an indicator of strong communication skills**. Concise candidates are often more efficient in articulating their thoughts, which is beneficial in roles where time management and clarity are critical.
- Below-Average Conciseness:** Candidates **7, 8, and 9 show lower conciseness**, indicating they might provide longer, less focused responses. This could either suggest a more detailed, thorough approach or a tendency to be verbose, which might affect their effectiveness in roles requiring quick, precise communication.
- Balanced Candidates:** Candidates **4, 5, 6, and 10 are near the average in conciseness, which suggests they are likely capable of providing balanced responses** – neither too brief nor too lengthy. They may be well-suited for roles that require both detail and efficiency.

“

transcript.csv Candidate scores based on analysis above

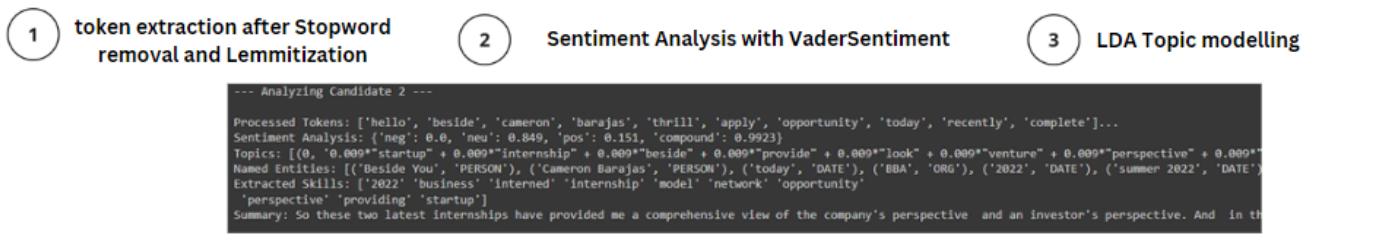
”

Overall Candidate Scores (Based on all four communication metrics):

Candidate	Speech Speed Score (Out of 5)	Confidence Score (Out of 5)	Hesitation Score (Out of 5)	Conciseness Score (Out of 5)	Overall Score
Candidate 1	4	3	3	3	3.25
Candidate 2	4	5	3	5	4.25
Candidate 3	4	5	3	5	4.25
Candidate 4	5	4	4	4	4.25
Candidate 5	5	3	4	4	4
Candidate 6	5	4	4	4	4.25
Candidate 7	3	3	5	3	3.5
Candidate 8	3	3	5	3	3.5
Candidate 9	3	3	5	3	3.5
Candidate 10	4	4	4	4	4

1. EDA on transcript.txt

To analyze the transcripts, I applied NLP algorithms and techniques to assess the candidate's skills and role fit based on the language used. These insights were combined with the previous analysis to arrive at a final hiring decision.

NLP Analysis with transcript.txt datasets for candidates 1-10

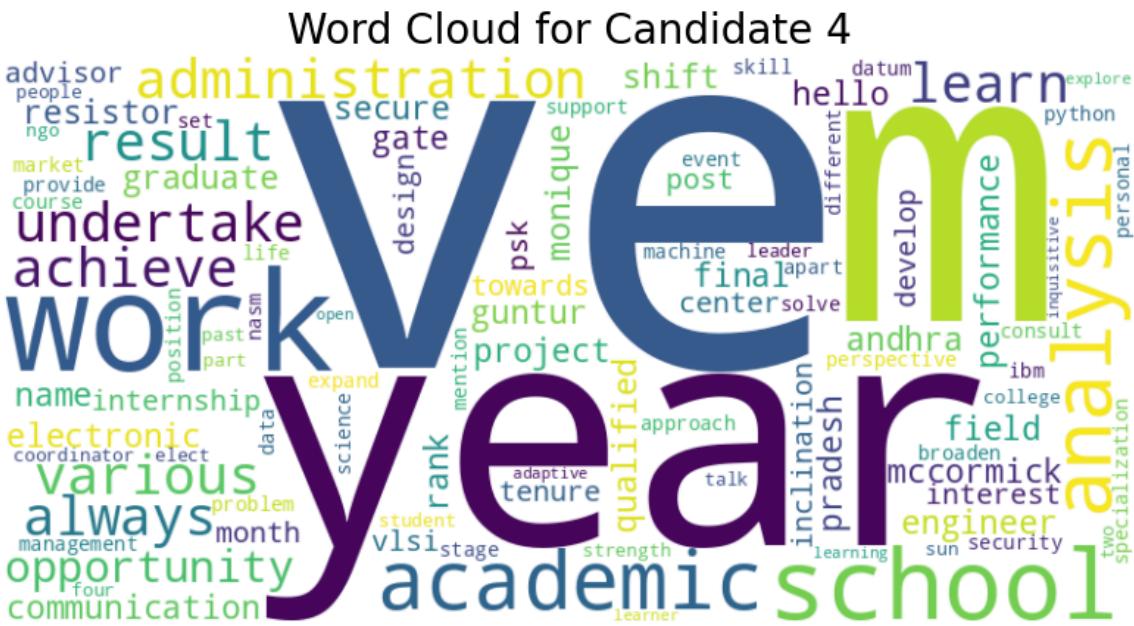
4 Named Entity Recognition

5

Skill extraction with TfIdfVectorizer
(inverse doc frequency)

6 Summarization with TextBlob

WordClouds for each candidate were plotted to understand and visualise the context of introduction using CountVectorizer().



From the word cloud of Candidate 4, we can gather the following insights based on the most prominent words:

Candidate 4 seems to have a strong focus on their **academic background**, **work experience**, and **project involvement**. They appear to have a technical or engineering-related profile, with an emphasis on **learning** and **performance**. Their experience likely spans both **academic** and **professional settings**, with involvement in projects requiring **analysis** and **problem-solving**. This profile suggests that the candidate might be well-suited for technical roles or positions requiring analytical and project management skills.

The prompt engineering screenshots can be found at this link.

