



# Yamaha Pianos

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# Data Extraction, Cleaning and Exploration of Attributes

The dataset has 88 variables data we can observe that there are many attributes which contains redundant information and might not be helpful for answering the questions First task was data extraction cleansing and exploration.

**Data Extraction:** Using Twitter API search, I extracted a **good 109467 tweets**. This is significant data set and will help us get a good understanding of the questions we are about to analyse. The keywords were also strategically selected to extract relevant tweets. They are as under:-

**“Yamahapiano, music, digitalpiano, piano, keyboard, yamaha, music education, learn, avantgrand, piano sales, piano music, piano lessons, hybrid pianos, YamahaMusicEU , Electronic Pianos, acoustic sound, digital sound, NU1, NU1X, N3X, pianist, pianist magazine, Yamaha AvantGrand Hybrid Piano, hybrid pianos, Pianist Magazine,grand piano.Pianocorder”**

This combination of keywords was important and was selected after carefully reading all the questions we need to answer further.

**Data Cleaning:** A few data cleaning processes were introduced. They are:-

Eliminated 82 attributes that were insignificant to our analysis

The variables selected were: - screen name, name, created at, location, source and text

A bag of words to study the tweet words was created

Japanese language tweets were removed from the data set to make our word clouds easy to understand and decipher

**Data Analysis:** Graphs, word clouds and sentimental analysis using the extracted data

(20 points) Yamaha (<https://usa.yamaha.com>) has five lines of pianos (and presumably five distinct consumer bases) that technologically innovate on the traditional acoustic piano:

- Disklavier
- Silent Piano
- Transacoustic
- Clavinova
- AvantGrand

Choose one of these lines, and do a search using the Twitter API to identify the potential customers for that line and to Quiz about their potential characteristics. After setting up your Developer Account / App / OAuth at <https://developer.twitter.com> you can start exploring with some R code that might look like that shown below. Add more code as needed to analyze the tweets that you have managed to extract on the particular piano market you are researching. First you have to get your `api_key` and your `api_secret` as well as your `access_token` and `access_token_secret` from your app settings on Twitter. Just click on the “API key” tab to see them.

Yamaha a company that redefined musical instruments a few years ago attempted a crazy experiment- a grand piano that was traditional in almost every respect — except that it replaced strings with sensors?

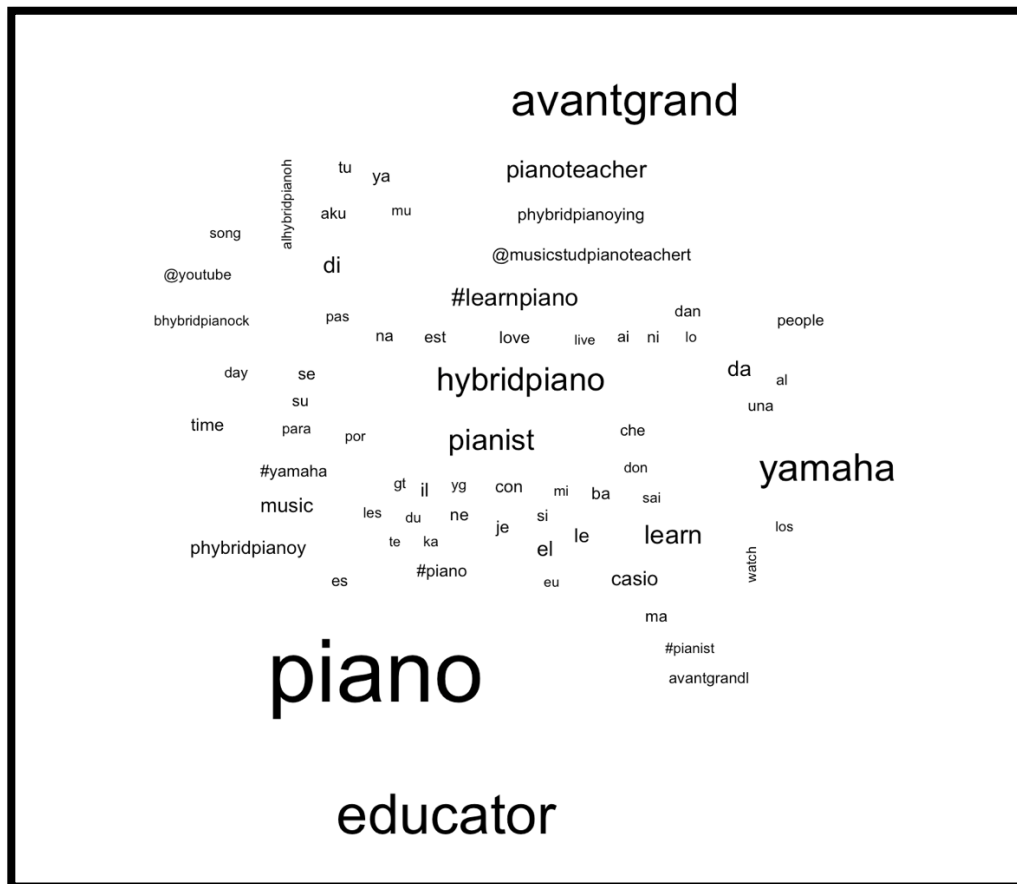
The result was the AvantGrand N3, a grand hybrid piano. However the price of this luxurious innovation is a breathe taking \$ 15000

Thus, in attempts to bring price down, Yamaha has introduced a new AvantGrand model, the NU1X upright hybrid.

