

# **Unlocking Twitter: Can Local Businesses Leverage Corporate Partnerships with the NBA?**

## **Test Case: The San Antonio Spurs**

**Project Team 57**

**Dashboard Link:** <https://public.tableau.com/app/profile/keeshasn.williams>

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### **A. Introduction**

As the COVID-19 pandemic has continued, the economic health of small businesses has suffered, creating opportunities to find creative ways to support them. Partnerships can bolster their success with professional sports teams in their local area, and while they have the same interest as large corporations in promoting their goods and services, they often lack the funds that they would need to secure partnerships with professional teams. Meanwhile, these businesses are embedded in the same communities that provide teams with their fan bases and can provide teams with a way to connect with fans on a personal level. Can social media platforms (e.g. Twitter) be used to better identify and connect large entities with local businesses?

The goal of this project was to create a mechanism by which local businesses can use social media platforms to effectively target larger corporations with similarly aligned mission statements and values. More, specifically can small businesses leverage the corporate partnerships that exist between national organizations that have a strong presence within the community and their sponsors?

To answer these questions, we identified the NBA as a national entity with a focus on outreach (e.g. NBA Cares) that impacts local businesses and communities. As a test case we chose a single NBA team to conduct this analysis using various natural language processing techniques (NLP) with the goal of identifying key trends and topics that may overlap between the NBA team, its players, corporate sponsors and local communities. The topics and trends could then be used to identify local businesses within each NBA team's city with a similar business realm as the corporate sponsors. Additionally, this analysis may

unlock new business ventures partnerships that have yet to be established but may be worthwhile for the NBA to explore.

## B. Data

Twitter data was collected for the San Antonio Spurs, the 5 most popular players on the Spurs, its 5 biggest corporate sponsors and 29 local businesses (see *Table 1*). In total 80,692 tweets were collected, which after various text cleaning steps was reduced to 66,593 tweets (see *Table 2*). All data was collected using the Tweepy API. The full text of each tweet was cleaned using the following steps: and saved as dataframe:

1. All re-tweets were removed
2. All text was made lower case
3. All line breaks were removed
4. All website infer was removed
5. All twitter users tagged or mentioned were removed
6. All hashtags were removed
7. All digits were removed
8. All punctuation marks except “?”, “!” and “.” were removed
9. All emojis were removed.
10. All leading and trailing spaces were removed




**Table 1. Twitter Data collected for the San Antonio Spurs, its top 5 players, top 5 sponsors, and local businesses within the San Antonio area.**

Business / Sponsor / Player	Twitter Handle	Number of Cleaned Tweets	Start Date	End Date	Time span of Tweets (Days)	Category
Andretti Indoor Karting And Games	AndrettiKarting	2954	11/29/2010	07/07/2021	3872	Local Business
Urgentcare2go	UrgentCare2go	173	08/12/2016	06/15/2020	1403	Local Business
Unite Private Networks	UPNFiber	405	03/01/2016	07/29/2021	1975	Local Business
Toolbox Studios	toolboxstudios	1331	11/13/2008	10/13/2020	4351	Local Business
The General Public	thegenpublic	148	07/06/2015	03/14/2019	1346	Local Business
Tessmer Law Firm Pllc	TessmerLawFirm	1910	06/19/2012	07/28/2021	3326	Local Business

