Blood in the Water:
Storytelling and Sentiment Analysis in ABC's Shark Tank

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With the wise guidance of Professors Elkins and Chun

Abstract

Businesses, entrepreneurs, and scholars have spent decades examining the entrepreneurial discourse and sales pitch conversations, attempting to unveil a secret formula that will set them apart from the competition. Recently, the introduction of sentiment analysis has changed the discipline drastically and now companies are able to analyze sales people's conversations and provide feedback in real time. This study seeks to better understand the entrepreneurial discourse through the tracking of positive and negative sentiment within sales pitch conversations shown on the TV show Shark Tank. More specifically, this project focuses on the role of effective narrative composition within a sales pitch to entrepreneurs and if it has an effect on the outcome of the dialogue. Additionally, I will also be seeking to identify any hidden determinants of successful pitches.

Introduction

I have always loved storytelling. At a young age I would watch my father seize the attention of the entire dinner table to tell a story that could have had absolutely no relevance to the conversation at hand. Nevertheless, every eye in the room would be mesmerized as his arms would wave flamboyantly to the rhythm of his anecdote. Young Alexander Gow would sit quietly at his corner of the table, stricken with both amazement and jealousy of the power that my father had harnessed. The role of storytelling in the entrepreneurial world has been studied within academia for a long time and the positive relationship between a good story and a successful pitch is widely agreed upon. However, what makes stories effective is much blurrier. Van Werven et al. generated a framework for narratives: "Most narratives establish a valued endpoint of goal, specify events that are relevant to the endpoint, link those events in a temporal sequence, introduce characters and are narrated by an identifiable voice." Subsequently, the entrepreneur can insert themselves as the protagonist and fill in the rest of the story using the milestones of their new venture. More importantly, utilizing narratives to convey your message opens up space for the audience to become an active participant in the story. When an audience member becomes an active participant in the narrative, they will often fill the gaps in the story themselves making the narrative feel much more believable. Furthermore, by communicating their desired message through a narrative, entrepreneurs are able to be perceived as more believable without the requirement of providing explicit evidence (Van Werven). Entrepreneurs' first responsibility when they begin their pitch is to get investors to buy their story, then the product. Moreover, the narrative needs to appear plausible and resonate with the audience.

Over the previous few years sentiment analysis has become one of the hottest topics in Silicon Valley and within the tech industry. It has enabled us to analyze thousands of lines of text in a matter of minutes and provided a brand-new lens through which to understand everything from Harry Potter to a telemarketer's dialogue with a potential customer. In brief terms, sentiment analysis combines natural language processing with machine learning techniques to determine whether a piece of writing is positive or negative. The way in which the model determines whether the piece of text is positive or negative is based upon the training data for that model. The model will give different words a sentiment weight based upon the positive or negative connotations that come along with the word. Moreover, the ways in which sentiment analysis is currently being used in industry today is extraordinarily exciting. SalesForce has developed their own sentiment analysis tool called Einstein that they sell to other companies looking for an edge on sales. Einstein provides the users/salespeople with real time feedback about their conversations with customers, ultimately helping them optimize their sales strategies. With the employment of sentiment analysis having become pervasive throughout the tech world, being able to understand what it does is going to become increasingly important for everyone.

References

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The Data

Attempting to find a large repository of sales pitching data turned out to be a tall task. Thus, why I have transcribed episodes of Shark Tank to accumulate 37 individual pitches and the following dialogues. The pitches come from season 12 episodes 17, 9, and 11 with one more additional pitch from season 11, episode 13. Of the 37 pitches I analyzed, 28 pitches ended with a deal and only 9 entrepreneurs leave empty handed. Table 1 displays some of the fundamentals of my data. As you can see the success rate of entrepreneurs in my sample leaving the Shark Tank with a deal is over 75%. More interestingly, the average % change in valuation between what the entrepreneur offers and what they are given from the shark is 30%. A much larger percentage than I would have expected from the data. However, Table 2 displays similar statistics but the successful pitches and unsuccessful pitches have been separated to illuminate reasons why some pitches were successful and others were not. Table 2 clearly shows a fairly large difference between the average investment asked by the entrepreneurs who received funding and those who did not. On average the unsuccessful entrepreneurs asked for close to $340,000 at an average valuation of about $6.14 million. Successful ventures asked for an average investment that is about $40000 less than the unsuccessful entrepreneurs and their valuations were on average about $1.7 million less than the pitches that did not receive funding. Table 2 also displays the number of successful and unsuccessful pitches by sector.

