The AI Songwriter:
Coding a Co-Writer

Reshaping the Songwriting Process with a Machine Learning Lyric Generator

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Abstract

Technological advancements have enabled Artificial Intelligence (AI) to yield value for many industries, but how does this value translate to the creative aspects of the popular music industry? Many popular songs in recent years have utilised more songwriters, leaving fewer royalties to be distributed from streaming services. Therefore, reducing the number of people involved with this process allows songwriting and production to become a financially sustainable career. Using Market and Action research alongside Practice as Research (PaR) to identify what is currently available has allowed me to achieve a unique perspective on reshaping the songwriting process by coding and training a machine learning lyric generator to inspire and offer new alternatives to the collaborative practice. Focusing on the lack of women in both the music and AI industries, as well as on the economic aspects of music making, has yielded an insight to whether reshaping these processes could become an accepted practice as the music industry currently stands. In particular, the question of how varying levels of input for each song composed with AI would impact average consumer perception becomes an important one. The key research findings set the basis for an improved workflow and a new collaborative practice for AI-assisted composition, whose longevity, implications and implementation will be tested for the long term as a follow-up to this work.

Contents

Introduction

This project consists of nine songs in total, seven songs with proportions of AI-generated material ranging from 0% to 100%, in increments of 25%, with an additional two songs trained on data from other musical artists. The initial outcomes were to determine whether the average music consumer can determine the level of input of AI and whether it could have any commercial validity to use an AI as a co-writer, in place of additional songwriters or producers. Today, achieving living wage on Spotify without the backing of a major label requires 287,568 streams a month, totalling 3,450,816 million a year (Shotwell, 2021). Therefore, the question of whether AI can help cutting the costs of songwriting is of practical and financial interests for songwriters. Although this technology cannot write music without input or curation from humans, the effect it has had on the songwriting process is easily proven.

As this project evolved over twelve months, the idea of a case study to gauge audience perception translated to a thought experiment on further uses for this technology, such as the inclusion of AI to the songwriting process. Workshopping various ideas at record labels for new artists could be generated by AIs trained on similar, more established, artists. The main objective of this project became a reshaping of the songwriting process, incorporating technological advancements to help the modern songwriter.

Publicly, I have showcased this music weekly through performances and open mics to gauge audience feedback. This work is shown online through videos on TikTok, YouTube, Instagram and a Website, which consists of a variety of content including

videos, music, academic writings, presentations and in the future will appear on streaming services like Spotify and Apple Music.

2. Methodology and Background

2.1 Market Research

Cambridge Dictionary (2022a) defines Market Research as 'the collection and examination of information about things that people buy and their feelings about things they have bought'. In the early stages of this project, an overview and in-depth examination of the most popular AI songwriting tools was conducted. I discovered a wide range of software available, some which were locked behind payment options, some still in beta development and others that couldn't justify the legitimacy of the machine learning or AI inclusion of the software. Ultimately, I chose to focus the study on the following software and songwriting techniques: The Cut-Up Method, a Songwriting Prompt, *Audoir*, *Magenta*, *Amper*, *Song Lyric Generator*, *These Lyrics Do Not Exist*, *Scaler 2* and *Bored Humans*. Some of these AI technologies exclusively create audio or MIDI whilst others solely create lyrics, therefore a combination of two separate software was typically used to create a full song.

Alongside the four songs generated using AI, two additional songs were composed to showcase an analogue version of the same technology. After writing and recording these songs, I completed a reflective diary using Gibbs' (1988) reflective cycle, as shown in Appendix A. This consisted of noting a description of the events and outcome, feelings towards the project, an evaluation, conclusion and further actions (*ibid.*).

This process allowed me to view what was currently available to the general public, which software or methods I would use again and most importantly, why? McGivern (2009) states that in Market Research '[you] need to know your problem, relevant information about why you have the problem, what solutions you suggest, what you would like them to consider and who you will make that available to them'. Therefore, locating the primary issues was paramount. The largest inconveniences I recorded in the reflective diary was accessibility and user interfaces, followed by speed and length of content created. Therefore, I have ensured when building this lyric generator that each aspect is clearly labelled, explained and easy to use as shown in Figure 1.

Figure 1 - GPT2 parameters labelled and explained

2.2 Action Research

Kemmis and McTaggart (1988, p.595) describe action research as participatory research and showcase this method through a spiral of self-reflective cycles of:
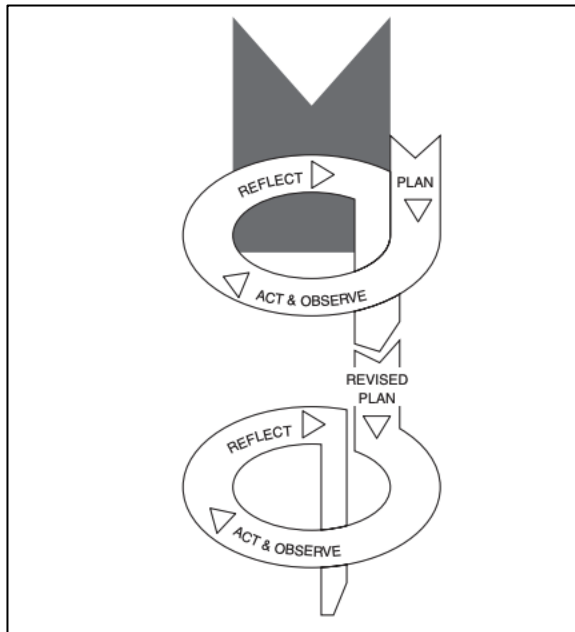
Figure 2 - Kemmis and McTaggart's (1988) action research spiral