10.Transcrip.txt analysis.png

Prompt used: “from this wordcloud of a candidate in an interview give me short insight”

Candidate	WordCloud ChatGPT analysis
1	<p>This candidate has a strong focus on experience and technical expertise, particularly in biotechnology or related fields. They also demonstrate an interest in management and regulatory aspects, making them a good fit for roles requiring a combination of technical and leadership skills in regulated industries like biotechnology or pharmaceuticals.</p>
2	<p>This candidate has strong experience and interest in startups, with a focus on internships, teamwork, and business strategy. Their background makes them a good fit for roles in startup environments, venture capital, or early-stage business development, where a mix of practical business skills and collaborative effort is essential.</p>
3	<p>This candidate seems to have a strong focus on their educational journey and experiences, particularly related to Varanasi and their school/college life. They may have been involved in small-scale projects or had limited professional experience but are committed to learning and growing. They could be a good fit for entry-level roles that provide opportunities to gain more hands-on experience, especially in education or early-stage career development.</p>
4	<p>This candidate appears to have a strong background in academia and work experience, with an emphasis on analysis, administration, and technical knowledge. Their focus on achieving results and continuous learning makes them a good fit for roles that require project management, administrative tasks, or technical expertise in fields like engineering or data analysis. They would likely excel in technical or leadership roles where both management and analysis skills are crucial.</p>
5	<p>This candidate appears to have a strong foundation in education and neurodevelopmental studies, with additional interests in media, creativity, and communication. They likely excel in multitasking and managing a busy workload. This profile would fit well in roles related to education, healthcare, or media/advertising, where they can leverage both their academic expertise and creative inclinations. They could be a good fit for positions that require a combination of specialized knowledge and media/communication skills.</p>
6	<p>This candidate has a strong academic background, particularly in business management and strategic planning, supported by real-world experience with Deloitte. Their focus on analytics, strategy, and consulting makes them a strong fit for roles in business consulting, strategic planning, or management. They would likely excel in environments that require a mix of analytical thinking and business acumen, especially in fields like consulting, corporate strategy, or financial analysis.</p>
7	<p>This candidate demonstrates strong expertise in the insurance and reinsurance sectors, with a focus on understanding complex concepts and applying analytical skills. Their background makes them a good fit for roles in insurance, particularly in reinsurance, underwriting, or risk management. Their ability to grasp intricate details and their focus on work and skill development suggest that they would excel in roles that require both analytical thinking and industry-specific knowledge.</p>
8	<p>This candidate has a strong background in finance and accounting, with practical experience in auditing and financial processes. Their academic background at IIM and potential pursuit of a CFA certification make them a</p>

strong fit for roles in financial analysis, auditing, or corporate finance. Their focus on problem-solving and collaboration suggests they would thrive in **roles** that require **analytical thinking and teamwork, particularly in finance or auditing environments.**

9

This candidate has a strong background in artificial intelligence, with a specific focus on agriculture and agritech. They likely possess technical and engineering skills, along with a passion for using AI to solve real-world problems. Their interests in facial recognition and AI applications further enhance their profile for technology-driven roles. This candidate would be a great fit for roles in AI development, **agritech innovation, or engineering roles that involve applying AI to solve societal challenges.**

10

This candidate appears to have a **solid foundation in commerce or accounting**, with a focus on applying knowledge in practical settings such as internships or extracurricular activities. They have been actively involved in committees and student associations, which highlights their leadership and teamwork abilities. This candidate would be well-suited for **entry-level roles in accounting, financial analysis, or business administration**, where they can continue applying and building on their academic knowledge.

All detailed understanding of the each word cloud can be found at this [Link](#).

WordCloud - Google Drive

Now we have understood each candidate's introduction and what roles they can fit into in. Using advanced NLP techniques for better mathematical insights:

```
1 from sklearn.feature_extraction.text import TfidfVectorizer
2 from vaderSentiment.vaderSentiment import SentimentIntensityAnalyzer
3 from nltk.corpus import stopwords
4 from nltk.tokenize import word_tokenize
5 from gensim import corpora, models
6
7 # Ensure NLTK resources are downloaded
8 nltk.download('punkt')
9 nltk.download('stopwords')
10
11 # Initialize Spacy model and Sentiment Analyzer
12 nlp = spacy.load("en_core_web_sm")
13 analyzer = SentimentIntensityAnalyzer()
14
15 # Preprocessing: Tokenization, Stopword Removal, Lemmatization
16 def preprocess_text(text):
17     # Tokenization
18     tokens = word_tokenize(text.lower())
19
20     # Remove punctuation and stopwords
21     stop_words = set(stopwords.words('english'))
22     tokens = [word for word in tokens if word not in stop_words and word not in string.punctuation]
23
24     # Lemmatization
25     doc = nlp(' '.join(tokens))
26     lemmatized_tokens = [token.lemma_ for token in doc]
27
28     return lemmatized_tokens
29
30 # Sentiment Analysis using VADER
31 def perform_sentiment_analysis(text):
32     sentiment = analyzer.polarity_scores(text)
33     return sentiment
34
35 # Topic Modeling using LDA
36 def perform_topic_modeling(corpus):
37     dictionary = corpora.Dictionary(corpus)
38     doc_term_matrix = [dictionary.doc2bow(doc) for doc in corpus]
39     LDA = gensim.models.LdaModel
40     lda_model = LDA(doc_term_matrix, num_topics=3, id2word=dictionary, passes=15)
41     return lda_model.print_topics()
```

1. **Sentiment Analysis:** Used VADER (Valence Aware Dictionary and sEntiment Reasoner) for lexicon and rule-based sentiment analysis, ideal for capturing sentiments in the interview transcripts.

GitHub - cjhutto/vaderSentiment: VADER Sentiment Analysis. VADER (Valence Aware...

2. **LDA Topic Modeling:** Applied Latent Dirichlet Allocation (LDA) to uncover underlying topics discussed in the transcripts.
3. **NER (Named Entity Recognition):** Identified key entities such as technologies, companies, and skills from the text.
4. **Skill Extraction:** Extracted relevant skills from the transcripts using keyword matching and NLP techniques.
5. **Summary Generation:** Generated concise summaries of candidate responses to capture the main points efficiently.