Business / Sponsor / Player	Twitter Handle	Number of Cleaned Tweets	Start Date	End Date	Time span of Tweets (Days)	Category
Ronald Mcdonald House Charities	SARMHC	742	06/03/2016	04/05/2021	1766	Local Business
Red Wing Shoes	RedWingShoes	2863	11/24/2016	07/26/2021	1705	Local Business
Reuter Law Group, PC	ReuterLaw	178	09/25/2020	07/30/2021	307	Local Business
Physicians Premier Emergency Room	MD_PremiER	1371	08/15/2014	07/26/2021	2537	Local Business
Once In A Wild	OnceInAWild	470	08/05/2019	07/30/2021	725	Local Business
Nasa Searchlights	NASASearchlight	6	02/22/2015	09/24/2015	214	Local Business
Modern Managed It	modernmanagedit	159	07/08/2020	07/27/2021	384	Local Business
Voiceovers By Cat	VoiceoversByCat	162	01/01/2015	11/24/2020	2154	Local Business
Mcrae Bail Bonds	McRaeBailBonds	3164	05/08/2018	11/22/2019	563	Local Business
La Quinta By Wyndham	LQ	3178	09/28/2017	02/21/2020	875	Local Business
Main Event	MyMainEvent	2022	04/30/2016	07/23/2021	1909	Local Business
Grande Communications	grandecom	3242	09/23/2020	07/30/2021	310	Local Business
Bob Mills Furniture	bobmills	1219	06/25/2012	07/30/2021	3321	Local Business
Bucay Center For Dermatology & Aesthetics	drvivianbucay	2780	02/09/2016	06/18/2021	1955	Local Business
Chamberlain Hrdlicka	ChamberlainHrd	773	07/13/2017	07/29/2021	1476	Local Business
Complete Emergency Care	CompleteEM	60	12/01/2012	11/27/2014	726	Local Business
Cowboys Dance Hall	CowboysDancehal	2004	09/20/2014	11/29/2019	1896	Local Business
DigiROI Marketing	digiROImarketin	25	01/12/2019	06/11/2020	515	Local Business
Wellaware	wellaware_us	488	06/25/2014	07/14/2021	2575	Local Business
Embassy Miniature Golf	EmbassyMiniGolf	178	08/15/2009	03/14/2020	3864	Local Business
Fed And Fit, LLC	fedandfit	3146	09/26/2012	01/16/2020	2668	Local Business
Flix Brewhouse	FlixBrewhouseTX	3030	08/02/2012	12/24/2020	3065	Local Business
Geekdom	Geekdom	1960	10/27/2016	07/28/2021	1735	Local Business
Dejounte Murray	DejounteMurray	1192	03/09/2014	07/24/2021	2693	Player
Demar Derozan	DeMar_DeRozan	2041	06/09/2010	06/30/2021	4038	Player

Business / Sponsor / Player	Twitter Handle	Number of Cleaned Tweets	Start Date	End Date	Time span of Tweets (Days)	Category
Trey Lyles	TreyLyles	2305	05/27/2014	07/29/2021	2620	Player
Patty Mills	Patty_Mills	2325	08/18/2013	07/28/2021	2900	Player
Rudy Gay	RudyGay	2382	06/21/2010	07/28/2021	4055	Player
H-E-B	HEB	3203	05/05/2021	07/30/2021	85	Sponsor
SWBC	SWBCServices	2719	07/06/2016	07/30/2021	1849	Sponsor
The San Antonio Spurs	spurs	2426	01/25/2021	07/30/2021	186	Sponsor
Frost Bank	FrostBank	2424	02/16/2015	07/30/2021	2355	Sponsor
USAA	USAA	3186	02/15/2021	07/30/2021	164	Sponsor
AT&T	ATT	2249	06/18/2021	07/30/2021	41	Sponsor

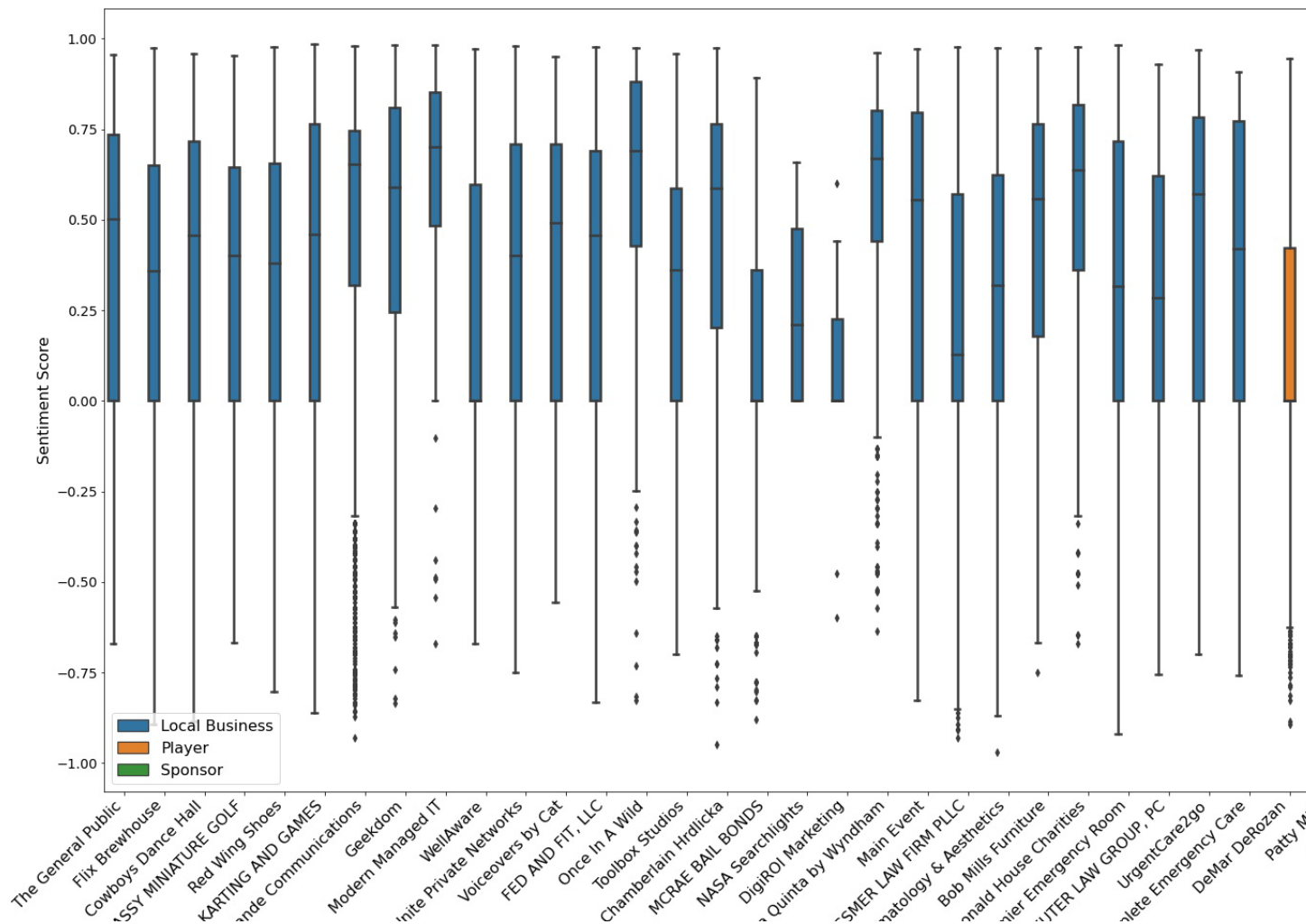
**Table 2. Examples of the text cleaning steps using regular expression, and sentiment labelling for a sampling of Tweets collected for the San Antonio Spurs.**