Planning a change, acting and observing the process and consequences of the change, reflecting on these processes and consequences then replanning, acting and observing, reflecting and so on. This spiral, shown in Figure 2, was implemented early in my research to decipher the effect this technology could have both on the songwriting process and popular music industry.

I planned to change the songwriting process by incorporating AI technologies to improve the quality and speed of writing popular music, easily incorporating influences and references to the writing stages. I created six songs with widely available technology and methods as market research, observed how audiences reacted and noted how this effected my experience of writing music. Upon reflection, there was audience push-back when I revealed the music was written, in part, by AI but the enhancement to the speed of my writing process was undeniable. I revised the plan by varying the level of AI input to the material and writing seven more tracks, since the newer AI lyric generator is trained on my back catalogue of lyrics it is more similar to my existing music created without AI. When playing the seven newer songs I explain in layman's terms that they are written in collaboration with AI

technologies and that the human element is still required to complete the process, it is more similar to working with a co-writer. This explanation sits better with audiences and as Music Ally (2022) stated in their article regarding advancements in AI technologies: "These blurry boundaries are an important principle: most of the time, we are not talking about machines (or now AIs) making music entirely on their own. It is about humans making music using machines or AIs, with varying degrees of input by the two parties." A video example of utilising AI and human collaboration can be found in Appendix L.

2.3 Practice as Research

Robin Nelson's (2013) *Practice as Research in the Arts: Principles, Protocols, Pedagogies, Resistances* defines PaR as 'substantial new insights' or 'new knowledge' by exploring creativity and its relationship to both making and understanding the world. This methodology primarily involves a research project in which 'practice is a key method of inquiry'. Haseman (2006) states that 'practice-led researchers are formulating a third species of research, one that stands in alignment with, but separate to, the established quantitative and qualitive research traditions', which further justifies why PaR is well-suited for this project. The music created using AI and machine learning would not benefit from a quantitative or qualitive research models, as the process is time consuming and not every output results in a qualitive product. PaR allows for experimentation and developing new songwriting techniques and technologies for the contemporary songwriter.

Nelson (2013) emphasises that location in a lineage is an important PaR research activity, stating: 'If we wish to claim that our praxis manifests *new knowledge or*

substantial new insights, the implication is that we know what the established knowledge or insights are'. Therefore, the aim of using both AI and analogue songwriting tools was to establish their location in the lineage of songwriting and technology collaboration. In the 1950s, computer-generated music initially appeared, albeit only focusing primarily on algorithmic music creation, a full timeline from the 1950s to current day of music and AI can be found in Appendix B. This became the starting point for endless possibilities for computational systems which could potentially "recognise, create and analyse music" (Ranwala, 2020). Whilst AIM software has developed exponentially since its initial conception in 1951 (*ibid.*), through first-hand experience using current market-leading technology, arguably its best use is to assist human songwriters to overcome writer's block.

Although there are many causes of writer's block, one of the most notable causes can be "self-criticism or perfectionism as a source of block" (Flaherty, p. 82). Therefore, by removing the self-criticism aspect of songwriting by utilising AI collaborative tools, this cause can be resolved. Additional sources of writer's block such as the "strangled feeling of inarticulateness, of ideas coming faster than words, of not being able to express what's inside" (*ibid.*) can be resolved by utilising one of OpenAI's many GPT models. GPT-3 is now the largest 'text in, text out' model, capable of generating "100 pages of content from a trained model" (Sagar, 2020). The GPT-3 model only requires a minimum of a single word to produce additional text, allowing songwriters the possibility of using the machine learning software to generate words at a quicker rate than their own ideas can form.

2.4 Influence on the Output

The final practical output, ten musical works and a working machine learning lyric generator prototype, is the result of existing market research, action research and practice as research throughout various stages of planning, researching, coding, recording and showcasing the work.

Market research was most valuable in the initial stages of discovering existing software and how to proceed building on those discoveries within my own work by ascertaining the strengths and weaknesses of current available software. Moving forward, continuing to research how this technology grows for consumers will influence how I utilise AI and machine learning in my songwriting processes moving forward.

Action research and PaR were more useful to critically reflecti on the process and discern how to formulate approaches moving forward based on previous workings. In order to continue and furthermore expand upon my research, compositions and software, it is crucial to maintain in-depth writing of how each process has been beneficial or detrimental to the project.