Candidate Insights: (was done with help of ChatGPT refer this [link](#)) . Access the dataset generated with code at this [Link](#).

combined_candidate_transcript_analysisNLP.csv

Results:

Candidate	Sentiment	Skills	Verdict
Candidate 1	Neutral with slight positivity	Focus on work experience and growth	Suitable for mid-level roles in management or operations, strong experience but lacks enthusiasm.
Candidate 2	Slightly positive	Focus on internships, startups, and business acumen	Suitable for entry-level or junior roles in startups, strong in internships but lacks depth.
Candidate 3	Neutral to positive	Adaptability, problem-solving, personal/professional growth	Suitable for dynamic roles requiring adaptability and continuous learning.
Candidate 4	Neutral with slight positivity	Strong in analysis, data, and learning	Suitable for data analysis or research roles, strong analytical and learning focus.
Candidate 5	Positive	Focus on innovation and problem-solving, particularly with AI	Suitable for creative or innovative tech roles requiring problem-solving.
Candidate 6	Neutral to slightly positive	Strong in analytics, consulting, and business management	Suitable for analytics or consulting roles, strong background in Deloitte and education.
Candidate 7	Neutral to slightly positive	Focus on finance, insurance, and reinsurance	Suitable for junior roles in finance or insurance, particularly reinsurance.
Candidate 8	Neutral to positive	Strong in finance, auditing, and structured thinking	Suitable for finance or audit roles, with solid problem-solving and financial acumen.
Candidate 9	Positive	Focus on AI, technology development, and engineering	Suitable for technology or AI-related roles, especially in AI development and innovation.
Candidate 10	Slightly positive	Focus on applying knowledge in social and educational contexts	Suitable for roles in education or social sciences, strong inclination for social contexts.

Final Verdicts of ChatGPT analysis on NLP dataframe :

- **Candidate 1:** Consider for mid-level roles requiring steady experience.
- **Candidate 2:** Recommend hiring for junior roles with growth potential, especially in startups.
- **Candidate 3:** Consider for versatile positions with adaptability.
- **Candidate 4:** Hire for analytical roles requiring data-driven decision-making.

- **Candidate 5: Hire for creative or tech roles** involving problem-solving and innovation.
- **Candidate 6: Hire for analytics or consulting roles** with strong experience in consulting and analytics.
- **Candidate 7: Hire for junior finance roles**, particularly in the insurance domain.
- **Candidate 8: Hire for audit or financial analyst positions**, with strong skills in finance and auditing.
- **Candidate 9: Hire for technology or AI roles**, with a focus on AI development and innovation.
- **Candidate 10: Hire for education or social research roles**, with strengths in applying knowledge in social contexts.

“

Here are the scores for each candidate based on the provided analysis, with a score scale from 1 to 5 (5 being the best) across the key metrics of **Sentiment**, **LDA Topics**, **NER Entities**, **Skills**, and **Final Role Fit**.

Candidate	Sentiment Score	LDA Topics Score	NER Entities Score	Skills Score	Final Role Fit Score
Candidate 1	3	4	4	4	3.5
Candidate 2	4	4.5	4.5	4	4
Candidate 3	4	4	4	4.5	4
Candidate 4	4	5	5	5	4.5
Candidate 5	4.5	4	4.5	5	4.5
Candidate 6	4	5	5	5	4.5
Candidate 7	3.5	4	4	4	4
Candidate 8	4	4	4.5	4	4
Candidate 9	4.5	5	5	5	4.5
Candidate 10	3.5	4	4	4	4

”

Now, that we have gone through and analysed each dataset, Let us calculate some Scores which might give us better understanding of the dataset.

Section-3.

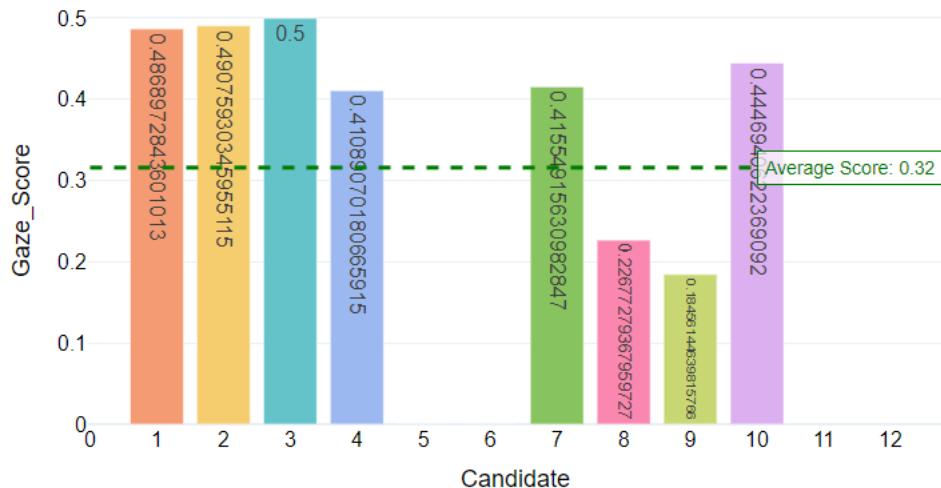
Communication Analysis Scores:

Communication Score	Formula used	Explanation
Confidence score	$\text{combined_conf_score} = w1 * \text{avg_confidence_score} - w2 * (\text{std_confidence_score} / \text{avg_confidence_score})$	w1=0.7 is a weight given to the average confidence score that shows the overall confidence in a video but considering variability that accounts for instance based scores with a weight of 0.3
Blink Rate	$\text{combined_speech_score} = w1 * \text{avg_speech_speed} - w2 * \text{std_speech_speed}$	#candidate should not blink too much, be moderate
Eye Offset Score	$\text{combined_score} = w1 * \text{avg_score} - w2 * \text{std_score}$	#score avg must be high to show consistent communication and variability must be a bit low
Speech Speed	$\text{combined_score} = w1 * \text{avg_score} - w2 * \text{std_score}$ #score avg must be high to show consistent communication and variability must be a bit low	for a good communication, candidate must not speak too fast or too slow
Conciseness	$\text{combined_score} = w1 * \text{avg_score} - w2 * \text{std_score}$ #score avg must be high to show consistent communication and variability must be a bit low	Conversation should be concise indicating good communication
Hesitancy	$\text{combined_score} = w1 * \text{avg_score} - w2 * \text{std_score}$ #score avg must be high to show consistent communication and variability must be a bit low	conversation should be moderate, which shows well structured and thought of communication.