Thus, for the purpose of this analysis, **I have selected the entry level Yamaha AvantGrand NU1X which is priced at \$6999**

- demographics (age, social status, education)
- price range
- who influences them
- how well do they play the piano
- when would they buy a piano, how often
- where are they
- what motivates them to choose a particular piano with particular features

We can deduce a lot of information using our Twitter Analysis. The below word cloud gives us relevant information for answering these extremely vital questions

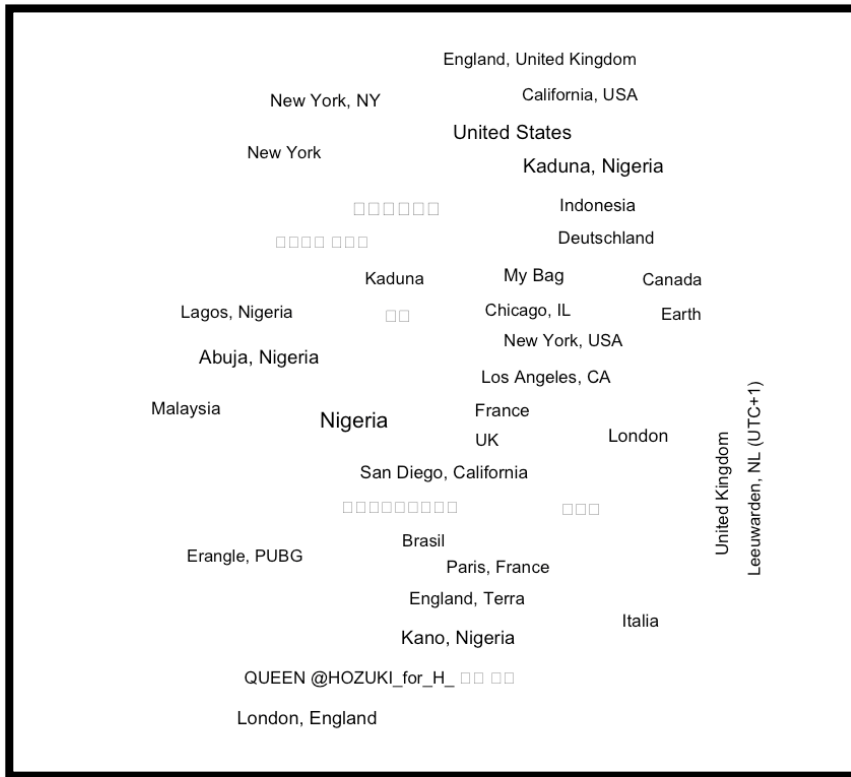


## Instagram



It can be observed that maximum of our audience uses Twitter Web Client to post tweets

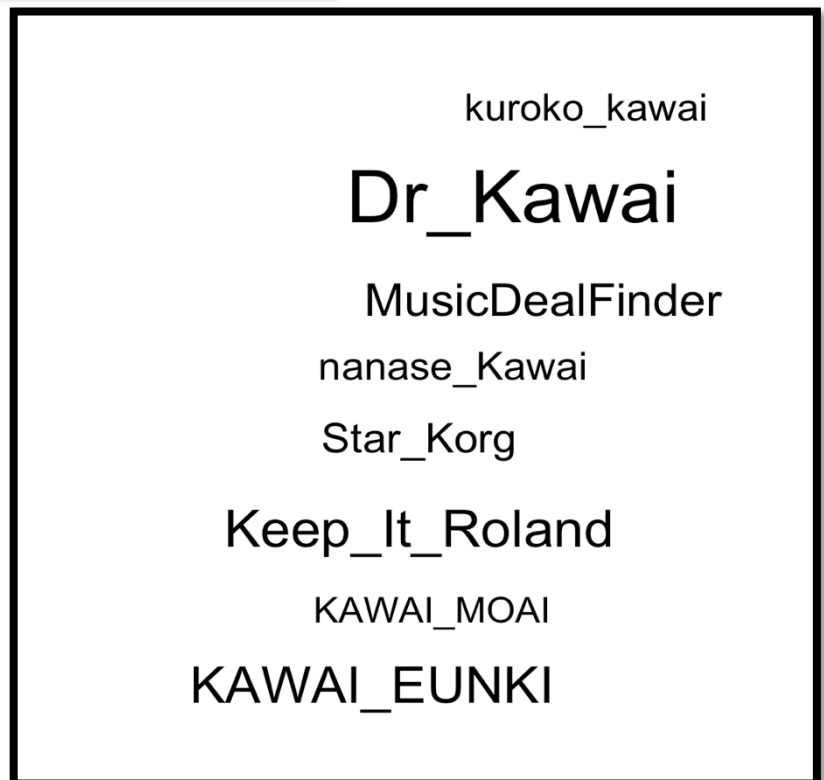




Word Clouds to analyse location and top posters of tweets

Location can help us understand where our target market comes from. We can see a mix of USA cities and Nigeria

From the top 10 posters we can create a potential buyer persona and understand various factors by visiting their page.