3. Contextual Analysis

3.1 Industry and Financial Trends

AI mediated composition tools and voice synthesis are introducing changes in music distribution changes, because they are making music creation more accessible and affordable to musicians worldwide. Stephen Phillips, CEO of AI lab *Mawson*, stated that

> it's a transition from mass-consumption to mass-creation. These kids who grew up on Minecraft are coming through, they entertain themselves by being creative. […] AI is just going to give them new creative tools and let them create whatever they can imagine (Pastukhov, 2022).

This further democratisation of music creation tools and machine learning software through inexpensive software made readily available on mobile devices are likely to increase the already over-subscribed streaming services. As of 2019, each day 40,000 tracks were being uploaded to Spotify, increasing to 60,000 tracks per day in 2021 (Ingham, 2021). Daniel Ek, CEO of Spotify, (*ibid.*) stated: 'I believe that by 2025, we could have as many as 50 million creators on our platform, whose art is enjoyed by a billion users around the world.' If Ek's forecast is correct, a total of 375,000 new tracks could be uploaded to the music streaming giant every day.

Although Spotify has 8 million users, how many of these are actually creating a financially sustainable income from the platform? Dawn Ostroff (*ibid.*), the chief content officer and advertising business officer at the 'Stream On' event, furthered this idea that the pool of artists creating substantial earning from Spotify keeps growing. Ostroff revealed that '90% of streams on Spotify today are shared between 57,000 artists – a number that has quadrupled in just six years' (*ibid.*). These numbers equate to an individual artist's chance of generating over $100,000 on Spotify this year being approximately 1 in 0.094 (*ibid.*). By making music creation tools more accessible and affordable, this trend is only going to increase and ultimately making it more difficult for newer artists to earn a living wage through streaming services. On the one hand, accessibility to Digital Audio Workstations (DAWs) and AI democratises music creation. Providing the tools for anyone to become the creator could, on the other hand, dilute the audiences to consume this content. If everyone is a creator, who is left to be a spectator?

In a post COVID-19 world in which many industries, including the popular music industry, are still recovering, it is crucial to understand that creating a financially viable career through songwriting and production royalties might not be feasible. Collective Management Organisations (CMOs) have seen a significant decline in royalties collected due to many public places closing during the pandemic. The Performing Right's Society (PRS), the organisation that collects music royalties for the UK, collected £650 million in 2020, which is a 20% reduction compared to 2019 which saw a royalty collection of £810 million (Edwards, 2021).

3.2 Women in the Industries

The presence of women in songwriting, production, AI and machine learning research is noticeably lacking. Dr Smith's (et al.) 2021 study *Inclusion in the Recording Studio* focuses on gender and race/ethnicity of artists, songwriters and producers across 900 popular songs from 2012 to 2020. Their findings show the average percentage of female songwriters to secure success within the industry was 12.6%. The study also concluded that only 2.6% of producers were women, to amplify this figure further, only 9 out of 1,291 producing credits went to women of colour (*ibid.*).

Prof. Susan Rogers in conversation with Mark Savage (2012) suggested that women who want to enter the music production field may face 'a boys club, or a guild mentality. Rogers (*ibid.*) also commented that 'sexism may be one factor […] but the bottom line is, women aren't interested'. Lindvall (2010) furthers these ideas in conversation with the Music Producer's Guild (MPG) stating that 'none of us can

really understand why there are so few women taking up the opportunity to be at the creative end of things'. MPG also commented 'through our sister organisation JAMES, which deals with education, we know that it is also a problem in the colleges. In fact, we think there are now fewer female engineers, producers and tape ops than there were 10 years ago' (*ibid*.).

Whilst many of the top male songwriters in Dr. Smith's (et al, 2021) study were not artists or performers, such a Max Martin, Lukasz Gottwald and Savan Kotecha, the top women songwriters of the 900 most popular songs were exclusively artists who wrote their own material. This is shown in depth in Figure 3, where it is noted that the top 11 male songwriters are responsible for 22.5% of the 900 most popular songs from 2012 to 2020. It is also crucial to acknowledge the number of credits, where the most

Top Men Songwriters	# of credits	Top Women Songwriters	# of credits
Martin Sandberg (Max Martin)	44	Onika Maraj (Nicki Minaj)	19
Aubrey Graham (Drake)	42	Robyn Fenty (Rihanna)	14
Benjamin Levin (Benny Blanco)	25	Taylor Swift	14
Lukasz Gottwald (Dr. Luke)	24	Belcalis Almanzar (Cardi B)	13
Savan Kotecha	24	Ariana Grande	12
Henry Walter (Cirkut)	23	Katheryn Hudson (Katy Perry)	9
Johan Schuster (Shellback)	21	Selena Gomez	9
Dijon McFarlane (DJ Mustard)	18		
Justin Bieber	18		
Jacob Hindlin (JKash)	17		

The top 11 male songwriters are responsible for 22.5% of the 900 most popular songs from 2012 to 2020.