In order to properly understand and interpret my sample in the greater context of all Shark Tank pitches, I've taken a look at a breakdown of all Shark Tank pitches from season 1 through season 10. From seasons 10 there were 895 pitches that resulted in a total of 499 closed deals which is the equivalent of a 55.75% success rate, a difference of more than 20% between my sample success rate and the success rate from season 110. As a result, it doesn't seem like my much smaller sample is very representative of a sample of every Shark Tank pitch. However, looking at the success rate by season, there is a clear positive trend in the percentage of closed deals year over year. Season 1 had a success rate of 42% while season 10 had a success rate of 68%. Additionally, and unsurprisingly, the average investment ask, average valuation, and average deal size all have grown notably from season 1, even accounting for inflation. So, perhaps my data may actually be moderately reflective of the current state of Shark Tank.

Table 1	
Number of Pitches	37
Number of Deals	28
Success Rate	76%
Avg Investment Asked	$308,648.65
Avg Equity Ask	11.01%
Avg Valuation Offered	$4,879,279.28
Avg Investment of Deals	$324,821.43
Avg Equity of Deals	22.5%
Avg % Change in Valuation	-30%

| Table 2	Successful Pitches	Unsuccessful Pitches
Count	28	9
Avg Invest Ask	$298,035.71	$341,666.67
Avg Equity Ask	11.89%	8.28%
Avg Valuation	$4,474,404.76	$6,138,888.89
Food/Bev	9	5
Lifestyle/Home	11	2
Fitness/Outdoors	4	2
Fashion/Clothing	2	0

On the other hand, I also need to address the source of the data itself. We need to keep in mind that the data I am dealing with has all been edited and prepared for consumption through television. Unfortunately, there's nothing I could do to adjust for the missing parts of the dialogue. Consequently, the sentiment analysis in this project is only being run on 67 minute manufactured entrepreneurial sales conversations consisting of snippets of an hour long discussion. This may imply that the results produced by the model may not truly reflect the sentiment arcs that pitching a new venture in real life may result in. Nevertheless, after transcribing each pitch and doing my own research into sales pitches and storytelling within entrepreneurial discourse, I will contend that some of the pitches still retain some valuable insights into finding success as an entrepreneur seeking funding.

Methods and Other Research

With the help of Professor Chun, we used a version of the roberta sentiment analysis model that's been trained on 15 data sets of text sources, for example, website review, tweets, and Wikipedia pages. The scripts were broken down line by line and the model will predict whether each line contains a positive or negative sentiment. The roberta model was chosen due to its superior performance in comparison to other natural language processors that analyze sentiment.