**Sentimental Analysis:** To really understand the positives and negatives of our product, we ran a simple sentiment analysis to get an idea of the positive and negative tweets.

**The most positive tweet:**

*"no but it must be so beautiful and interesting to work with someone as lively and passionate as jongdae;\nhe's an amazing vocalist,an amazing lyricst,got interested in composing and overall the most cheerful and brilliant artist who only wants to learn more-<https://t.co/xMxsECNFzA>"*

**The most negative tweet :**

*"@colleenpatricia @MissvalCa @gatewaypundit @AOC Octave and a 3/4 on my piano, but don't worry about my reach; try cracking a history book now and then, you might actually dispel some of your sad ignorance and avoid becoming the latest \"sucker born every minute\" for this motley crew of illiterate socialist thugs."he Yamaha NU1X is a beautiful, shiny black upright magnificent-looking piece of art which is compact at the same time. In terms of dimensions, it's the perfect solution for a small space "*

**Demographics (age, social status, education)**

Using our Twitter findings, we can infer that piano buying public can be segmented into different groups. Most piano makers have an expensive grand and premium product line and a cheaper entry level upright line. Each line then further contains several sub-groups of differing quality.

Eg The Avant Grand Line with product models such as N1,N2,N3, NU1X etc.

Our product the Nu1X is an entry level newer hybrid model. **Our keyword search suggests the NU1X as a practical, yet still worthy of a music professional.** It is a perfect machine for a professional “educator” whose commitment to students has prevented the pianist from reaping the rewards of public performance.

The Nu1X yields the perfect balance in terms of professionalism and sound to the larger, grand pianos. Sound and prestige are not sacrificed, thus making it an ideal purchase for an educator who aims to teach piano to a very beginner to intermediate level audience.

The NU1X is intended for families, students, educators, and urban dwellers who wish to fit a no-compromise piano experience into a limited space at a surprisingly affordable price. With the NU1X taking its place alongside its larger N3X, N2, and N1 siblings, virtually anyone who longs for that experience can now afford the playability and prestige of a genuine Avant Grand.

**Target market:** Piano Educators who purchase pianos to conduct or run classes

**Price range:** Finding the ideal price point directly using twitter analysis is not possible. However, we can estimate a range based on our target audience and some secondary research. However, based on our use case, an ideal scenario for us would be a device that offers maximum features at a reasonable price. An ideal price range for a classroom setting upright piano should be between \$5000- \$15000.

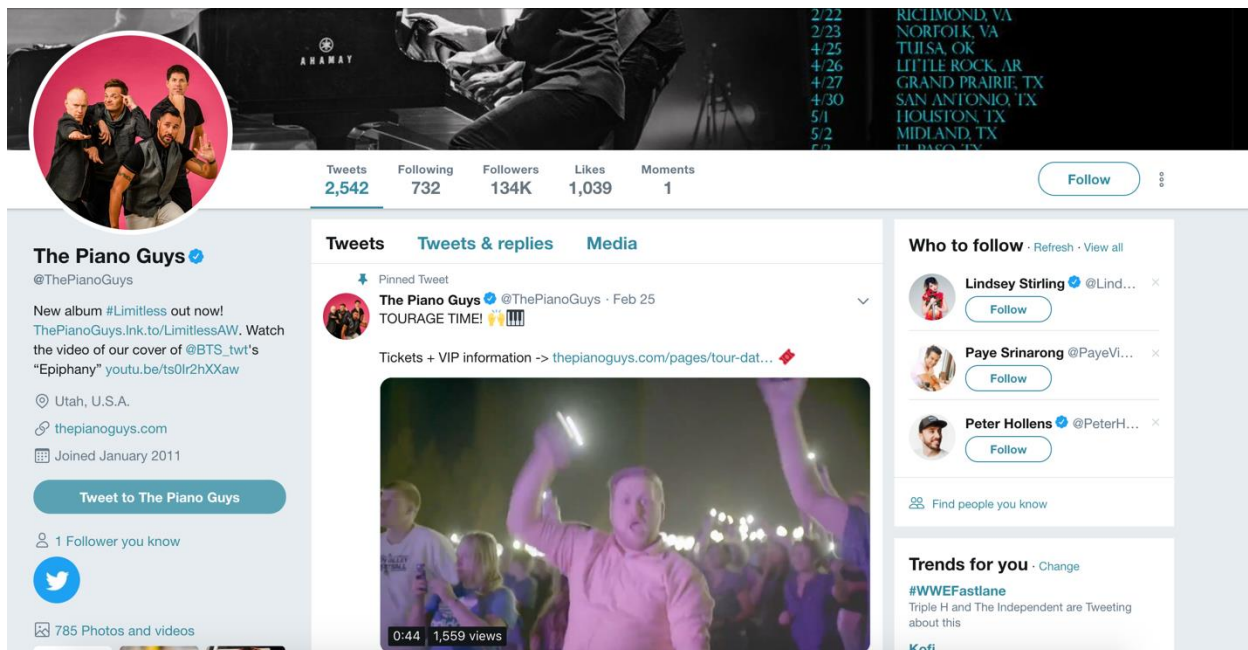
## Piano Influencers:

Considering our target audience, they are more of the influencer kind rather than getting influenced. Social media has set the stage for music artists and performers of all kinds. For pianists, there are two modes: the pomp of the performance, and the solitude of quiet practice and personal play. There is, however, a growing community of piano enthusiasts who are using social media to share their passion with the world, and it's happening – almost exclusively – on Instagram.