Figure 3 - Dr Stacy Smith (2021) Inclusion in the Recording Studio

credited male songwriter was Max Martin with 44 credits, the most credited female songwriter Onika Maraj claimed less than half as many works with 19 credits.

Women who are performing or recording artists in the music industry total approximately 21.6%, however it is primarily men writing and producing the music they perform. There are numerous anthems of feminine strength performed by women but written and produced by teams of men. Single Ladies (2008) and Run

The World (2011) both performed by Beyonce, where she was the only woman involved in the writing and recording process (96.1 The River, 2018).

However it is not just the music industry that suffers from gender imbalance, a study organised by Professor Wajcman and Dr Young (Wajcman, Young and Sprejer, 2021) questioned why so few women enter data science and AI professions. According to the World Economic Forum, women only form approximately 26% of workers in data and AI roles worldwide. These low numbers could originate from a young age where girls may feel discouraged from pursuing STEM subjects and furthermore not enter STEM professions. In 2012, the OCED conducted a survey of the UK's 15-year-old students and discovered that a mere 41% of the girls agreed with the statement 'I am just not good at maths', compared to the 24% of boys who agreed (*ibid.*).

Women who have careers in data sciences and AI in the technology sector have higher turnover and attrition than their male counterparts. The Women in Data Science and AI project at The Alan Turing Institute found that 'women spend more than men in most industries apart from the Technology/IT sector they spend almost a year and a half less' (*ibid.*). The same study stated that popular interventions meant to create gender balance and increase diversity such as 'diversity training or women-only conferences' (*ibid.*). Rather, increasing the participation of women in computer science departments by US universities Canergie Mellon and Harvey Mudd have seen the number of women increase from 5% in 1995 to 42% in 2000 (*ibid.*).

The under-representation of women is a fact, but beyond the moral question of fairness, there could be significant advantages to achieving gender balance. By allowing different viewpoints and themes in songwriting and production, more women could consume music that relates directly to their own experiences. Additionally, there would be more diversity in song topics, themes, production techniques and unique perspectives on problem solving in these industries.

3.3 Invisible Workers

The ethical implications regarding the invisible labour problem in AI and machine learning is a consideration that has been at play throughout the entire space that I have worked through and will continue to work on in this project. Many of the most advanced machine, deep learning and AI models have been trained with the help of thousands of low-paid crowd workers (Heaven, 2020). Therefore it is imperative to understand and appreciate the work that these workforces have completed to ensure these programs perform at their best. In machine learning software, these invisible labour questions expand further into potential copyright issues with the material on which the software is trained and ownership queries of human-AI collaborative works. When the first AI Song Contest[1] was held in 2020, one of the partaking teams were asked about the ownership and copyright holder of the AI-generated track and responded with:

> We chose which algorithm to run and also selected the track. So in that sense, we're the owner. On the other hand, we made use of *Magenta,* which generated the basics. And *Magenta* is created by other people. On the other, you also can't generate guitar tune without a guitar and we never say that Gibson is part of the owner of a song. Is AI a tool or is it a creator? It's both, so there's a very grey zone (Netwon-Rex and Koops, 2020).

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[1] The AI Song Contest is an international competition exploring the use of AI in the songwriting process. Similar to Eurovision, teams compete to have their song declared the winner by a panel of judges (AI Song Contest, 2022)

I have historically attempted to combat this controversy by training a lyric generator on my own back catalogue of lyrics, meaning the only person I would infringe copyright on is myself.

4. Project Contributions

4.1 Calculating AI Percentage

In my portfolio accompanying this writing, there are seven songs that have varying amounts of AI collaboration. To maintain a strict method of quantifying the levels of AI in each track when composing, I worked with Mathematician Thomas Colton. My main difficulty when communicating with Colton was the drastic difference of our professional and educational backgrounds. His main areas focused on COVID-19 modelling (Colton, 2020) and risk analysis, topics that are typically easily quantifiable. Creating formulas for music composition, an area that can be highly creative and fluctuating process, became difficult for us both to comprehend and measure. Where Colton wanted a quantifiable number, such as number of bars or minutes of AI generated material per song, I preferred talking through the creative process and songwriting techniques incorporated in each track. After much negation and explanation, we agreed upon the formulas shown in Figures 4,5 and 6 to be used to place each song on a scale between 0% and 100%, with 5% leeway in each 25% increment.

$$X1(bars) + Y1(bars) = 1$$
$$X2(bars) + Y2(bars) = 1$$
$$X3(bars) + Y3(bars) = 1$$

$$X(bars) + Y(bars) = 1$$

for example in a song with 60 bars

$$X1(60) + 0.3(60) = 60 \rightarrow 70\% \text{ AI}$$
$$X2(60) + 0.5(60) = 60 \rightarrow 50\% \text{ AI}$$
$$X3(60) + 0.4(60) = 60 \rightarrow 80\% \text{ AI}$$