Visualisation of Communication scores:

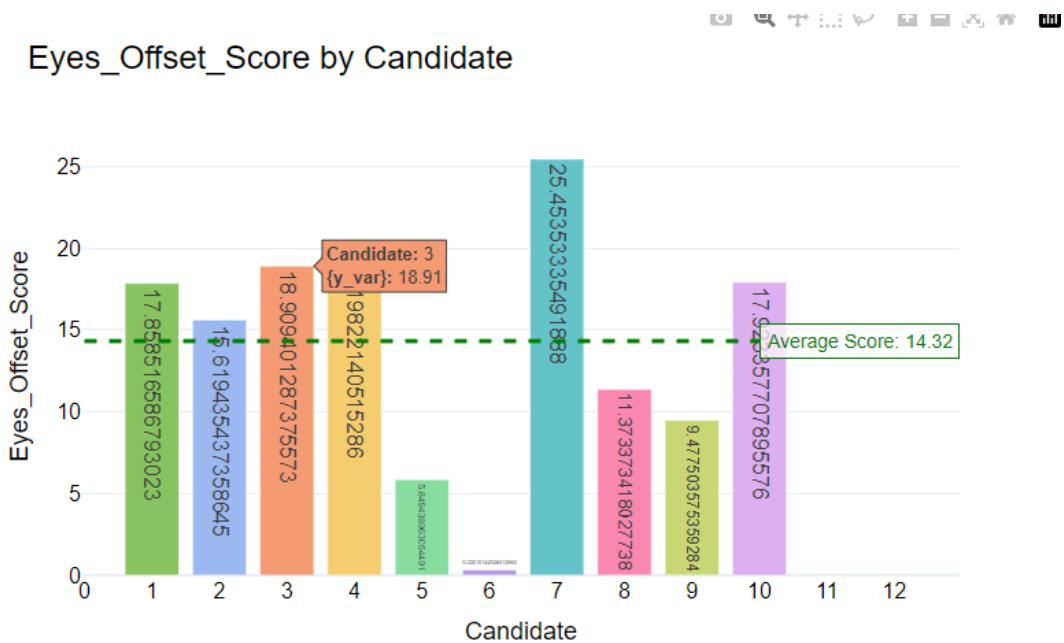
i. Gaze score distribution of candidates:

Gaze_Score by Candidate



“ Candidates should maintain eye contact with the camera to ensure they're not reading from pre-written notes, which could suggest weak communication. As observed, candidates 5, 6, 7, 8, and 9 have low gaze scores, indicating they may have looked away from the camera during their introduction. ”

ii. Eyes_offset_score distribution plot of candidates:

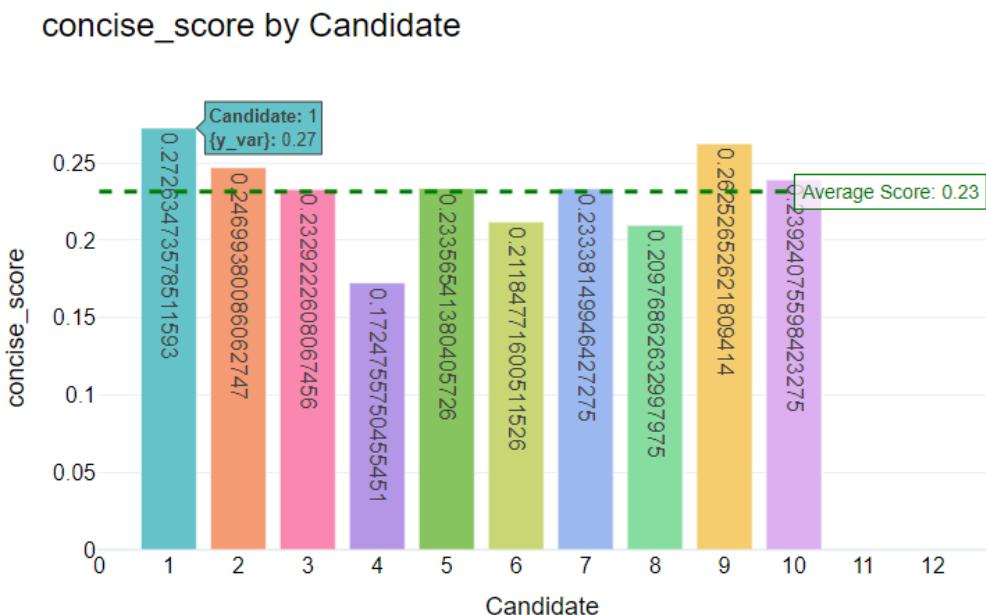


“

Candidates with lower deviation scores (e.g., 5, 9) tend to appear more focused and engaged, which may be beneficial in roles requiring communication and interpersonal interaction. Conversely, higher scores (e.g., 7, 6) could raise concerns about focus or engagement, especially in customer-facing roles

”

iii. concise_score distribution plot of candidates:

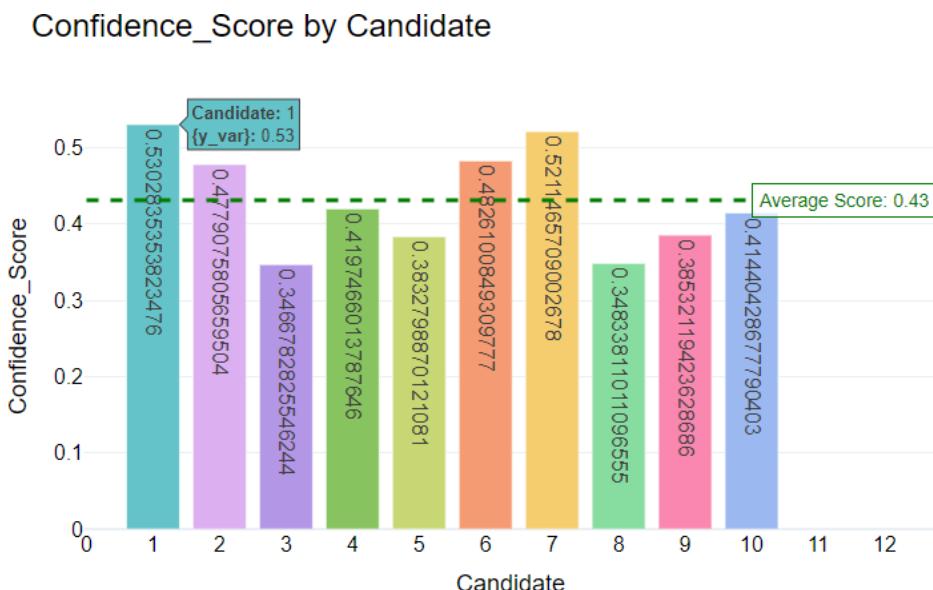


“

Conciseness is a key metric for evaluating communication skills. However, candidates 4, 6, and 8 performed below others in this area.