Date of Tweets	Original Tweet	Tweet after text cleaning	Tweet Sentiment
2021-07-30 16:2:08	Hard work paid off for @JoshuaPrimo4  <a href="https://t.co/2G2HddLG57">https://t.co/2G2HddLG57</a>	hard work paid off for	Negative
2021-07-10 01:34:25	@Tre3Jones checking in from the @SanAntonioFC  @PumasMX match! #Defend210 <a href="https://t.co/5x0v5F6wu8">https://t.co/5x0v5F6wu8</a>	checking in from the match!	Neutral
2021-07-11 14:36:44	BALA FOR THE WIN  @Patty_Mills led @BasketballAus to an opening victory vs. Argentina in exhibition play at the buzzer last night in Vegas! <a href="https://t.co/lhZallEdPE">https://t.co/lhZallEdPE</a>	bala for the win led to an opening victory vs. argentina in exhibition play at the buzzer last night in vegas!	Positive

### C. Analysis and Results

*Our goal in the project to gauge the similarities that may exist within the collected tweets for the various groups. To accomplish this, we focused on two analyses: the sentiment of each cleaned tweet, and creating a vector out of the collected tweets for each group and measuring the relative distance between groups. The sentiment analysis was conducted*

using the *SentimentAnalyzer* within the natural language tool kit (*nltk*) in python (see



**Figure 1).** After text cleaning, the final twitter data was saved to a dataframe with the following columns:

1. User
2. Original Tweet
3. Number Of likes
4. Date of tweets
5. All emojis, if used in a tweet (stored as a dictionary, with key-values pairs as the emoji image and its description, respectively).
6. All hashtags, if used in a tweet
7. All twitter users mentioned in a tweet
8. Cleaned tweets - after all the steps outlined in part B have been applied.

9. Sentiment score of each cleaned tweet (stored as a dictionary, with key-values pairs as a fraction of the text that is negative, neutral, positive and its compound score).
10. The compound score of each tweet
11. The Sentiment label for each tweet, based on its compound score:
  - a. Positive - Compound Score  $> 0$
  - b. Negative - Compound Score  $< 0$
  - c. Neutral - Compound Score  $= 0$

The similarity of the tweets was determined by first combining all the tweets for each user into single text document and then applying several of the preprocessing packages within the *gensim* module of python which removed stopwords, lemmatized and identified bigrams and trigrams within the text. The modified text for each group was then vectorized using the *TfidfVectorizer* of the *Scikit-Learn* module in python, and saved to a dataframe where the rows represented the Business / Sponsor / Player and the columns were the unique words (this resulted in a dataframe of 40 rows and 662,331 columns). Once vectorized the distance between each vector was computed using Cosine similarity, which calculates the cosine of the angle between the vectors. The values of the cosine similarity metric varies between 0 and 1, with the former representing vectors that are perpendicular (i.e. the angle between the vectors is  $90^\circ$ ,  $\cos(90) = 0$ ) and perfectly aligned (i.e. the angle between the vectors is  $0^\circ$ ,  $\cos(0) = 1$ ). The heatmap of the cosine similarity metric (see *Figure 2*) displays the relative distance between all members of the dataset to each other.

