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| Text  Description automatically generated  Your time will come: recurrent themes in iron Maiden albums | Abstract  Iron Maiden, one of the most popular heavy metal bands of all time, has released over 20 studio albums, with songs touching on a great variety of topics. In this project, I examined the relative frequencies of three themes that stood out to me as particularly common in Iron Maiden’s songs – light vs. darkness, death, and the passage of time. I found that, while the verbosity of their songs has increased over time, there has been no clear trend in the prevalence of any of those themes.  Mark Olson  DS 745 |

**Purpose**

As a long-time metalhead, I’ve always had a special fondness for Iron Maiden’s ability to consistently produce fun and rousing metal hits, often with poetic and thoughtful lyrics. Across 41 years and 17 studio albums, Iron Maiden has developed their own distinctive style while remaining true to its roots. I embarked on this project to get a better sense of how Iron Maiden has evolved over time. An empirical investigation of the major themes in their albums can help me get a sense of what properties of their music are most important in shaping the listener’s perceptions.

**Data sources**

I used Python’s [requests](https://docs.python-requests.org/en/latest/) and [BeautifulSoup](https://beautiful-soup-4.readthedocs.io/en/latest/) libraries to scrape the lyrics of all of Iron Maiden’s albums off of <http://www.darklyrics.com/i/ironmaiden.html>. Each unique song’s lyrics was stored along with the song title, the name and release year of its album, and its number in the album as a single row in a tab-separated variables (TSV) file. In total, 187 distinct songs and 27 albums were found, including several live albums and singles. Although the model was trained on all of their albums, the discussion below only considers the studio albums.

Data analysis was conducted using Python’s [spaCy](https://spacy.io/) natural language processing framework along with general data analysis libraries [pandas](https://pandas.pydata.org/) and [matplotlib](https://matplotlib.org/). The word cloud above (colored by word theme) was generated by the [wordcloud](https://amueller.github.io/word_cloud/references.html) Python package.

**Analysis**

It seemed to me that most of Iron Maiden’s later albums tended to have longer, wordier songs than their earlier albums, so I first examined how the length of their albums varied as a function of release year.

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We do indeed see a positive trend in number of words per song over time, with critically acclaimed “The Final Frontier” marking a high point in their verbosity. Their first studio album, Iron Maiden, has less than half as many words per song as all three of their albums since 2010. I was not able to get data on the run time of these albums, but I believe that The Book of Souls had a runtime at least as long as The Final Frontier. Combining this dataset with data on runtimes would help determine whether Dickinson was singing faster or for more of the runtime of The Final Frontier compared to other later albums.

I next examined recurrent themes in Iron Maiden’s albums. As I re-listened to some of their music, three themes seemed like promising candidates for analysis – **death, light vs. darkness, and time**. Religion, mysticism, and dreams are also major motif in Iron Maiden’s discography, but those themes are less sharply delimited and harder to label, and consistently labeling text is one of the greatest challenges in a natural language processing project.

To save labor and avoid the risk of being inconsistent in my labeling of sentences, I used spaCy’s Matcher tool to automatically label words based on their part of speech and their lemma (root word). For example, I created a rule that applied the “**LIGHT**” label to all words based on the word “light” (e.g., “lights”, “lighted”), but only when it was tagged as being a noun or a verb, to avoid the adjectival sense as in “a light load”. I made similar rules for many words associated with “**DEATH**” (e.g., “death”, “slaughter”, “hell”), “**LIGHT**” (“sun”, “dark”, “white”, “black”), and “**TIME**” (“day”, “second”, “minute”, “eternal”). Initial attempts to manually label other words those rules missed resulted in much worse performance due to inconsistency (e.g., repeatedly mislabeling “day” as “**DEATH**” because both words start with the letter “d”).

Let’s look at the word cloud again to see how frequent words are in Iron Maiden songs (after conversion to lower-case). The words are colored according to whether they matched one of my rules – cyan words have no designated theme, red words are supposed to be death-themed, grey and white words are time-themed, and yellow words are light/darkness-themed.

Text

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We can see that “time” is the most important themed word in this dataset, but “death”, “die” and “soul” all have a substantial presence. Based on this word cloud, the “light” theme appears less prevalent than I initially expected.

Having labeled my data set, I used spaCy to train a model to predict my labels and hopefully identify other words as having one of those themes. Below is an image of how the final model annotated one Megadeth song, “Play For Blood”. Note that, because this is a song from a completely different band with many of the same themes, it is an appropriate validation case for this model.

Graphical user interface, application

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We see that this model has made several mistakes – labeling “keeps” as death-related, “flight” as light-related (odd because it doesn’t have “light” as a root word), and “win” as time-related, but only inconsistently. “Abottoir” should be labeled as death-related, but it’s such a rare word that that mistake is entirely forgivable. “Blood”, “die”, “mortal”, “soul”, “late”, and “fire” are all correctly labeled, but only because those words were specified by one of the rules in my training data. In short, the model did a good job of memorizing the rules I wanted it to memorize, but it does a bad job of generalizing beyond those labels, which is the only reason to create a statistical model in the first place. A thesaurus would certainly do a better job than this model.

Although the model has been shown to be mediocre at generalization, it correctly labels the most common words with a relevant theme. As such, it is worth looking at the relative frequencies of labels for each of Iron Maiden’s albums. These frequencies are divided by the words in each album. To avoid crowding the plot with too much text, I’ve only annotated the “death” points for each album, which makes it impossible to determine which album has which frequency of “time” or “light” in the years where there were multiple albums.

Chart

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I found it surprising that Powerslave had the highest frequency of death-related words, especially compared to their four albums with death-themed words in the title (an exercise for the reader). Piece Of Mind, with its rousing repetition of “If you’re gonna die, die with your boots on!”, is a close second. Only one album (Fear Of The Dark, appropriately enough) is the only album for which light/darkness was the main theme. Both Somewhere In Time (again, apt) and Virtual XI had time as their main theme.

**Conclusions**

To the surprise of nobody who has been paying attention to Iron Maiden over the years, death is a very important theme in their music, perhaps the most important theme. This is as much a reflection of their genre (heavy metal) as anything else. Also unsurprisingly, their albums have gotten more verbose over the years. The degree to which their wordiness has increased is almost shocking.

The most interesting takeaway from this exercise is how much influence a few words can have on our perception of a written work. No album had more than 5% death-labeled words (although admittedly the model missed some), but death and mortality certainly loom large in the listener’s mind while they listen. Methods more sophisticated than mere counting are required to begin to quantify the strength and nature of a song’s emotional valence.

The next logical extension of this exercise would be to compare Iron Maiden to other heavy metal bands using some of the same methods. How well does the model trained on Iron Maiden generalize to other bands, and how much death and destruction is in their songs? Another longer-term project in the same vein would be to try to improve this model. Because of the relatively small data set (only 6679 sentences total, 2671 of which were in the training set), it would be very difficult for a model to learn to classify multi-word spans of text. Hand-annotation would also help the model learn rarer words like “abattoir”.