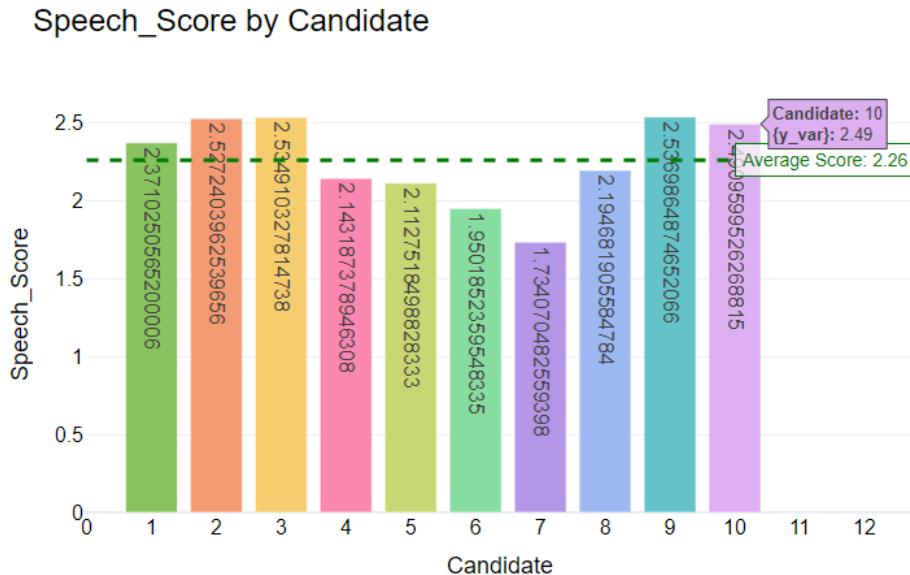
”

iv. confidence_score distribution plot of candidates:



“ The combined confidence scores reflect communication effectiveness. Candidates 3, 5, 8, and 9 show lower confidence levels. ”

v. Speech_score distribution plot of candidates:



“ Candidates 3, 2, and 10 should be considered for roles that require strong communication, as they performed well in this area. Conversely, Candidates 7 and 9 may need improvement in speech clarity and should be considered for roles where communication is less critical. ”

“

Communication scores of each candidate ChatGPT

Candidate	Gaze/Focus Score	Conciseness Score	Confidence Score	Final Communication Score
Candidate 1	4	4	3.5	3.8
Candidate 2	4.5	4.5	4.5	4.5
Candidate 3	4	5	4.5	4.5
Candidate 4	3.5	3.5	4	3.7
Candidate 5	3	4	3.5	3.5
Candidate 6	3	3.5	4	3.5
Candidate 7	2.5	4	3	3.2
Candidate 8	3	3.5	3.5	3.3
Candidate 9	3	4	3.5	3.5
Candidate 10	4.5	4	4.5	4.3

”

Section-4.

Emotional Analysis Scores:

I asked ChatGPT if there could be any way to quantify emotional intelligence from the dataset, it gave me this.

Emotional Intelligence (EQ) reflects how well a candidate manages, perceives, and expresses emotions. To quantify this from the dataset, we used a metric based on:

- **Emotion Perception:** Understanding various emotions.
- **Emotion Regulation:** Managing intense emotions like fear or anger.
- **Emotion Expression:** Appropriateness of emotional display.
- **Dominant Emotion:** The candidate's overall emotional state during the interaction.

We assigned emotional weights to each emotion and summed them across the video to track emotional fluctuations and assess the candidate's emotional intelligence.

Approach to Calculate Combined Score:

1. **Mean (μ):** Represents the **average emotional intelligence** of the candidate.
 - **Higher is better:** Indicates positive or emotionally intelligent behavior.
2. **Standard Deviation (σ):** Represents the **variability or consistency** in emotional intelligence.
 - **Lower is better:** Indicates more emotional stability and consistent behavior.

Combined Score Formula:

To combine these two factors, the **mean** is the main indicator of emotional intelligence, and the **standard deviation** is a penalty for inconsistency. We can calculate the **combined score** as:

$$\text{Combined Score} = \mu - k \times \sigma$$

Where:

- μ is the mean EI score.
- σ is the standard deviation.
- k is a **penalty factor** (a constant to control how much weight you give to inconsistency).

EI score calculation code snippet:

```
def calculate_ei(row):  
    # Assign weights to emotions  
    emotion_weights = {  
        'angry': -2, # Negative influence  
        'disgust': -2, # Negative influence  
        'fear': -1, # Negative but less intense  
        'happy': 2, # Positive  
        'sad': -2, # Strong negative  
        'surprise': 0, # Neutral  
        'neutral': 1 # Moderate positive  
    }  
  
    # Calculate score based on emotions and intensity  
    emotional_score = sum(row[emotion] * weight for emotion, weight in emotion_weights.items())  
  
    # Adjust score based on dominant emotion (could be fine-tuned)  
    dominant_modifiers = {  
        'sad': -3, 'happy': 3, 'surprise': 0, 'neutral': 1, 'fear': -2, 'angry': -2, 'disgust': -2  
    }  
  
    emotional_score += dominant_modifiers.get(row['dominant_emotion'], 0)  
  
    return emotional_score
```

Emotional weights were assigned to each emotion and they were cumulatively summed over the entire duration of the video. This made us understand how emotions of the candidate fluctuated and again talks about the Emotion Perception concept.