#### D. Discussion

The metrics outlined in the previous section permitted the development of an interactive dashboard (<https://public.tableau.com/app/profile/keeshasn.williams>). The dashboard allows the user to select one of the 29 local businesses (see *Table 3*) registered with the San Antonio Chamber of Commerce ( <https://web.sachamber.org/search>), which then updates different quadrants of the dashboard:

1. Upper Left: Displays the business information location, industry and description
2. Upper Right: Displays the top 10 business/sponsor with closest cosine similarity matches
3. Lower Left: Box-whisker plots of the sentiment scores for the Spurs, top 5 players and top 5 sponsors.
4. Lower right: Box-whisker plots of the sentiment scores for the selected business and a pie chart for the total amount of cleaned tweets analyzed and their labels.

This project was evaluated using the San Antonio Spurs as a test case and was successful in using tweets as a mechanism to align businesses. Although the drop-down menu only allows selection of a local business, it can easily re-configured to permit the Spurs or a corporate sponsor to evaluate which local business is most closely aligned. Additionally, the results shows the ability of this analysis to scale to multiple teams within the NBA, and or to cities nationwide.

One drawback of the analysis is the lack of uniformity in the time frames and number of tweets collected for each group within the data set. For example, roughly the same number of tweets were collected for SWBC and the San Antonio Spurs, 2719 and 2426, yet the time frame spanned was 1849 and 186 days, respectively. With such a discrepancy, it is difficult to capture any types of seasonality trends that may exist within the tweets. This imbalance also weakens the comparison of the cumulative sentiment analysis among the different groups in the box whisker plots possibly skewing the sentiment scores. This is consequence of the standard Twitter developer access that was available for this project. The standard developer access is free, but only permits a limited amount of tweets to be obtained, which may be a function of tweet number or time. The upgraded developer access, which is subscription-based permits access to all historical tweet data. Additionally, there are many other parameters that can be accessed when obtaining a tweet (i.e. geographic data) which may also be useful in discerning trends within tweets among different groups.

**Table 3. Table of local San Antonio businesses used in the data analysis, sourced from the San Antonio Chamber of Commerce.**