66% AI

$$X(M) + X(L) + Y(M) + Y(L) = 1$$

$$X(T) + Y(T) = 1(T)$$

for example

X: AI lyrics ratio x total lyrics
0.75 x 112 = 84

Y: Human input ratio x total lyrics
0.25 x 112 = 28
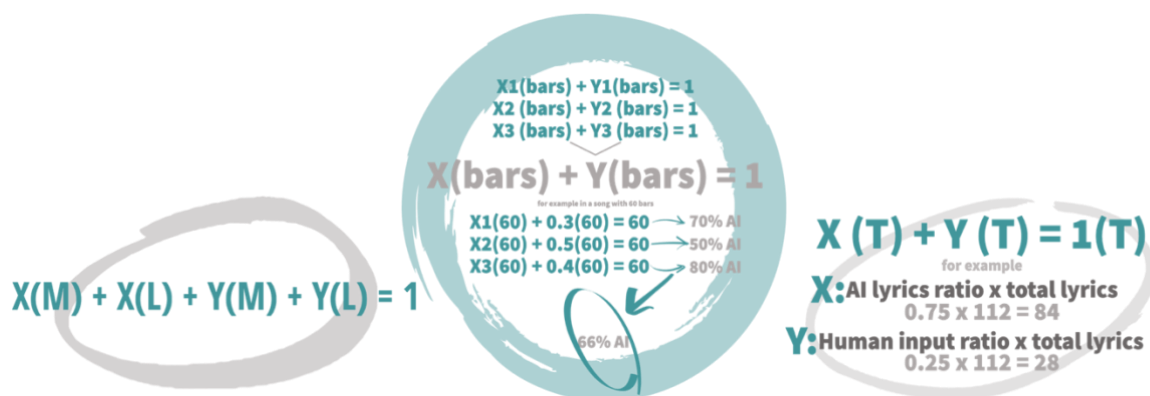
Figure 4 - Overall Equation	*Figure 5 - Music Breakdown (M) with example*	*Figure 6 - Lyric Breakdown (L) with example*

To demonstrate how these formulas can be used within the music, looking at the lyrics for the song *Silhouette* in Figure 7 and listening to this track in Appendix K, we can identify the number of words in distinct sections[2]. Highlighted in blue, the human input data is the chorus, which contains 55 words. The verses and pre-chorus are highlighted in green and were solely AI generated therefore, we know that 57 out the 112 lyrics are AI generated. Using the formula in Figure 6, this translates to 0.5(112) + 0.5(112) = 112, meaning 50% of all lyrics are AI generated. In the instance of this song, there was no collaboration with AI regarding the musical elements of melody, chord progression or arrangement so the outcome of the formula in Figure 5 is zero. Using the final formula in Figure 4 to calculate the overall involvement of AI in *Silhouette* concludes the song is 25% AI generated:

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[2] Distinct sections are not necessarily unique, i.e. a chorus repeats itself several times in a musical work but is only counted once for the sake of these formulas as the lyrical content is identical.

$$X(0) + X(0.25) + Y(0.5) + Y(0.25)=1.[3]$$

I feel like a dying light,
Am I losing my mind?
Searching for the spark you left behind

I was happy in the dark   AI generated material
Wishing I'd never known a spark
To watch it burn out like a star

Lately I've been thinking I should turn off the light
I can't let myself fall asleep at night

I see your silhouette on the walls   Human input data
I can feel the marks you left through the scars
I still leave the lights on so it's never dark
And I can watch the shadows dance around till dawn

I think I'm still dreaming
Can you feel me suffering?
I'm out in the cold with a broken wing

Figure 7 - Lyrics for the song Silhouette broken down into distinct sections

4.2 Lyric Analysis

There are numerous ways to define the most crucial aspect of a modern popular

song, some consider the "pop-drop", featured in many chart-toppers, a feature that

shifts expectations to highlight the climax of the song during or after the vocalist's

hook (Goldstein, 2019). It can be argued that the most important aspect of a song is

the context in which the artist decided to create their music and the personal relation

of the artist to their own creation. This, in turn, leads to the consumer's emotional

experience, while finding their own humanity in the work (Claudio, 2016). The

narrative and lyrics themselves can be reinterpreted, yet an AI would never be able

to experience these emotions. It may be able to replicate or mimic loss, grief,

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[3] In this equation x=music and y=lyrics

happiness and various human-like emotions but would never have its own personal

history.

Looking at Wolfgang Iser's (1972) The Reading Process: A Phenomenological

Approach, he states that:

> one text is potentially capable of several different realizations, and no reading
> can ever exhaust the full potential, for each individual reader will fill in the
> gaps in his own way, thereby excluding the various other possibilities; as he
> reads, he will make his own decision as to how the gap is to be filled.

This is the view I have taken with the AI generated lyrics, looking at lyrics from the

0% AI generated song *Streetlamp Spotlights* in Appendix I, the lyrics lend

themselves to a clear, concise narrative. This is demonstrated in the chorus section

shown in Figure 8.