Here us where piano educators come into the picture. For them social media platforms like Twitter, Facebook and Instagram can serve as a sneak peak into their level of skill and give them a medium to promote their classes and their work to their target audience.

However, our educators can also be influenced by big artists and performance groups.

E.g. The Piano Guys having almost 134K followers are the best in the industry for Piano professionals to follow







**Skill level of educators is between intermediate and experts.** These individuals can have 0 to few years of experience as a music educator. Ideally the life of a digital piano is a good 20 years. Thus, we can understand for the purpose of running classes a onetime purchase would be enough. Post analyzing the location of our tweets, we can see our **potential market is the United states and mostly big cities like New York, Chicago etc.**

**Motivators:** For pianists' potential motivators are skill development, personal pleasure/enjoyment, self-expression, and love of the instrument. Our twitter analysis suggests the desire to learn piano or pursue a hobby that would be enjoyable and relaxing. We can also understand perceived rewards of piano study to be happiness, relaxation, developing discipline, personal pleasure, improving concentration, developing the ability to express oneself, and increased feelings of self-esteem.

**Q3 (20 points) Given what you know about the customer (based on your Twitter analysis) identify “Basic” features that must appear in any instrument (both positive and negative) and three “Differentiators” that will make the particular Yamaha line you have chosen more attractive to these customers than would be competitors’ products. You have the latitude to define Yamaha’s product characteristics without worrying about whether Yamaha actually builds a piano as you suggest. Your three “Differentiators” will form the basis for your marketing campaign. Based on your “Differentiators” what would your starting keyword choices be for your advertising campaign?**

To really understand the positives and negatives of our product, we can use the combination of simple sentiment analysis and word clouds to get an idea of the positive and negative features as well as the main differentiators. On examination of our results, we can see that people relate the Yamaha NU1X to increased skill levels, learning and passionate work.

**Basic features of Yamaha NU1x as best understood are as follows:**

Yamaha Avant Grand is simple digital hybrid upright piano that is compact and is perfect for small spaces. Its dimensions are:

***Dimensions: 18 inches W x 40 inches H***

Real wooden keys and hammer mechanism makes the hybrid feel exactly like a real piano, giving you all of the same expressive capability. The hammer mechanism on the NU1X is exactly like the one on an upright piano. However, when you compare the same mechanism on meaning on the N1, N2 and N3, which all feel like grand pianos, it is not as quite great. The NU1X is a beast for heavy playing, light playing, fast playing, grace notes and clomping chords. These are the positive factors.

First among the refinements in the new NU1X is the sound. The NU1X improves upon the NU1's multi-samples of the critically acclaimed Yamaha CFX concert grand even further, while adding a companion world-class piano, the mighty Bösendorfer Imperial. These are reproduced via a pair of 16cm woofers and 1.9cm tweeters (all front-facing), with the inside of the NU1X being a unified enclosure with specially designed acoustic chambering to enhance natural reverberation as on an acoustic piano, not to mention providing bass response that does justice to the presence and thunder of the nine-foot source pianos. This is further enhanced by "tone escape" ports on the rear, which give a sense of the sound reflecting from whatever wall the instrument is likely to be placed against. Thanks to the company's prominent expertise in acoustic sampling, the core sounds and onboard speaker system were not merely "bolted on" to one another but engineered from the ground up as an organic whole. The purpose: To give an utterly convincing sense of the plethora of tones of which a piano can blend naturally in the air, as they do on the genuine acoustic article.

The NU1X is budget model that has some minor downsides too. This piano has white plastic on the tops of its wooden keys, rather than the synthetic ivory on the N2 and N3. The NU1 also lacks the two features



that the more expensive AvantGrand pianos use to create subtle, realistic resonance and vibration: what Yamaha calls the Tactile Response System (the keys vibrate slightly) and the Soundboard Resonator (a flat-panel oscillating unit, on the N3 grand, that replicates the vibration of the strings themselves “singing”). Only a hard-core pianist would notice that these features are gone.

### Yamaha NX1U Basic Features

Type of Piano : Console Hybrid Type

Number of Keys : 88

Built in Tones: 10-25 tones

Portability: Semi-Portable/Non Portable

Price \$5000 +

Connectivity: USB,Aux etc.

### Pros

- Look similar to an acoustic piano
- Comes with a cabinet and 3 pedals
- Will make a nice addition to your home interior

### Cons

- Not very portable
- Heavy, require more space
- Tend to cost \$200-\$300 more than portable alternatives
- Require assembly

### Best Use cases

- Home Practice
- Classroom Environment
- Church and Other Venues



**Our 3 main differentiators. Our twitter analysis helps us understand 3 very important factors that can serve as our key selling points. They are:**

**A Digital Hybrid:** The NU1X is a digital hybrid upright piano. And so, as on its predecessors, it offers a few buttons that expand its flexibility. For example, you get a choice of keyboard sounds: two grand piano sounds, two electric pianos and an incredibly authentic-sounding harpsichord. Buttons on the left-side control panel also let you transpose the entire instrument to a different key or fraction of a key, or even choose a different temperament, that is, a historical tuning; history buffs and music students know what that means.