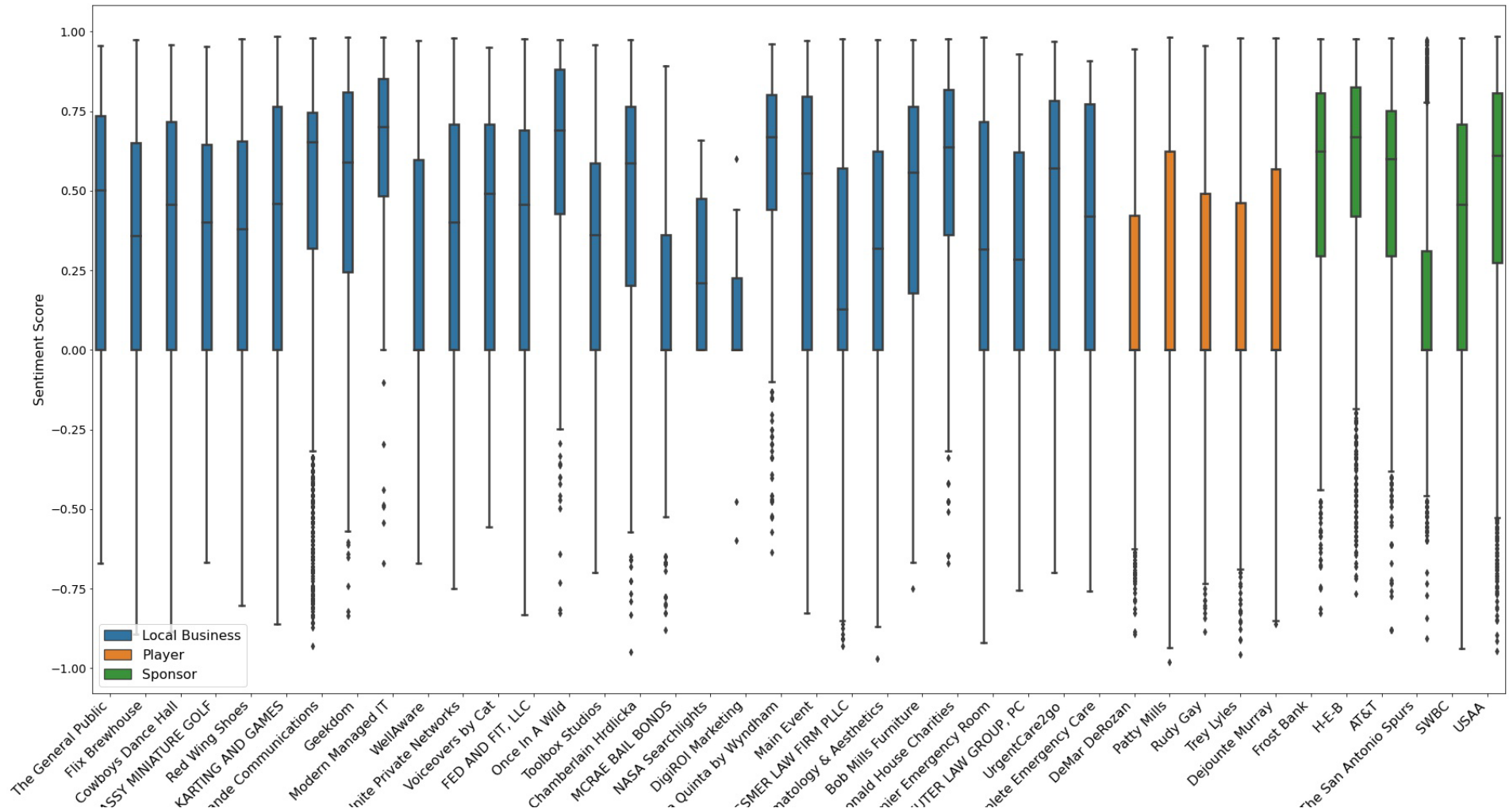
Business Name	Business Address	Zip	Industry	Twitter Handle	Business Description
The General Public	17619 La Cantera Pkwy Ste 102 San Antonio, TX	78257	Bar	thegenpublic	The General Public is a spirited neighborhood restaurant and bar committed to wholesome food and warm hospitality. We are devoted to rewriting familiar recipes using only the freshest ingredients from farmers and suppliers we know personally. And we are committed to always keeping you in good spirits.
Main Event	1911 N Loop 1604 E San Antonio, TX	78232	Bar	MyMainEvent	Main Event Entertainment is an expanding, Dallas-based company that was founded in 1993 and currently operates high-volume family entertainment centers throughout Texas. Main Event Holdings Inc. operates as a subsidiary of Ardent Leisure Group of Australia. Main Event family entertainment centers house 45,000-75,000 square feet of high-quality recreational bowling, billiards, laser tag, a unique selection of interactive games, a tempting array of quality food and beverage, as well as flexible meeting and event space with VIP accommodations for corporate meetings or group gatherings. For more information visit <a href="http://www.MainEventUSA.com">www.MainEventUSA.com</a> or call (512) 554-3572.
La Quinta by Wyndham	11006 IH-35 North San Antonio, TX	78233	Bar	LQ	We are a brand new vibrant La Quinta Hotel located conveniently right off the IH-35 North. With 92 modern spacious rooms, we are going to be your default stop when staying in San Antonio. We also have a great Texas shaped pool and kid friendly play spaces!
NASA Searchlights	616 Isom Rd San Antonio, TX	78216	Advertising - Marketing	NASASearchlight	Searchlight rental and sales, special event equipment. Advertising events, grand openings, sports special events
DigiROI Marketing	914 Spring Knoll San Antonio, TX	78258	Advertising - Marketing	digiROImarketin	DigiROI Marketing is a digital marketing and advertising company built to serve local, regional, and national businesses. We specialize in audience targeting using Display, Video, Native, Search, Social, Email, SEO, Mobile and other digital services.
Toolbox Studios	10123 Broadway Street San Antonio, TX	78217	Advertising - Marketing	toolboxstudios	Where Ideas Work ® Toolbox Studios is a marketing/design firm that likes to think big for like-minded companies. It's a space filled with people devoted to the pursuit of the fabled and ever elusive "Big Idea". That being said, we believe big ideas are little more than empty notions until we're certain we can execute them across multiple channels to reach and ultimately move the intended audience. To that end, we apply critical thinking, strategic insight, creative expertise, and meticulous execution to our best and/or wildest concepts to ensure they will meet or surpass your stated goals. We've been known to fall in love with an idea. It happens. But we refuse to rush into any serious long-term commitments until we're certain it's right for us, and for you. That goes for ads, logos, web sites, videos, packaging and cross-media marketing pushes. Over the years, we've found these methods work pretty well for all concerned. And isn't that the whole idea?
Chamberlain Hrdlicka	112 E Pecan Ste 1450 San Antonio, TX	78205	Legal	ChamberlainHrd	Chamberlain, Hrdlicka's San Antonio office focuses on all facets of tax law. Its high-profile and experienced bench of attorneys are frequently sought-after speakers and panelists addressing emerging tax issues. Clients served by the San Antonio office include a diverse range of privately-held businesses, tax exempt organizations, limited liability entities, <u>partnerships and individuals.</u>
MCRAE BAIL BONDS	4715 Fredericksburg	78249	Legal	McRaeBailBonds	As the bail enforcement agent for McRae Bail Bonds, I am committed to providing you with the highest degree of professionalism and respect. Our bail bond company has been in