> **Streetlamp spotlights illuminate the way we walk home**
> **You're by my side, makes me feel like I'm invincible**
> **Something's implied by the way you're holding me tonight**
>
> **'Cause I can see the sunlight creeping up behind us**
> **I guess in hindsight we made too many detours**
> **But they were justified so that we could get a little more time**

Figure 8- Streetlamp Spotlights Lyrics (Chorus)

These lyrics depict two people walking home together at night-time, not wanting the evening to end. However, lyrics with more AI involvement such as *Homesick*, found in Appendix L, which consists of 50% of the music and lyrics contributed by AI, lend themselves to a more open-ended interpretation, as shown in Figure 9.

I hide no bones about it
I'm a pragmatist never weakened by steel
I can't take it back
Like a hole in a punch card make it disappear

I break my rules every time
When you look at me and hang the stars from the sky
Chasing after the elusive
This could be the night I try to justify

Figure 9 – Homesick Lyrics (Verses)

These lyrics do not necessary walk the listener through a journey or particular narrative but rather focus on individual thoughts or feelings that can equate to the listener's own personal experiences. This is even more noticeable in *Under My Skin,* a song that consists of 100% AI generated material and was simply curated, performed and recorded by myself. The track, which can be listened to in Appendix O, features lyrics such as these found in Figure 10. The lyrics in *Under My Skin* are quite repetitive, with the line 'I watched your every move' appearing four times in the pre-chorus alone. Yet, repetition as a component of

I'm not built like you think I am
Built like you don't need me
Put my heart and soul into war
And you have me defeated

Acre my feet, tired and weak
On my knees, think logically
I watched your every move
I watched your every move

Sitting on my hands and knees
Outside mired in mystery
I watched your every move
I watched your every move

Figure 10 - Under My Skin Lyrics (Verse and Pre-Chorus)

musical and lyrical structure has long been a notable feature in popular music, with

many asking why do listeners find such interest and pleasure in hearing the same thing over and over? (Middleton, 2008). Therefore, I wouldn't necessarily view this as an issue, but more of a characteristic of the songwriting style.

It is important, at this stage, to acknowledge the grammar mistakes and unusual phrases within these lyrics, both 'acre my feet' and 'outside mired in mystery' are not typical structures of lyrical phrases. The former does not make grammatical sense at all, with the common phrase being 'anchor my feet' and the word 'mired' often referring to being stuck, especially for a long time (Cambridge Dictionary, 2022b). Full annotated lyric sheets for all nine songs can be found in Appendix C.

4.3 Inventive Technology Used

Throughout the duration of this project, artificial intelligence and machine learning technologies have been at the forefront of my research. Whilst there are a few instances of popular music written in collaboration with these types of software, typically they have been over-hyped media stories with little involvements of AI or utilising only pre-existing software as backing tracks or production tools. A prime example of this is Taryn Southern's *I AM AI*, where she used tools such as IBM's Watson Beat, AIVA, Amper and Google Magenta to create only the instrumental aspects of her songs. Southern arranged the compositions, wrote vocal melodies and lyrics, while producer Ethan Carlson handled vocal production, mixing and mastering (Southern, 2018). Although the use of this technology was inventive at the time and deemed to sound 'like something from a Spotify playlist' (*ibid.*), my research is intended to push these ideas further.

Implementing Open AI's GPT-2 alongside a NVIDIA GPU processor and Google's TensorFlow, I have devised a songwriting method that is incorporating new technological advancements but still requires the human element. Training this machine learning lyric generator on my own back catalogue, of which a prototype can be found in Appendix D, tailors the results to my personal style of songwriting. Mixing this training data with other artists' back catalogues of lyrics has allowed the potential of creating a track that sounds co-written without having ever met the artist. There are two examples of this process shown in Appendices P and Q.

5. Insights

5.1 Upon Reflection

Overall, the development and restructuring of this project throughout the duration has enabled it to evolve and expand beyond the initial research questions. Initially the focus was on deciphering at what point could the average listener determine whether a song contained AI generated material but transformed into reshaping the songwriting process. This has revealed many strengths and weaknesses of the project and several potential future career opportunities.

5.2 Strengths

Overall, there have been many strengths of utilising AI in songwriting. Personally, I have found it has improved the speed of the songwriting process, although it had taken time to perfect the process, I can now easily write several songs in a matter of hours. It has also provided a new angle and interesting story for A&R purposes, alongside an improved response from audiences in live performances. Using existing

songwriting methods with a machine learning lyric generator could potentially be used to workshop new artists at labels, by combining their existing music and lyrics with their main influences. This would easily generate many ideas in the right genre for the new artist, reducing the time and effort currently taken in this process.

The website I created, found in Appendix E, has allowed a showcase of my academic writings, research, music and images all in one location. This has been my primarily method of disseminating my work to peers, potential employers and future collaborators. I have been approached more often by other songwriters, artists and producers wishing to work together since launching my website and branded social media as *The AI Songwriter*. Most importantly, throughout the course of this project I have discovered new ways to utilise this technology in an area I wasn't familiar with before and improved my own songwriting process without the inclusion of countless co-writers, with whom I would have to share royalties with.