i. EI Score with std deviation of each candidate plotted

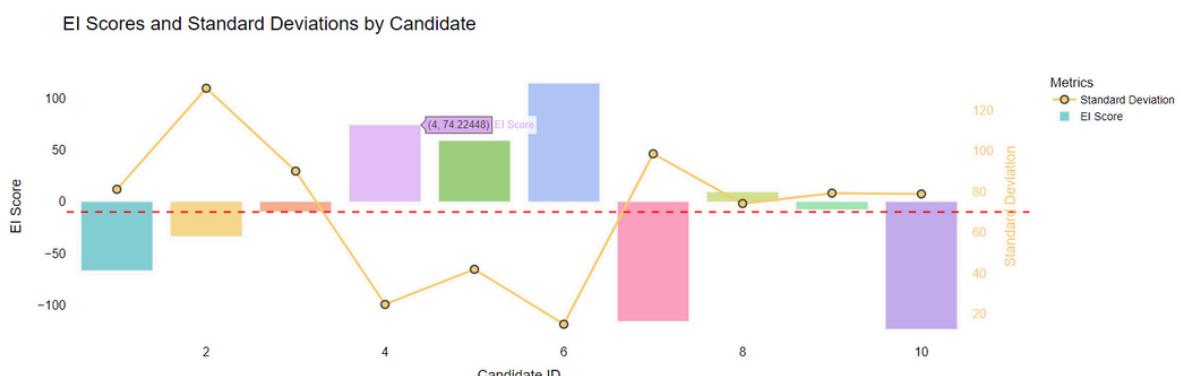


Chart Explanation:

- **EI Score** (bar chart): Reflects each candidate's emotional intelligence based on their emotional perception, regulation, expression, and dominant emotions during the interview.
- **Standard Deviation** (line with dots): Shows the volatility or consistency in a candidate's emotional intelligence across the interview. A **lower standard deviation** indicates emotional stability, while a **higher standard deviation** points to emotional volatility or inconsistency.

Candidate-by-Candidate Insights:

1. **Candidate 1:**
 - **EI Score:** Slightly below 0.
 - **Standard Deviation:** Moderate.
 - **Insight:** The candidate appears to struggle with emotional regulation or expression. Their emotional intelligence is inconsistent, which may result in challenges in managing stress or communicating effectively.
 - **Verdict:** **Not recommended** for hiring, as the low EI score and moderate emotional volatility suggest difficulties in handling emotions under pressure.
2. **Candidate 2:**
 - **EI Score:** Slightly positive, above 0.
 - **Standard Deviation:** Low (relatively stable emotions).
 - **Insight:** The candidate demonstrates moderate emotional intelligence with a low standard deviation, indicating emotional stability. They can handle emotional expression and regulation well.
 - **Verdict:** **Recommended** for hiring, especially for roles requiring emotional stability and interpersonal skills.
3. **Candidate 3:**
 - **EI Score:** Slightly positive, close to 0.
 - **Standard Deviation:** Very high (large emotional fluctuations).
 - **Insight:** While the EI score is slightly positive, the high standard deviation suggests that the candidate's emotional intelligence is highly inconsistent. They may experience emotional swings or volatility during high-pressure situations.
 - **Verdict:** **Not recommended** due to emotional volatility. Inconsistent emotional regulation could be problematic in stressful environments.
4. **Candidate 4:**
 - **EI Score:** Highest among all candidates (over 70).
 - **Standard Deviation:** Moderate.
 - **Insight:** This candidate shows high emotional intelligence, with the ability to manage emotions effectively. Their moderate standard deviation indicates a good balance between emotional intensity and regulation.
 - **Verdict:** **Highly recommended** for hiring. The candidate's strong EI suggests they can manage interpersonal dynamics and stress effectively.
5. **Candidate 5:**
 - **EI Score:** Positive.

- **Standard Deviation:** Low (consistent emotions).
- **Insight:** The candidate demonstrates good emotional intelligence and is emotionally consistent throughout the interview. This indicates a well-regulated emotional state.
- **Verdict: Recommended** for hiring. Strong emotional consistency makes this candidate a solid choice for roles requiring stable interpersonal interactions.

6. Candidate 6:

- **EI Score:** Very low (below -50).
- **Standard Deviation:** Low (consistent, but negative emotions).
- **Insight:** The candidate shows poor emotional intelligence with consistently negative emotional tendencies. Their EI score suggests struggles with emotional expression or management.
- **Verdict: Not recommended** for hiring. Consistently low emotional intelligence can indicate poor interpersonal skills and inability to handle emotional situations effectively.

7. Candidate 7:

- **EI Score:** Slightly positive, near 0.
- **Standard Deviation:** High.
- **Insight:** The candidate's emotional intelligence is positive but unstable, with high volatility in emotional expression.
- **Verdict: Not recommended** due to high emotional variability. This candidate may struggle with consistent emotional regulation in high-stress environments.

8. Candidate 8:

- **EI Score:** Neutral (close to 0).
- **Standard Deviation:** High.
- **Insight:** The candidate's emotional intelligence is average but inconsistent, with fluctuating emotions during the interview.
- **Verdict: Not recommended** due to emotional inconsistency. Their unstable emotional responses may cause issues in situations requiring steady emotional management.

9. Candidate 9:

- **EI Score:** Positive.
- **Standard Deviation:** Low.
- **Insight:** The candidate demonstrates strong emotional intelligence with a high degree of emotional stability, suggesting good emotional regulation and communication.
- **Verdict: Recommended** for hiring. Strong emotional intelligence and consistency make them suitable for roles involving teamwork and communication.

10. Candidate 10:

- **EI Score:** Negative (below -50).
- **Standard Deviation:** Moderate.
- **Insight:** The candidate displays poor emotional intelligence, consistently struggling with emotional expression and regulation. Their emotional tendencies lean towards the negative.
- **Verdict: Not recommended** for hiring. Poor emotional intelligence and negative emotional tendencies are concerning, particularly for roles requiring interpersonal skills.

Final Verdict based on EI Scores:

- **Highly Recommended for Hiring: Candidates 4, 5, and 9** (high or positive EI scores with low to moderate emotional volatility).
- **Not Recommended: Candidates 1, 3, 6, 7, 8, and 10** (either low EI scores or high emotional volatility, indicating poor emotional regulation or consistency).

Candidates with high emotional intelligence and low volatility (standard deviation) are better suited for roles requiring interpersonal interactions, stress management, and teamwork.

“

Candidate	EI Score (1-5)	Emotional Stability (1-5)	Overall EI Score (1-5)
Candidate 1	1	3	2
Candidate 2	4	5	4.5
Candidate 3	3	1	2
Candidate 4	5	4	4.5
Candidate 5	4	5	4.5
Candidate 6	1	2	1.5
Candidate 7	3	2	2.5
Candidate 8	2	1	1.5
Candidate 9	4	5	4.5
Candidate 10	1	3	2

”

Section-5.