Yamaha has added phenomenal digital flexibility to the NU1X without affecting the feel and the sound keeping the price really fair.

For a learning student a hybrid piano is worth the money. The Yamaha NU1X offers the perfect balance of a realistic action and the realistic sound of a real grand piano.

**Learning ease:** For a learner, it is important to have a device that nurtures progress. The NU1X does just that! A computer can be connected for recording and playback using MIDI software, through USB. You can also plug in a USB flash drive to save audio recordings of your performances. This helps for young listeners to go back home and spend more hours on practice.

The piano also comes with 50 built-in classical recordings and a book of music. The NU1X also slows down the playback, thus making it a great teaching and learning machine. Many people would happily sacrifice a little acoustical realism to save several thousand dollars. The NU1X makes a fantastic practice piano, apartment piano or starter piano — better, for most people, than an equivalently priced real piano.

**Great Value for Money:** The NU1X is intended for families, students, educators, and urban dwellers who wish to fit a no-compromise piano experience into a limited space at a surprisingly affordable price. With the NU1X taking its place alongside its larger N3X, N2, and N1 siblings, virtually anyone who longs for that experience can now afford the playability and prestige of a genuine AvantGrand piano.

**Pricing and Availability :** The AvantGrand NU1X will be available at authorized Yamaha piano retailers with an MSRP of \$6,999.00.

4) Design a Google Ads marketing campaign based on the three “Differentiators” you chose in 3. above. Use Google Ads Keyword Planner (<https://ads.google.com/aw/keywordplanner/>) to suggest 10 the best search keywords to show your ads. For the purpose of this question, the “best keywords” are those that yield the highest ROI, assuming MRSP represents a 200% markup and we have a conversion rate that is 2.5% of the click-through rate. Let the price of each piano be the MRSP of that particular piano on Yamaha’s website. For example, on ([https://usa.yamaha.com/products/musical\\_instruments/pianos/avantgrand/n1/index.html](https://usa.yamaha.com/products/musical_instruments/pianos/avantgrand/n1/index.html)) we find that the Yamaha N1 AvantGrand has a manufacturer’s suggested retail price of \$9999. Assume that Yamaha’s markup is 200% (i.e., the N1’s cost to produce is \$3333) and that the conversion rate of your ad campaign is 2.5% (i.e., 2.5% of your click-throughs from the Google Ad campaign result in the sale of an N1).

What is your ROI on your Google Ad dollars spent (i.e., if your campaign costs \$10,000 during a period that you sell 10 pianos, then you will have made  $10 \times 6666 = 66,660$  gross margin on a \$10,000 ad expenditure yielding a 667% ROI)

Based on our 3 main differentiators, we have selected the following keywords:

<input type="checkbox"/> Keyword ↑	Ad group	Max. CPC	Clicks	Impressions	Cost	CTR	Avg. CPC
<input type="checkbox"/> cheap digital piano	Ad group 1	\$3.00	2.28	37.87	\$2.36	6.0%	\$1.03
<input type="checkbox"/> learn piano	Ad group 1	\$3.00	1,307.44	37,795.15	\$2,656.10	3.5%	\$2.03
<input type="checkbox"/> Nu1x	Ad group 1	\$3.00	7.33	255.65	\$12.70	2.9%	\$1.73
<input type="checkbox"/> piano instructor	Ad group 1	\$3.00	190.41	9,436.90	\$432.92	2.0%	\$2.27
<input type="checkbox"/> piano student	Ad group 1	\$3.00	1.53	58.09	\$2.68	2.6%	\$1.75
<input type="checkbox"/> yamaha avantgrand	Ad group 1	\$3.00	9.30	318.75	\$18.25	2.9%	\$1.96
<input type="checkbox"/> yamaha hybrid piano	Ad group 1	\$3.00	7.56	264.82	\$15.31	2.9%	\$2.03
<input type="checkbox"/> yamaha NU1X	Ad group 1	\$3.00	21.32	772.41	\$40.07	2.8%	\$1.88

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Using the forecast tool under keyword planner, we received the following expected results

If we run a campaign with the above combination of Keywords.

The  
Price  
of a

Your plan can get **32** <sup>?</sup>  
**conversions** for  
**\$3.3K** and a **\$3** max.  
CPC

Conversion rate : 2.00%, Value  
per conversion : \$7.0K

Conversions	Avg. CPA	Conversion value	ROAS	Clicks	Impressions	Cost	CTR
32	\$100	\$220K	68	1.6K	50K	\$3.3K	3.2% >

Daily Budget: \$140

Yamaha NU1X as stated on the website is \$6999

Considering our gross margin is 200%, our cost of making the piano per unit is \$2333

Thus, the gross margin = MRSP – Cost = 6999-2333 = \$4666 per unit

The conversion rate in the above campaign is 3.2 %. Our forecast predicts 32 conversions at a cost of \$3300.