Business Name	Business Address	Zip	Industry	Twitter Handle	Business Description
	Rd, Suite 507 San Antonio, TX				business for over 30 years and has provided bail bond services for the San Antonio metro area, and Bexar, Guadalupe, Comal, Kendall, Atascosa, Wilson and Medina Counties in Texas. Our mission is not only to help you get a friend or loved one out of jail in the shortest time possible, but to assist you through the process by keeping track of court appointments and other legal requirements to make this difficult time easier for you and your family. You can count on us to help your family in every way possible.
Rosenblatt Law Firm	16731 Huebner Rd San Antonio, TX	78248	Legal		Rosenblatt Law Firm represents our clients in a caring and compassionate manner, while at the same time aggressively pursuing their legal rights. We believe strongly in providing the highest level of service, while simultaneously affording individualized
REUTER LAW GROUP, PC	112 E Pecan St, Suite 2920 San Antonio, TX	78205	Legal	ReuterLaw	Reuter Law Group, PC is a boutique family law firm that represents clients in divorce and child custody/support matters.
Complete Emergency Care	10628 Culebra Rd Ste 200 San Antonio, TX	78251	Medical services	CompleteEM	Free-Standing Emergency Room. Open 24-7 and able to provide care to all emergencies. See a doctor in 10 minutes or less. Avoid crowded waiting rooms. Full-service emergency care.
UrgentCare2go	1804 NE Loop 410 Ste 104 San Antonio, TX	78217	Medical services	UrgentCare2go	Affordable & Quality Care Delivered To Your Doorstep 24/7 No Insurance Required. Care That Never Closes. On-Demand Urgent Care. Convenient & Affordable. Quality Care Delievered. Services: Covid Testing, Lab Work, Strep Throat Testing, Influenza Testing.
Ronald McDonald House Charities	4847 Charles Katz San Antonio, TX	78229	Medical services	SARMHC	The Mission of the Ronald McDonald House Charities of San Antonio is to provide support and temporary living accommodations for families with critically ill and injured children who are receiving essential medical services in San Antonio.
Physicians Premier Emergency Room	3154 SE Military Dr Ste 103 San Antonio, TX	78223	Medical services	MD_PremiER	Physicians Premier Emergency Room is dedicated to providing the most efficient, compassionate and patient-centered emergency care.
Bucay Center for Dermatology & Aesthetics	326 W Craig Place San Antonio, TX	78212	Medical services	drvivianbucay	
TESSMER LAW FIRM PLLC	7800 IH-10 W Ste 830 San Antonio, TX	78230	Retail	TessmerLawFirm	Tessmer Law Firm is a full-service firm handling cases in central & south Texas. Call us for help with divorce, child custody and/or support, personal injury, estate planning, wills and probate.
Bob Mills Furniture	12621 Interstate 10 W San Antonio, TX	78230	Retail	bobmills	Bob Mills Furniture opened it's newest store on May 1 2018, introducing San Antonio to a different way to shop for furniture and mattresses. The 96,000 square foot building, located in the Fiesta Trails Shopping Center, next to Marshall's and H-E-B on I-10.Currently, Bob Mills Furniture has nine locations, one in Oklahoma City, one in Tulsa, and seven in Texas;