Transcript Analysis Scores (with GPT-4 Agent):

In this section of the analysis, ChatGPT API was used in Python code: (Refer this link to checkout the cell in Google [Colab](#))

Prompt that i did on ChatGPT to get better insights from this graph [link](#) below:

9.Transcript analyse1.png

```

def get_response(transcript):
    # Create the messages list with a system prompt
    messages = [
        {"role": "system", "content": "You are a seasoned interviewer."},
        {"role": "user", "content": f"""
            Please analyze the following transcript with the following objectives:

            1. **Role Fit**: Determine the most suitable role for the candidate based on their responses and experience.
            2. **Technical Knowledge**: Assess the candidate's technical knowledge and expertise relevant to the potential role.
            3. **Communication Analysis**: Evaluate how the candidate conveys their thoughts, including clarity, confidence, and articulation.
            4. **Emotional and Personality Insights**: Analyze the emotional tone and personality traits reflected in the candidate's speech. Consider factors such as enthusiasm, passion, and confidence.
            5. **Hiring Decision**: Based on the analysis, provide a recommendation on whether the candidate should be hired for the role, including justifications for your decision.

            Transcript: {transcript}

            Please format your response as a dictionary with the following keys:
            - "Role Fit"
            - "Technical Knowledge"
            - "Communication Analysis"
            - "Emotional and Personality Insights"
            - "Hiring Decision"
        ...}]
    ]

    # Generate the response from the model
    response = openai.chat.completions.create(
        model="gpt-4", # Specify the model you want to use
        messages=messages
    )

    # Extract the reply
    reply = response.choices[0].message.content
    return reply

response_df=pd.DataFrame(columns=['candidate_id','transcript_analysis'])

```

The ChatGPT agent was working as an experienced interviewer who read through the transcript of candidate divided it into 4 major segments and made a final decision of Hiring. The response generated by ChatGPT was then passed through VaderSentiment Analyser to get scores corresponding to:

1. Role Fit
2. Technical Knowledge
3. Communication Skills
4. Emotional and Personality Insights
5. Hiring Decision

Higher score indicates higher metrics in each objective.

i. Snippet of how the dataframe of scores looks like is shown below 

 [gpt_response_with_scores.csv](#) [Link](#).

1 gpt_response_score_df=pd.read_csv("/content/gpt_response_with_scores.csv")
2 gpt_response_score_df.head()

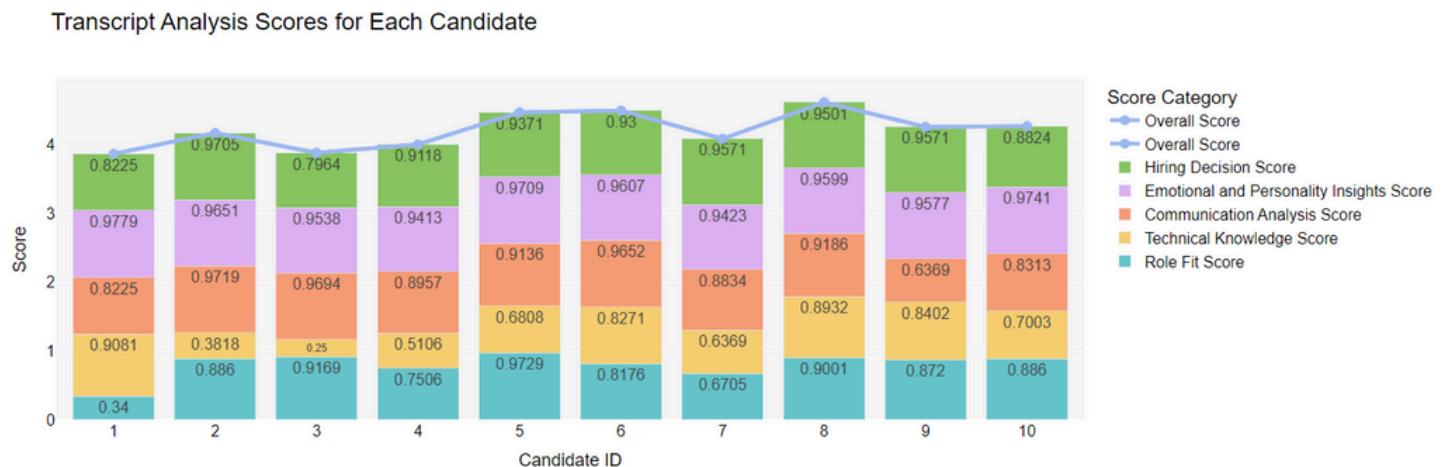
		candidate_id	Role Fit	Technical Knowledge	Communication Analysis	Emotional and Personality Insights	Hiring Decision	Role Fit_Score	Technical Knowledge_Score	Communication Analysis_Score	Emotional and Personality Insights_Score	Hiring Decision_Score	Overall_Score
0	1	Based on the candidate's experience and education...	The candidate demonstrated a high level of tec...	\n\nThe candidate seems to have clear communicat...	\n\nThe candidate presents as confident and ent...	\n\nBased on the structured response provided ...	0.3400	0.9081	0.8225	0.9779	0.8225	3.8710	
1	2	Based on the candidate's experience and respons...	From a technical standpoint, the candidate dis...	The candidate's speech is clear, confident, an...	The candidate seems to be highly enthusiastic ...	Considering the analysis, it is clear that the...	0.8860	0.3818	0.9719	0.9651	0.9705	4.1753	
2	3	The candidate has a mixed array of experiences...	The candidate has demonstrated exposure to tec...	The candidate communicates his thoughts with c...	Overall, the candidate displays high energy an...	Based on the presented analysis, the candidate...	0.9169	0.2500	0.9694	0.9538	0.7964	3.8865	
3	4	\n\nThe candidate, Monique, demonstrates a stron...	\n\nMonique shows proficiency in electronics and...	\n\nMonique communicates her thoughts clearly an...	\n\nMonique exhibits a strong personality charac...	\n\nBased on the analysis, Monique is recommende...	0.7506	0.5106	0.8957	0.9413	0.9118	4.0100	
4	5	\n\nThe candidate, Sakshi, seems to be a creativ...	\n\nSakshi appears to have a strong grounding in...	\n\nSakshi communicates clearly and enthusiastic...	\n\nThe candidate shows passion and enthusiasm ...	\n\nConsidering her profile, Sakshi could bring ...	0.9729	0.6808	0.9136	0.9709	0.9371	4.4753	

Next steps: [Generate code with gpt_response_score_df](#)

 [View recommended plots](#)

 [New interactive sheet](#)

ii. Transcript Analysis scores plot



Overall Insights:

- **Top Performers:** Candidates 2, 5, and 9 stand out with high overall scores (above 3.8), indicating well-rounded performances across all metrics.
- **Low Performers:** Candidates 1 and 3 show relatively lower overall scores, particularly in the **communication** and **hiring decision** categories.
- **Balance:** Candidates 4, 6, 7, and 10 have consistent performances, with moderate to high scores in most categories, but a few weaknesses in either technical knowledge or role fit.