There has actually been quite a large amount of research already conducted on pitches in Shark Tank, however, very few have dealt with sentiment. Research done by Elizabeth Tomlinson investigate the role of stasis, essentially can be understood as pivotal moments in the conversation, and how the entrepreneur handles each moment influences their chances of receiving funding. I found this research to be particularly relevant to this project because I hoped to be able to apply her conclusions to the changes in direction of sentiment arcs.
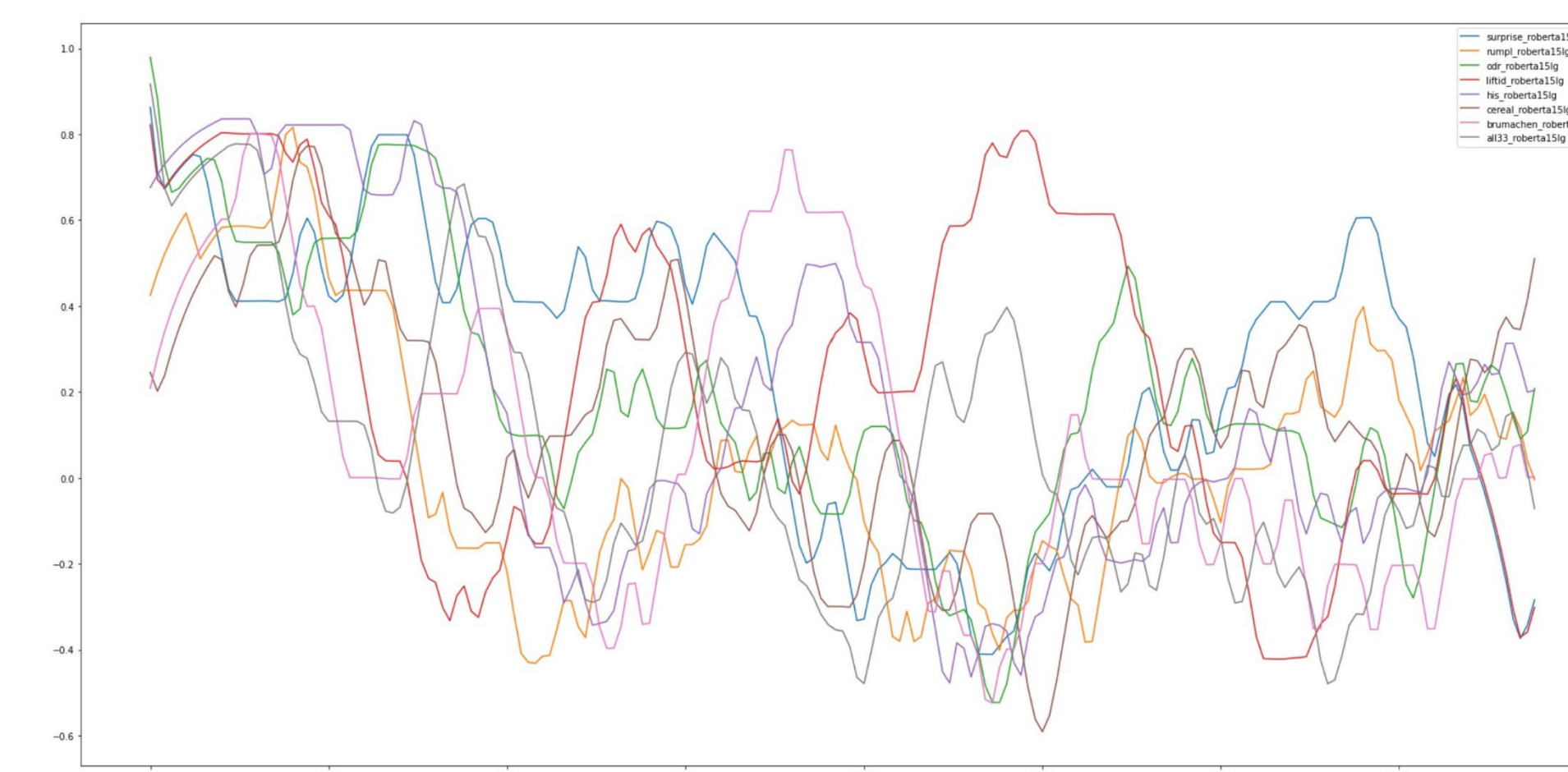
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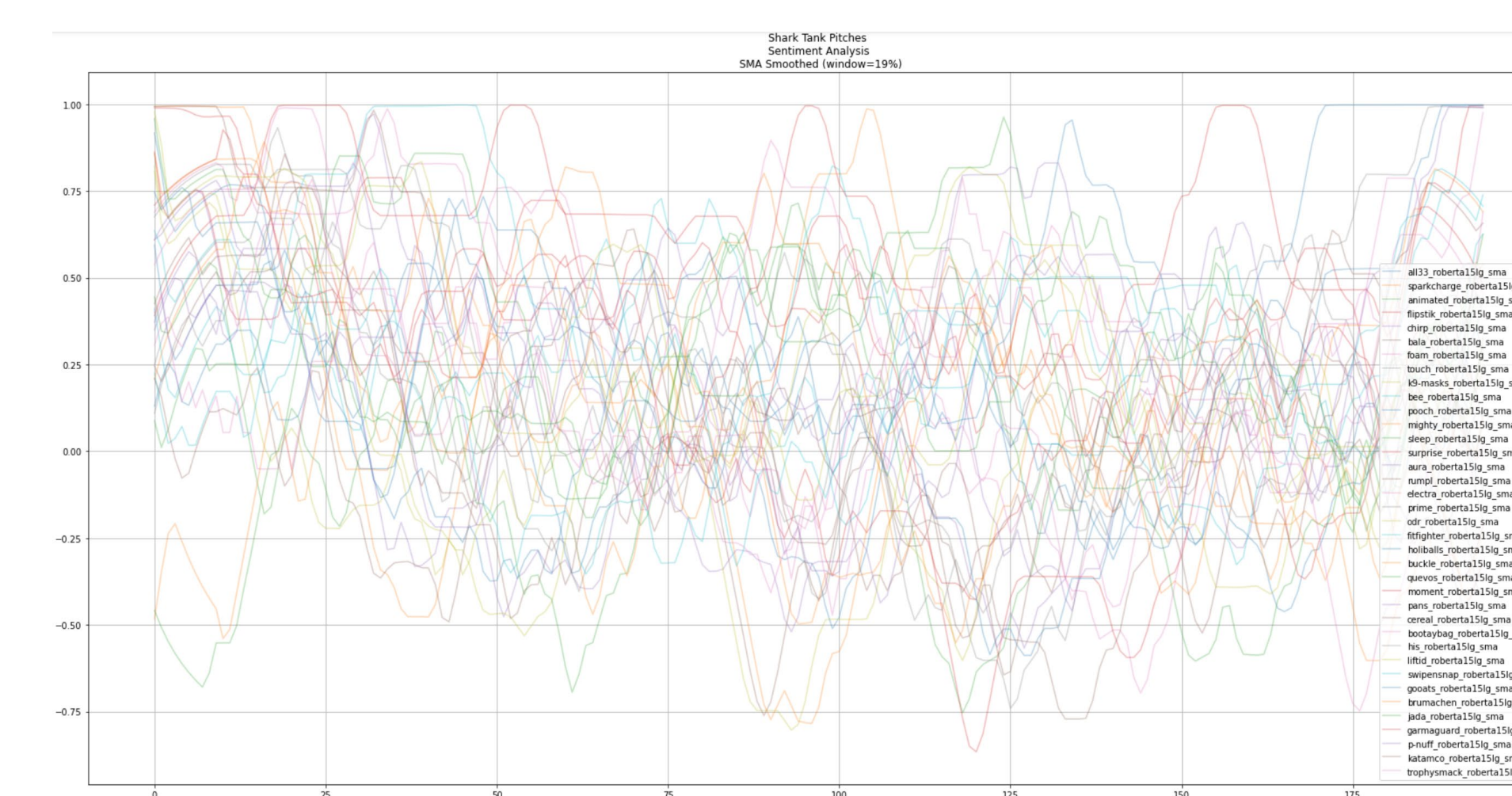
The graph here displays the sentiment arcs of all the pitches in my sample. Each pitch was expanded and interpolated in order to make