5.3 Improvements

Although the strengths of this project cannot be disputed, there are many improvements that could still be made. The research time for making this project viable was extensive, as it also included an additional course at Staffordshire University to learn Python coding language, which is commonly used in machine learning and AI. Furthering this, the lack of available sources of education that are not personally funded limited which courses and resources I could use. The time and costs required for market research in this area were taken into consideration but were deemed necessary as it yielded valuable insights to the project. There is, most certainly, more software I have yet to test or even discover, although that is be

beyond the scope of this project and essay as it currently stands. There are also more definitive answers to early research questions from this project, such as deciphering at which point music and lyrics generated by AI become distinguishable to the human ear. This could also be broken down to whether music or lyrics generated by AI are more noticeable than the other. Although there are many available academic journals and sources available on songwriting, production and algorithmic music. Literature related AI popular music appeared scarce, which suggests that this project is touching upon something very innovative.

5.4 Moving Forward

With a continuant of this project in the future, I would like to see an expansion on the original research questions, with a more in-depth study into determine at exactly which point AI generated music and lyrics are distinguishable to the human ear. I plan to increase the music and lyrics separately in increments of 10% to discover a more precise result with stricter parameters to ensure an accurate result.

I will continue to perform, record and release these songs as a singer/songwriter and talk about my processes to audiences. I will also present my research findings at a minimum of two academic conferences and collaborate with other artists utilising AI as a songwriting tool and working as a producer. An 18-month GANTT chart of my planned progression is shown in Appendix F.

6. Conclusion

The primarily aim of this project was to reshape the songwriting process to reduce the number of co-writers on tracks ad achieve a financially viable career as a

songwriter and producer. I feel that this has been achieved with the introduction of the machine learning lyric generator, which provides relevant prompts and lyrics to speed up and enhance my songwriting. Although this research has primarily focused on lyric generation, utilising the equations in Figures 4 and 5, I plan to expand this research to melodic and chord generation.

Initially I stated that the questions that inform the research would include: What is the effectiveness of AI in music creation currently? Can an average music consumer distinguish between AI and human composition? Would a commercial audience voluntarily listen to AI generated music based purely on the concept? Can this research or potential prototype be utilised to gauge what music might become popular in the future?

I have established where the current technological advancements have led to with effectiveness of AI in music creation and developed my own tools to improve this. Although I did not conduct a case study to determine whether an average consumer could detect AI in a composition, I have planned to enact this in the future with more in-depth parameters. Many audiences I have played live were more intrigued by my music once the AI involvement has been mentioned. In my future work I will form a questionnaire to gauge the validity of this across various age ranges, genres and location.

From my research, website and music created I have received interest from an A&R company in Leeds named Music Vine (2022), who have offered me the position of A&R coordinator. However, I have declined this offer to further my research at Music

Tribe as a Research Music Creation Specialist. The job description for this position is found in Appendix G, which is a role that was created specifically for me after talking with Sacha Krstulovic regarding my existing research. Following from this development, a video showcasing my research will be shown at the Music Tribe Super Partners conference, shown in Appendix H.

Overall, taking a different stance on popular music creation, technology and the songwriting process has enabled many new opportunities and provided a unique point of view. I have developed the best practice guide for using AI for songwriting, devised a metric for AI proportions and concluded that the inclusion of AI in my songwriting process does increase productivity. Although the quality of the music created seems acceptable, the question of optimal proportions of AI incorporation remains open. The interpretability and reliability of the lyrics are at play, but still require more in-depth research. I have observed that some of the songs were qualitatively acceptable and of interest to consumers, suggesting that AI can be a viable route to reduce costs and increase the revenue of songwriters and artists. Ultimately, the contributions and findings from the research are substantial and I am eager to continue co-writing with AI.

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Appendix A – Reflective Songwriting Diary

AI Songwriting Diary

Reflective Diary documenting the composition process of each song using Gibbs' Reflective Cycle

Song 1 – 25th October – Cut Up Method "Don't Know What I'd Do Without You"

1. Description

I started this session by selected the page I wanted to use from the book *The Futures* by Anna Pitoniak, then I cut the page into individual words and three phrases that were particularly memorable. I then randomly and blindly chose one word at a time and laid them out one by one to make some lyrics. After this, I took a more curated approach where I laid the words out alphabetically and chose one word at a time from the list. Following the lyric selection, I wrote down chords on pieces of paper and chose four randomly and blindly from a tub and used a combination of the lyrics and chords to compose the song.

2. Feelings

I felt happy that the stimulus I had created helped me compose a song much quicker than normal but creating the stimulus itself was quite time consuming which was frustrating. It made me sad to physically cut up a book, but it felt worth it for the outcome of the song.