Candidate-by-Candidate Insights:

1. **Candidate 1:**
 - **Overall Score:** 0.8225 (one of the lowest).
 - **Weakness:** Low in **Role Fit** and **Technical Knowledge** (0.34), affecting the overall score.
 - **Verdict:** **Not recommended** for hiring due to poor technical knowledge and a low role fit score.
2. **Candidate 2:**
 - **Overall Score:** 0.9705 (one of the highest).
 - **Strengths:** Strong performance in all areas, especially **Communication** and **Role Fit**.
 - **Verdict:** **Highly recommended** for hiring due to strong performance across the board.
3. **Candidate 3:**
 - **Overall Score:** 0.7964.
 - **Weakness:** Lower **Role Fit** and **Communication** scores, but good emotional insights.
 - **Verdict:** **Not recommended** due to poor role fit and communication, despite strong emotional insights.
4. **Candidate 4:**
 - **Overall Score:** 0.9118.
 - **Strengths:** Well-rounded, with good **Technical Knowledge** and **Hiring Decision** scores.
 - **Verdict:** **Recommended** for hiring, with balanced scores across most categories.
5. **Candidate 5:**
 - **Overall Score:** 0.9371 (high performer).
 - **Strengths:** Strong in **Technical Knowledge** and **Role Fit**, consistent across all metrics.
 - **Verdict:** **Highly recommended** due to strong technical knowledge and role fit.
6. **Candidate 6:**

- **Overall Score:** 0.930.
- **Strengths:** Strong in **Communication** and **Hiring Decision** scores.
- **Verdict:** **Recommended** for hiring, with strengths in communication and technical abilities.

7. Candidate 7:

- **Overall Score:** 0.9571.
- **Strengths:** Strong in all areas except **Role Fit**.
- **Verdict:** **Recommended** with caution; needs a better role fit but excels in technical and communication areas.

8. Candidate 8:

- **Overall Score:** 0.9501.
- **Strengths:** Balanced across all areas, with particular strengths in **Hiring Decision** and **Technical Knowledge**.
- **Verdict:** **Highly recommended** due to strong technical skills and role fit.

9. Candidate 9:

- **Overall Score:** 0.9571 (high performer).
- **Strengths:** Balanced performance across all areas.
- **Verdict:** **Highly recommended** for hiring, showing strength in technical and emotional insights.

10. Candidate 10:

- **Overall Score:** 0.8824.
- **Strengths:** Strong in **Technical Knowledge** and **Emotional Insights**, with a lower score in **Hiring Decision**.
- **Verdict:** **Recommended** but may need further evaluation in fit and final hiring decision.

Final Hiring Recommendations for Transcript analysis scores:

- **Highly Recommended for Hiring:** Candidates **2, 5, 8, and 9** – all exhibit high scores in **Role Fit**, **Technical Knowledge**, and **Hiring Decision**.
- **Recommended for Hiring:** Candidates **4, 6, 7, and 10** – while not perfect, these candidates have strong overall scores with specific areas of strength.
- **Not Recommended:** Candidates **1 and 3** – these candidates performed poorly in key areas like **Role Fit** and **Technical Knowledge**, making them less suitable.

The candidates highlighted for **high performance** demonstrate strong overall capabilities, making them suitable for a wide range of roles, especially those demanding technical expertise and good role fit.

“

Candidate	Role Fit (1-5)	Technical Knowledge (1-5)	Communication Skills (1-5)	Emotional Insights (1-5)	Hiring Decision (1-5)	Overall Score (1-5)
Candidate 1	1	1	3	3	2	2
Candidate 2	5	5	4.5	5	5	4.9
Candidate 3	2	2	2	4	2	2.4
Candidate 4	4	4.5	4	4	4.5	4.2
Candidate 5	5	5	4	4.5	5	4.7
Candidate 6	4	4.5	5	4.5	4.5	4.5
Candidate 7	3.5	5	5	4	4	4.3
Candidate 8	5	5	4.5	5	5	4.9
Candidate 9	5	4.5	4.5	5	5	4.8
Candidate 10	3.5	4.5	4	4.5	4	4.1

”

Section-6.

Conclusion:

The final decision of hiring would be based on the overall decision of each section

1. Pre-built in functions EDA of 3 datasets
2. Communication Analysis Score
3. Emotional Intelligence Score
4. Transcript Analysis Score

Candidate	Gaze Sum / Eye Offset	Emotional Stability	Communication Skills	EI Score	Overall Role Fit	Average Score
Candidate 1	3.5	3	3.25	3.5	2	3.05
Candidate 2	4	3.5	4.25	4.5	4.9	4.23
Candidate 3	4	3.5	4.25	2	2.4	3.23
Candidate 4	4.5	4.5	4.25	4.5	4.2	4.39
Candidate 5	2.5	4.5	4.25	4.5	4.7	4.09
Candidate 6	3.5	4	4.25	1.5	4.3	3.51
Candidate 7	3.5	3.5	3.5	2.5	4.3	3.46
Candidate 8	4	3.75	3.5	1.5	4.9	3.53
Candidate 9	4.5	4.25	3.5	4.5	4.1	4.17
Candidate 10	3.5	3	4	2	4.1	3.32

My assumption is that out of 10 candidate the company hires 4 people and a score greater than 4 is good.

Candidate	Overall Score (Basic EDA + Communication Score +EI Score + Transcript NLP Analysis Score)	Hiring Decision
1	3.05	No
2	4.23	Yes
3	3.23	No
4	4.39	Yes
5	4.09	Yes
6	3.51	No
7	3.46	No
8	3.53	No
9	4.17	Yes
10	3.32	No

Refer to the Prompt Engineering Documentation to review the ChatGPT interaction!.