

Creating a Machine Learning Model using an Earnings Calls Analysis

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Background

Audio characteristics have developed overtime and researchers have found more ways to analyze how these characteristics evoke certain emotions and perceptions. Analyzing audio and was observed to increase hat elements make a person act a certain way customer engagement and connect market reactions. Past research focuses on how pitch, in particular affects how investors and customers feel in work place and external environments. Specifically, lower pitch is associated with confidence and truth while higher pitch is associated with hesitation and deemed unfavorable.

Based on this understanding of the significant effect pitch has on human perception, we found it important to look into more factors like tone, hesitation, pace, clarity, and word sentiment to create an overall confidence rating on earnings calls of public companies in the technology sector. Earnings calls are a big part of the finance industry and analysts rely on some of the information disclosed in these calls every quarter. Earnings calls are a key communication medium for firms to explain their strategy and performance and future plans to the investor community. Stock analysts' assessments shape a firm's stock price and is therefore, crucial to understand how stock analysts form perceptions based on audio features.

Our research takes six elements of audio analysis to formulate a confidence score for each segment of an earnings call. This helps later train a machine learning model with the required test data for it to be able to automatically generate confidence levels for an earnings call that is prompted by a user.

Metrics	Rating
Confidence	Scale: 1-5
Tone	Scale: 1-3
Hesitation	Scale: 1-5
Pace	Scale: 1-5
Pitch Variation	Scale: 1-3
Clarity	Scale: 0-1
Word Sentiment	Scale: 1-3
Summary	-

Figure 1. Audio elements and metric guide created and used to analyze each audio segment

Methodology

- To analyze the confidence level of earnings calls we first accessed 10 publicly available earnings calls from the past few quarters released by Microsoft, Apple, and Amazon.
- We then listened to these calls which were about 60 minutes in length and created a guide of metrics with rating scales and definitions of characteristics that are important to understand the confidence of these companies. (Figure 1.)
- Then, we took audio segments, ranging from 1-4 minutes in length and created an Excel spreadsheet with any audio elements we observed. We repeated this step several times for each company and for multiple earnings calls over the past few years.
- Next, we uploaded the earnings calls to Transcribetotext, an artificial intelligence (AI) software that converts the audio to text.
- Then, we used Audacity to cut each earnings call into segments to create our surveys.
- Using Qualtrics and Prolific, we created surveys that randomly assign 5 audio segments to each participant, in which they rate each audio based on the scale in Figure 1.
- We collected a total of 20 responses, with 5-6 ratings for each of the 18 audio segments used. We used these results to calculate the average, standard deviation, minimum, and maximum of each metric for all the 18 audio segments. (Figure 2.)
- We compared these statistics to the spreadsheet created in step 3 and observed that the human coded metrics were higher than the metrics from the survey results.

Statistics	Tone	Hesitation	Pace	Pitch	Clarity	Word sentiment	Confidence
Average	3.70	2.78	2.86	1.17	0.66	3.25	3.60
Minimum	2.50	1.70	0.70	1.00	0.20	1.80	2.00
Maximum	4.80	4.20	3.80	3.00	1.00	4.20	4.50

Figure 2. Average, Minimum, and Maximum for the audio metrics for all audio segments.

Results

Our results show the average, minimum, and maximum rating for each metric analyzed for the 18 audio segments. These statistics allow us to understand how the external population perceives the audio segments and how greatly their ratings vary. The average confidence rating of 3.6 indicates that the executives speaking in the earnings call are moderately confident in their disclosure of financial information. Based on this confidence level, an analyst or firm executive can act accordingly by changing the way they present information or make investment calls.

Future Direction

We plan on creating a machine learning model in python to detect these metrics without human interference. We will do this using our training data created throughout this research project to teach the model patterns and audio metrics to detect the confidence of any earnings call presented.

This could ultimately provide firm executives and stock analysts with another layer of confidence when analyzing, presenting, and investing.

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References