Business Name	Business Address	Zip	Industry	Twitter Handle	Business Description
					Amarillo, Lubbock, Midland, Odessa, Temple, Waco and San Antonio. The company employs over 400 employees, many of them working for the company for over 25 years. For more information, visit their website at <a href="http://www.BobMillsFurniture.com">http://www.BobMillsFurniture.com</a>
Red Wing Store	22906 U.S. Highway 281N Suite 102 San Antonio, TX	78258	Retail	RedWingShoes	Red Wing Stone Oak (opening May 2021) will provide North San Antonio with the highest quality work boots designed and built in the USA. Going back to World War I when they outfitted the American soldier, the Red Wing Shoe Company has a 115-year history of protecting Americans with footwear for construction, manufacturing, drilling, ranching, hunting, hiking, and all out working. In addition to the best American-made work boots you can buy, we'll carry Irish Setter, Vasque and Red Wing's iconic line of "Heritage" boots. Come to Red Wing Stone Oak for a set of boots that look as good in the hunting stand as they do in the board room.
ANDRETTI INDOOR KARTING AND GAMES	5527 N Loop 1604 W San Antonio, TX	78249	Entertainment	AndrettiKarting	
Flix Brewhouse	845 S. Loop 1604 W San Antonio, TX	78245	Entertainment	FlixBrewhouseTX	We brew up to 12 of our own beers at any time and offer dozens of other draft beers for guests to enjoy. Flix Brewhouse is a movie theatre with awesome food and one of a kind craft beers.
Cowboys Dance Hall	3030 NE Loop 410 San Antonio, TX	78218	Entertainment	CowboysDancehal	Located 8 minutes from downtown, Cowboys is a 70,000 square foot, complex that offers variety for individual fun, or private events. Cowboys offers live professional rodeo, dancing, live music, a mechanical bull, billiards tables, and games. Cowboys is dedicated to providing a high quality experience for our residents as well as visitors to San Antonio. We're open to the public Wednesday through Saturday.
EMBASSY MINIATURE GOLF	500 Embassy Oaks San Antonio, TX	78070	Entertainment	EmbassyMiniGolf	Our miniature golf course, has been around for almost 35 years. We provide a family friendly atmosphere for all customers, to come play a round of 18 holes. We have beautiful waterfalls and scenic greenery.
Once In A Wild	915 El Valle San Antonio, TX	78258	Entertainment	OnceInAWild	INSPIRING OTHERS TO MAKE A DIFFERENCE THROUGH LIVE ANIMAL EXPERIENCES. Prepare for the experience of a lifetime! Once in a Wild is a unique mobile zoo. We specialize in live animal educational programs for your next event. We offer up-close interactions with amazing animals. Perfect for classrooms, parties, corporate events, and much more.
FED AND FIT, LLC	4085 Cibolo Canyons Street #300 San Antonio, TX	78261	Fitness and Weight Loss	fedandfit	Fed and Fit is on a mission to simplify wellness through quick and tasty recipes, unbiased, easy-to-understand nutrition and fitness advice, and simple wraps for safer home and beauty.
SUNNY SANKALPA YOGA	San Antonio, TX	78204	Fitness and Weight Loss	sunnysankalpa	Movement based yoga instructor focused on wellness, relaxation and self care.

Business Name	Business Address	Zip	Industry	Twitter Handle	Business Description
Geekdom	110 E Houston St 7th Floor San Antonio, TX	78205	Technology Consulting	Geekdom	Geekdom is a new kind of collaborative coworking space where Entrepreneurs, Technologists, Developers, Makers & Creatives help each other build businesses & other cool things together.
Modern Managed IT	110 E Houston St Fl 7 #57 San Antonio, TX	78205	Technology Consulting	modernmanagedit	Modern Managed IT is a tech start-up company focused on managed IT services for small businesses. With employees trained and certified in Microsoft, Google, Amazon, other leading technology platforms - we are the first IT service firm to offer various benefits including no term contracts, fixed pricing for all services, and dedicated teams for our customers.
WellAware	3424 Paesanos Parkway, Suite 200 San Antonio, TX	78231	Technology Consulting	wellaware_us	WellAware empowers organizations to be efficient, safe and sustainable by streaming mission critical data to their employees, so they can remotely monitor and control physical assets. Our open technology is easy to deploy, affordable and secure.  We do all of this with a team of dedicated professionals that provides a combination of deep knowledge, vast experience and innovative spirit that is unsurpassed in the industry.
Grande Communication s	11603 Crosswinds Way Ste 120 San Antonio, TX	78233	Telecommunic ations	grandecom	Grande Communications is a Texas-based broadband communications company that offers a full suite of Internet, TV and phone services for residential and business customers. Like the Texans we serve, we're proud of our independent, 'can-do' attitude that has enabled us to serve over 160,000 customers in communities big and small across Texas.
Unite Private Networks	8111 LBJ Freeway Ste. 600 Dallas, TX	75251	Telecommunic ations	UPNFiber	Unite Private Networks provides high-bandwidth, fiber-based communications networks and services to schools, governments, carriers, data centers, hospitals, and enterprise business customers across a 21 state service area. Service offerings include dark and lit fiber, private line, optical Ethernet, Internet access, data center services, and other customized solutions.
Voiceovers by Cat	26134 Wood Chuck San Antonio, TX	78260	Telecommunic ations	VoiceoversByCat	Professional Narration Voice Actor: A passion for eLearning voiceover—including non-fiction audio books, explainer videos, online classes, and corporate narration—makes me the perfect choice for organizations in any number of markets. I also bring a strong customer focus and love of problem-solving to everything I do.