all pitches have the same length. As you can see, there is a huge amount of variation of sentiment arcs in my sample. There doesn't seem to be a clear pattern that is consistent among all the pitches. However, I imagine it might be possible to see patterns more easily if the sentiment arcs of pitches that ended in a deal were separated from pitches that didn't.
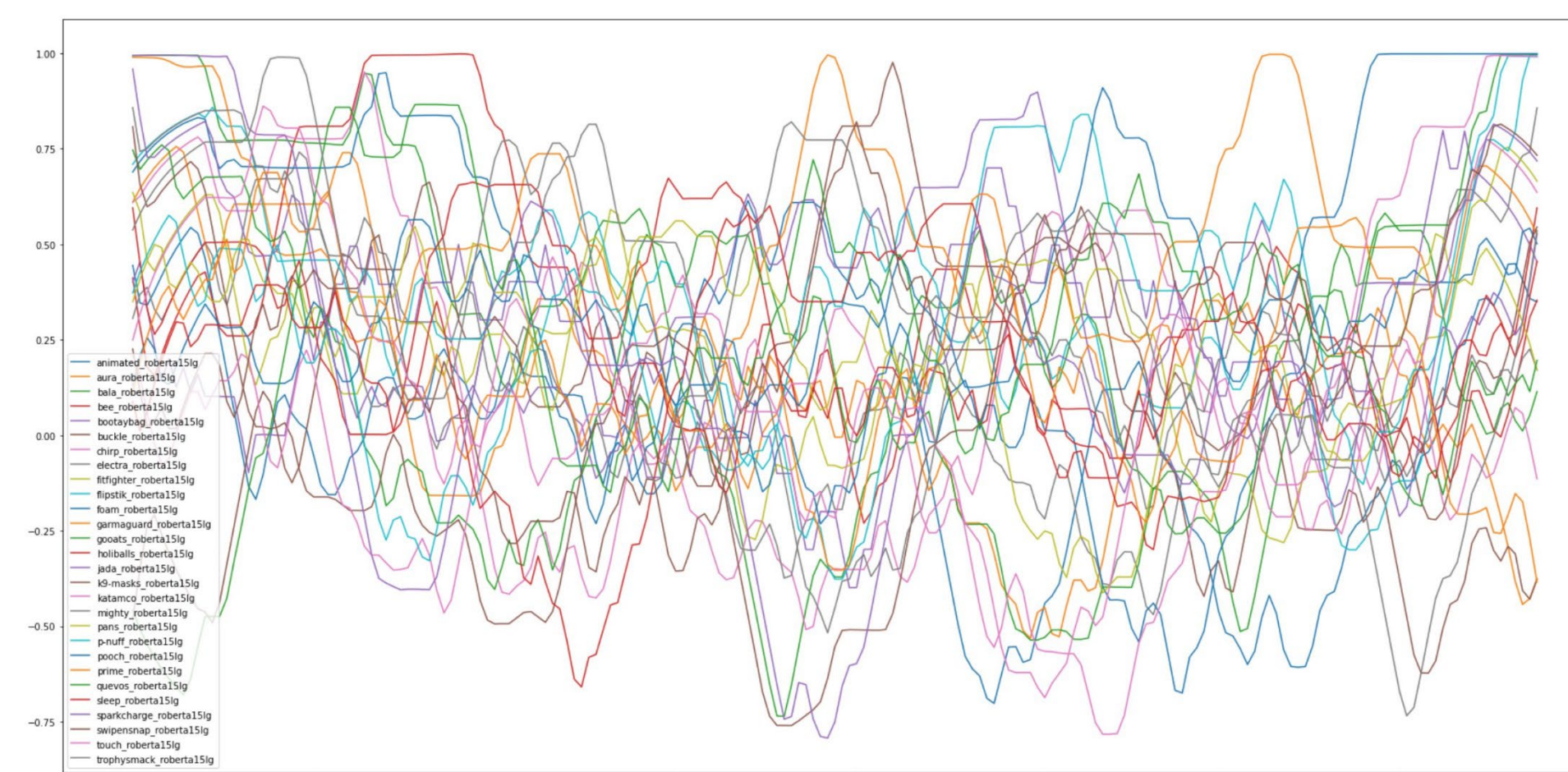