Cost of Campaign = \$3300

Sales = 32 units

Gross margin on 32 sales units =  $32 * 4666 = \$149312$

Therefore, our ROI on Google Ad Campaign =  $\text{Gross Margin} / \text{Cost of Campaign} * 100$

$= 149213 / 3300 * 100 = 4524\%$

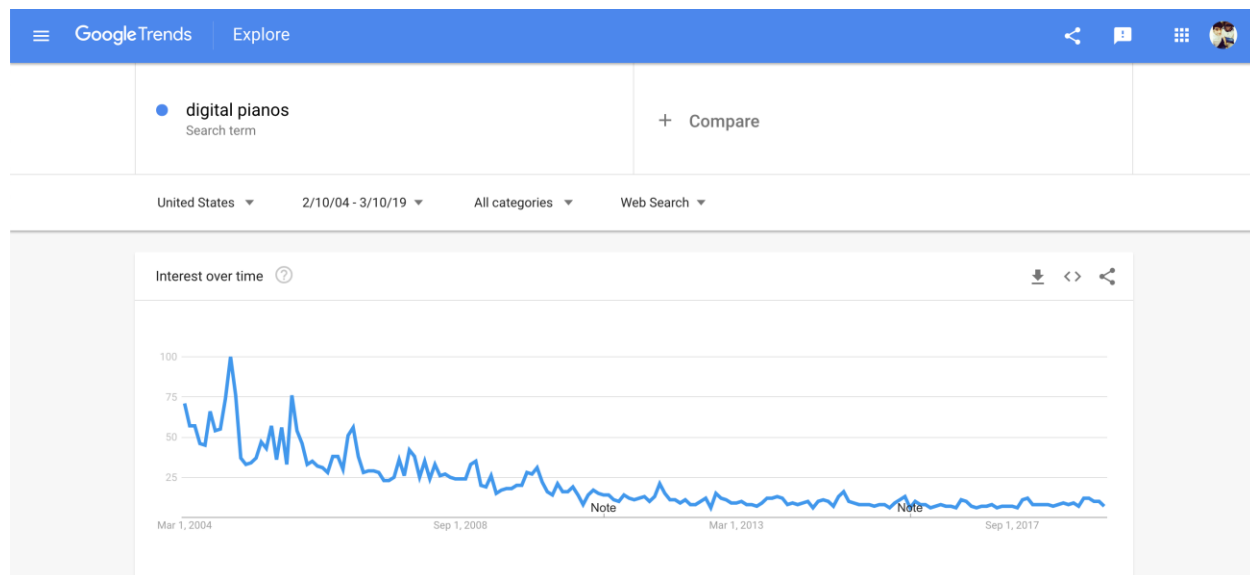
Thus, with the above combination of keywords, **we can expect a ROI of 4524%**

5. (20 points) Use Google Trends (<https://trends.google.com>) and Ngram Viewer (<https://books.google.com/ngrams>) to identify short and long term trends in the musical instruments industry, its consumer base, and its technology. How will the product you have chosen fare over the short-term future? Over the long-term future? What technologies will “disrupt” the digital-hybrid piano industry? What technologies must Yamaha compete in over the near future. Synopsise all you have discovered in a short (two-three paragraph) report to Yamaha’s management concerning emerging challenges and opportunities.

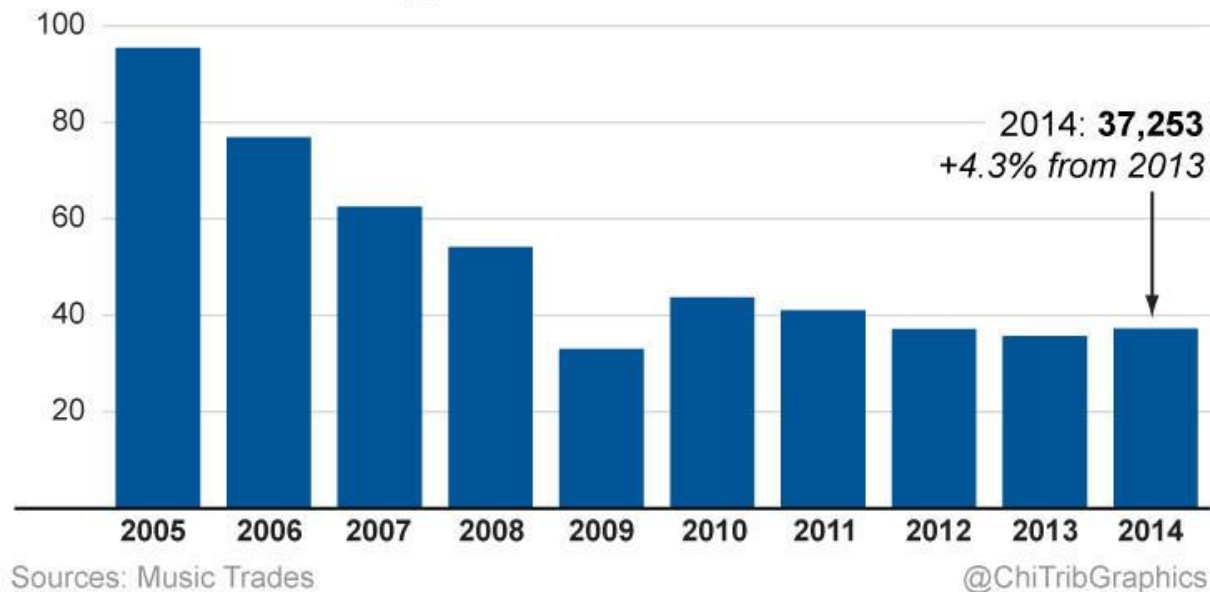
### Short and Long term future of Digital Hybrid Pianos:

A hybrid piano is a digital instrument with an acoustic piano action inside. Simply, it’s an acoustic piano with an amplifier and speakers. Depending on the make and model, hybrid pianos feature either an upright or grand piano action that has been only slightly modified from the original acoustic construction.

When we search the term digital pianos on Google Trends, we see a very strong declining interest over the last 15 years. However, I was curious to understand the sales pattern over the same 15 years. Much to my surprise the sales have also been consistently falling (as shown in the graph under)



## U.S. acoustic piano sales *Scale in thousands*



A striking resemblance in both these graphs suggest that the industry is definitely on a declining path which is somewhat of a bad news. If we try to understand the reasons why, we can think of it as a generational change in the world. Kids don't have the time or the interest in musical instruments. Apps are the modern age entertainment; Retail Shops are folding. Houses are too small and Electronic keyboards are the main reasons for this decline.

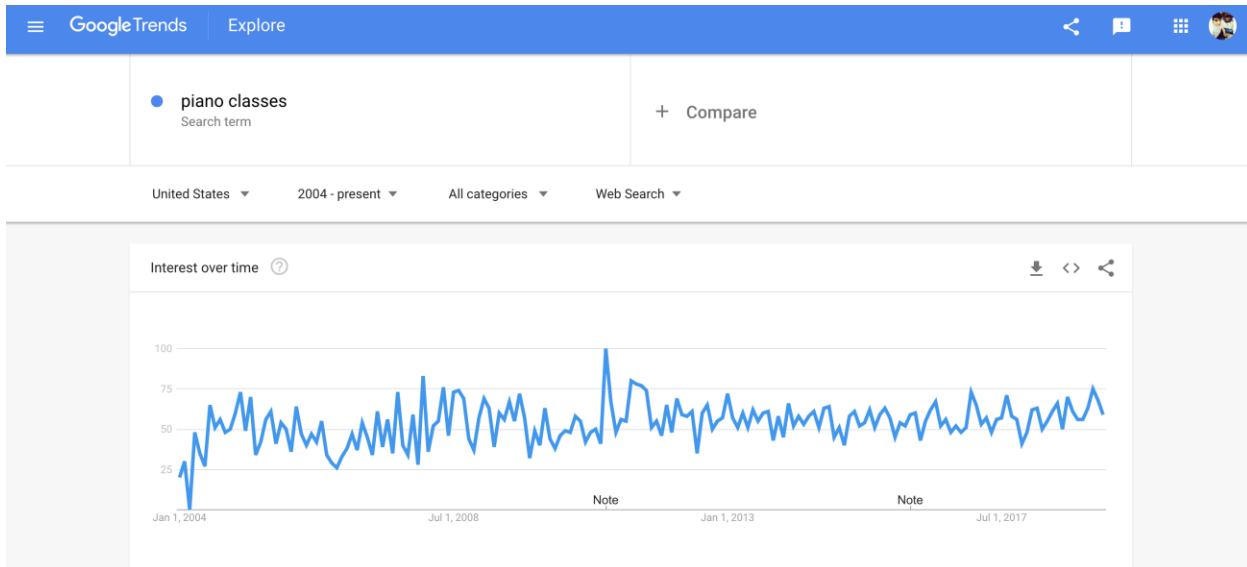
A simple google search gave me the result for the best year for piano sales in U.S. being 1909, when more than 364,500 were sold. In 2005, that number was 95,000, dropping to 33,000 units during 2009

This arises the key question: does it mean the industry is over?

The answer is; the industry is trying to figure out where piano music lies in homes! To understand this, let us examine their interest in learning music. On examining the interest pattern of learning piano, the levels have remained constant. This makes it evident that the market for pianos is shifting from home to professional learning centers. **This is where a market for NU1X exists.** There is a tendency for today's generation to showcase talent on social media. To be free and artistic and express their thoughts. Learning piano is one such form of art which is not only pleasing but a rare talent.