**Figure 1. Box-Whisker plots of sentiment scores of tweets collected for all groups. Sentiment scores were determined using the sentiment analyzer within the nltk package in python. Sentiment scores <0, 0 and >0 pertain to tweets classified with negative, neutral or positive sentiments, respectively.**

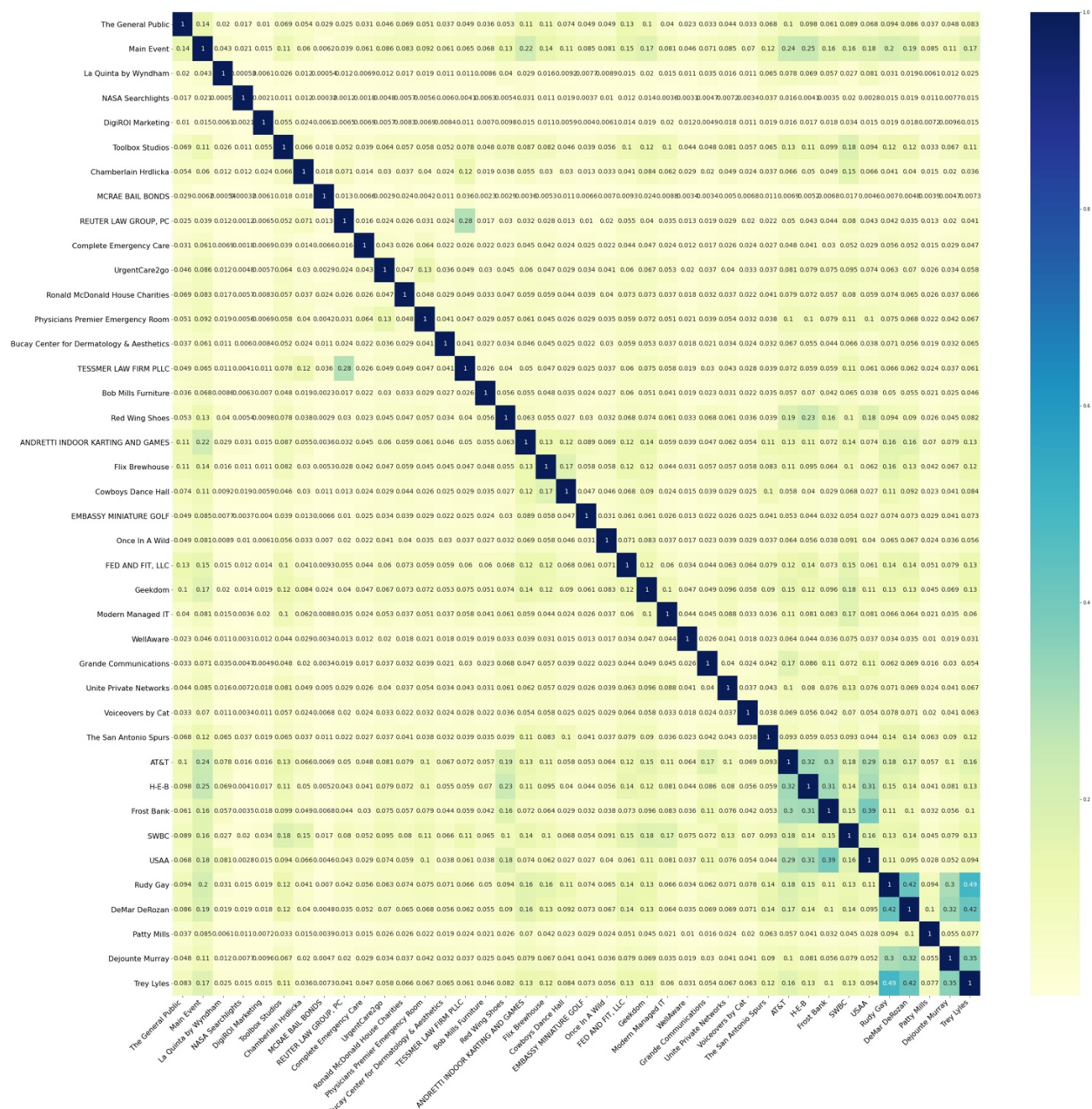


Figure 2. Heatmap displaying the cosine similarity metric for all groups.