The second plot displays the sentiment arcs of all pitches that resulted in a deal in my sample. Unfortunately, because my sample contained such a high percentage of pitches that ended up with a deal, it's hard to say with any degree of certainty that there is a consistent pattern among the successful attempts inside the tank. However, it is interesting to note how volatile the individual sentiment arcs are, perhaps there is something in the conversation that provokes sudden shifts in the sentiment of the actual dialogue.

The third visualization depicts the sentiment arcs of all the pitches in my sample that did not result in a deal. It wasn't until I produced this visualization when I finally started to feel like maybe there is something in the text of the dialogues that can be picked up by the sentiment analysis. This visualization appears to contain a little more of a pattern than either of the previous two. Furthermore, the pitches that did not result in a deal appear to have similar arcs for the first roughly 20% of the pitch and then the graph depicts almost all of the sentiment arcs finishing closer to zero, signaling a much lower finishing sentiment than the visualization of pitches that did end in a deal appears to suggest. Although the sentiment arcs from pitches that did not receive funding appear to be much more similar, I cannot say with certainty that there are any significant patterns to distinguish the two groups.

Conclusion
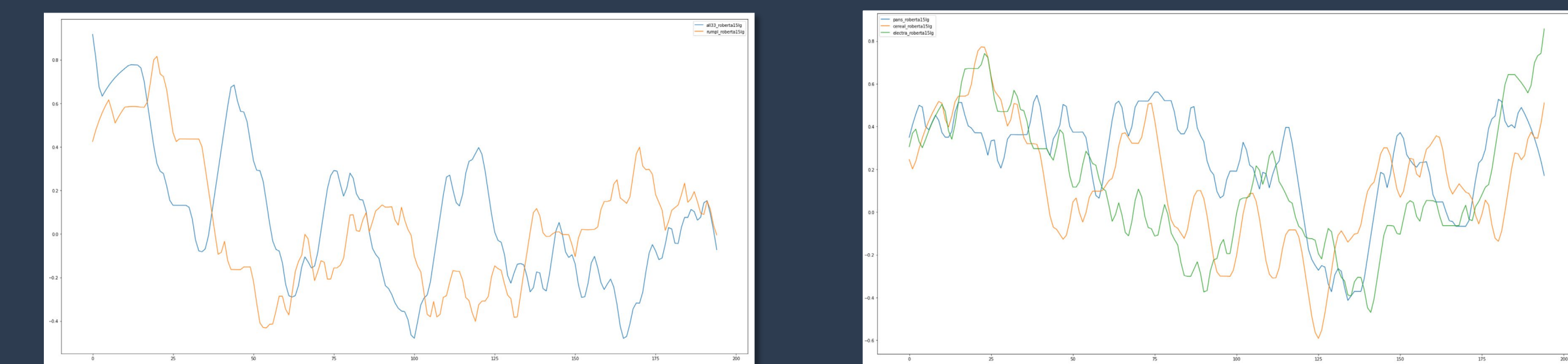
Going into this project I had high hopes for what tracking the sentiment of the shark tank dialogues might be able to tell us about entrepreneurial discourse. However, due to the fact that I am dealing with a limited data set, containing heavily polished dialogue, those high expectations had to be thrown out. With that in mind, the upper left visualization depicts the sentiment arcs for the pitches given by All33 Chairs and Rumpl. According to the model this pair of pitches had the second highest similarity score among all combinations of the sentiment. These two pitches that both ended without receiving funding from any of the sharks also depicted individual male entrepreneurs who both created really high quality products. The factor that both entrepreneurs shared that I find most compelling is that they both offered ridiculously high valuations of their companies, Wylie Robinson of Rumpl came in with an offer of $600,000 for 4% and Bing Howenstein from All33 Chairs offered the sharks 2.5% for $500,000. According to similar research done by Elizabeth Tomlinson, the most common reason for sharks to drop out of the deal is when the entrepreneur offers a valuation of their company that the sharks don't agree with. Now, obviously when an entrepreneur cannot accurately evaluate their own company, this will raise red flags, I didn't need sentiment analysis to tell us that. However, it may not be a coincidence that both of the sentiment arcs of these pitches are similar and the fact that they share many of the same qualities. Furthermore, when watching and transcribing the text for each of these pitches, I remember getting the feeling that the sharks handled the dialogues differently after Bing and Wylie gave their valuations. Additionally, both entrepreneurs failed to put together a quality narrative about them and their product. Bing simply used a video of Justin Beiber advertising the chair, while Wylie appeared to be unengaged when he was discussing the conception of Rumpl.

This upper-right graph displays the sentiment arcs of Cereal Killerz Kitchen (no deal), Electra(deal), and Pan's Mushroom Jerky(deal). I found the fact that this combination of pitches in particular, to be very compelling. All three hopeful ventures were related to food or beverage, however, each in a very different manner. Cereal Killerz Kitchen, the only one of the three to not receive funding, was a husband and wife seeking to get funding to expand their cereal restaurant locations. With this pitch occurring in the middle of the pandemic and restaurants shutting down left and right, the fact that they didn't leave with a deal doesn't hold any weight in my eyes. Moreover, the sharks loved them and their pitch, they just didn't see any financial opportunity in it. So in the context of this project, the no-deal result is not a reflection of them or their valuation but the idea and timing. I was excited to see the similarity of sentiment arcs between these three pitches because the sharks all loved each pitch, finding each one compelling and effective. More importantly, each of the entrepreneurs put together a pitch that synthesized a compelling narrative for why they need funding with the pertinent fundamental information regarding their company while placing themselves as the competent protagonist who can execute their promises. I think the fact that Electra was funded stands as proof of this because it was a pitch for a new sports hydration drink and usually sharks won't want to give any money to a product entering a market as crowded as that one. But Fran from Electra simply framed her request for funding in a way that was irresistible.

The results of this project, admittedly not exactly robust, do appear to show a pattern within the sentiment arcs that suggests entrepreneurs who were able to integrate their company or venture as the ultimate goal of a narrative that places them as the main actor saw more success on the show. However, Elizabeth Tomlinson's research concluded that the most common reason for dropout had to do with "stasis of quantity". The sharks most often dropped out for fundamental reasons any investor would drop out: lack of sales and offering an offensive valuation. For this reason we can't expect to get much information from the dialogues in my sample regarding the role of storytelling. However, the lines where the entrepreneur is able to put together a compelling story are reflected with positive shifts in the sentiment arcs. If I had another opportunity to do this project over again, I would first certainly attempt to find a new data source. The Shark Tank scripts were too polished and edited in order for me to say with any degree of certainty that these sentiment arcs would mimic those of real sales discourses. Moreover, many of the pitches contained a W-shaped curve (see Rumpl plot), which is also known in the literary community as the best-seller code, books like Harry Potter for example. I don't imagine the fact that 8 plots of my sample display the W-shaped arc is a coincidence and I assume that this might be a result of Hollywood production.