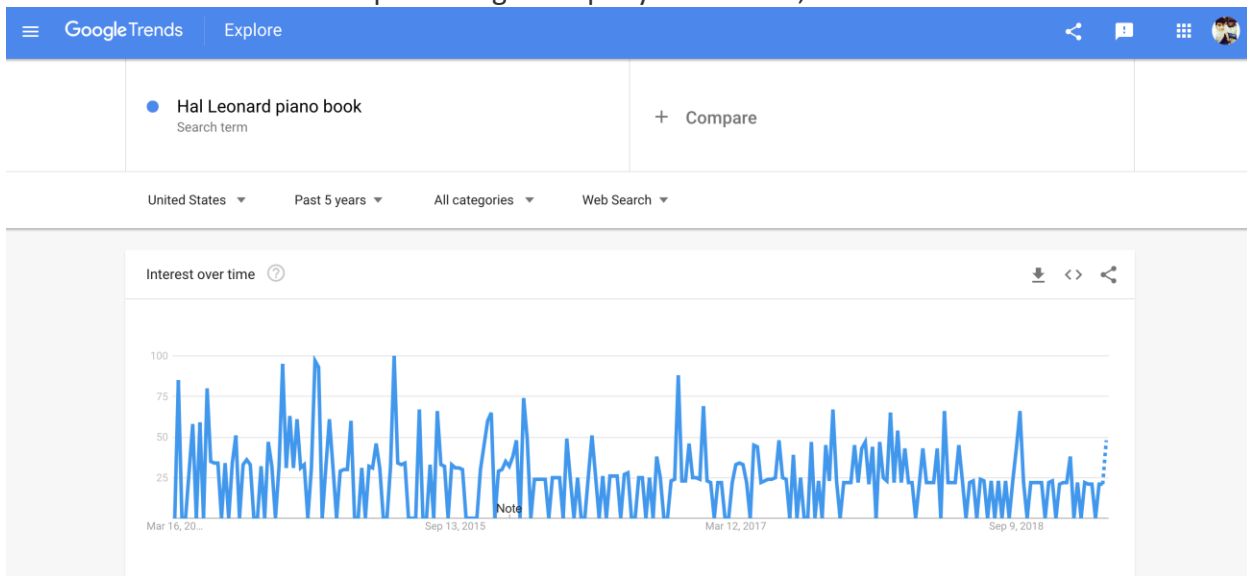


## Yamaha Pianos



Thus, public interest in **learning the instrument is where the real short and long term future lies**. Parents enroll their youngsters in lessons, while adults pick up sheet music to fulfill long-held dreams of playing.

Another interesting fact suggests the interest levels of Hal Leonard's level one instruction books have remained constant. The publishing company serves 7,500 music stores across the nation.



This brings use to an interesting question: How can instructional materials remain constant while piano sales are going down?

Thus, we can infer ,the demand still exists, people are using pianos differently and in a different place. A place where they do not need to purchase an instrument directly.

Few digital pianos made 15 to 20 years ago are still in use, due either to technological obsolescence or to wear. True, the relevant technologies have evolved, as has the design of digital pianos and the quality of their construction. Realistically, however, if past experience is any guide, pianos that are largely acoustic with digital enhancement may well last for many decades, while those that are digitals enhanced with acoustic-like features are unlikely to last as long.

**What technologies will “disrupt” the digital-hybrid piano industry? What technologies must Yamaha compete in over the near future. Synopsise all you have discovered in a short (two-three paragraph) report to Yamaha’s management concerning emerging challenges and opportunities.**

Apple’s Ipad Pro is a big threat to all musical instruments overall including the piano. Music has always been at the heart of Apple’s DNA. Over the years, Apple has produced apps such as GarageBand or Logic Pro, that aim at providing both amateurs and professional musicians with the best tools to foster their creativity. Yet, despite the very high expectations that the iPhone and iPad raised amongst musicians, no portable device could match the performance of a laptop while simultaneously improving workflow. This notion changed when the iPad Pro released in 2015 – the first Apple device to provide a comprehensive answer to musicians’ needs. The iPad Pro is perhaps one of the best devices on the market for music production. With great computing power and features like Force Touch ability, which is similar to the after-touch of modern keyboards, allows users to explore new possibilities and extend their playing through compatible apps, such as Roli’s Seaboard 5D app. There’s also the option of connecting an external MIDI controller to the iPad Pro thanks to Core MIDI.

Furthermore, if you can connect a keyboard to a small machine like an Ipad, you seriously enhance the portability of your musical instrument without sacrificing on quality of your production.



The Ipad pro is unmatched in terms of portability, ease of use and price (when compared to a piano). **This perhaps makes it one of the major disruptors.**



With Apple year after year boosting the performance of the Ipad Pro, Yamaha has some serious reasons to worry about potential consumers migrating to the Ipad for composing Music.

Thus, in summary, every key stroke of a digital hybrid piano is an extension of the pianist's art. These specially-designed pianos allow for a more responsive playing experience than that of a digital piano and replicate the touch and feel of an acoustic piano without the cost or maintenance. This creates a realistic auditory experience – in a sleek, compact design. Furthermore, hybrid pianos now recreate the vibrations and feedback felt when playing a real acoustic piano, unifying the emotional energy between the pianist and the piano by producing natural resonance that, dare we say, envelops the pianist. This is the epitome of the traditional acoustic piano experience. The merits of hybrid pianos and how they can positively impact learning and performing is worth the money. Technology is impacting every aspect of our lives and while some may want to keep pianos out of it, the time has come to open our eyes to the enormous potential digitalized instruments offer us. The piano has evolved a great deal since Bartolomeo Cristofori invented it in 1700, and that evolution continues. The hybrid pianos are just another step — or branch — in that evolution.

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