3. Evaluation

The lyrics were a little nonsensical, even when I took the decision to curate the selection process. When I randomly chose the words, the lyrics made little to no sense, so I had to take a different approach. The chords that were randomly selected didn't make a cohesive sequence, so I opted to remove the non-diatonic option I had pulled out.

4. Conclusions

I learned that it would probably be better to use sentences or phrases rather than individual words as this could retain a sense of the original material whilst creating something new.

5. Actions

If I use a model similar to this method to create my own AI songwriting tool, I will need to code a way to remove excess and repetitive words. Need to ensure for future songwriting that if only provided with the lyrics, I don't compose melodies and chord sequences that are very similar to each other. Options to guarantee this include

Song 2 – 27th October – Songwriting Prompt "Beck & Call"

1. Description

I found the songwriting prompt from SongFancy's 5 in 5 challenge which is intended to inspire songwriters to quickly compose five songs in five days. I started by grouping words that would work well together, such as "whipped" and "whirring", and chose which words from the prompt I would omit as they didn't fit with the others,

these were "olive" and "apron". I then used the chords provided with the challenge and started composing a top-line melody and slotting the words into suitable sections of the song and tried to steer away from the obvious uses of the words. For example, the prompts clearly lean towards a coffee shop or kitchen setting, yet I avoided any of these comparisons. I decided to create a lyrical theme around an unhealthy relationship, being with someone who is sickly sweet and "tastes like syrup", yet also makes you "whipped", and your head feel like it's "whirring".

2. Feelings

I felt that the lyrical content, although curated by a pre-selected list of words, were authentic and the words felt like they had some real weight to them. I felt happy that I had composed a new song quite quickly from a starting point and that I had taken the lyrics in a direction that they weren't intended for.

3. Evaluation

I think this song has some real commercial validity, the chorus and hook are catchy, the lyrics and melody are suitable and memorable and the songwriting process was significantly shortened by the inclusion of the prompt.

4. Conclusions

I don't think that this method of composition can be really considered AI, as all the composition, except for eight words, came from a human. Though the resulting song is proof of a concept that these resources can assist songwriters in creating new music.

5. Actions

It might be interesting to experiment with an AI generated songwriting prompt that can create visuals with a selection of randomised words? As a general improvement on my songwriting outside of AI composition, I will use more songwriting prompts from the 5 in 5 challenge.

Song 3 – 11th November – Audoir AI "Another Rose"

1. Description

Audoir is one of the few AI software that can produce both lyrics and melodies, I took the prompt from Song 1 "gazes met in a mirror, and he smiled at me" into the lyric generator which gave me three paragraphs of material. I selected four lines from these paragraphs and input those into the music generator, which gave four different melody options that I exported as MIDI data. Once I had these MIDI files in the same key and tempo, I added chords underneath and simplified the melodies, as many of them had repeated notes that would be too quick and difficult to sing. I didn't stray far from the original melody that was provided and only added three lines in total to the lyrics. I did, however, move a couple lines around to create a makeshift rhyme scheme that mostly consist of half and assonant rhymes.

2. Feelings

I felt relieved at how quick and efficient this software was to use, especially for someone who has never used it before. I felt happy to successfully complete a song using almost exclusively AI generated material and how quick the overall process was. I was a little bit sad that the AI came up with some lyrical content that I thought was better than I would have written given the same stimulus, for example: "I knew he wondered at the scheming universe".

3. Evaluation

The lyrical content added more value to my songwriting process than the melody, but that could have been from the sheer number of lyrics that were generated in comparison to the four melody lines that were devised. The process required significantly less brain power and input from a human songwriter which meant I could achieve more for less energy.

4. Conclusions

I would use Audoir again, the lyric generator was more beneficial to my songwriting process and it created a vast amount of content from a small input.

5. Actions

I don't think I would change anything about the songwriting process with Audoir, it was very effective, quick and easy to use - the resulting song was indicative of this.

Song 4 – 12th November – Magenta AI "Duplicating"

1. Description

I used Google's Magenta AI to initially generate 4 bars of music, this composed a bass line, drumbeat, chord sequence and top line. I then took the drumbeat and fed that to the Groove tool which changed the MIDI drum file slightly and made it 'groovier'. I then used the Song Lyrics Generator, which is intended to create a starting line for a song rather than use the prompts in a linear verse like I did. The lyrics generated were a little nonsensical, with lines like "I've been hearing eyes" and "duplicating duplicating duplicating". I didn't change those though, I tried not to interfere with the AI generated material and create an authentic representation of what the software is capable of.

2. Feelings

This song didn't really hold any commercial validity, but I still thoroughly enjoyed the process of making the outrageously random lyrics have some coherence in the form of a song. The resulting piece made me happy as it showed the fun side of composing with AI and took the seriousness of composing music away, making the process enjoyable, if a little ridiculous.

3. Evaluation

Magenta creates Funk stems and audio well, but I would struggle to use the material generated in other genres or for another application. Perhaps with more experimentation I would be able to tailor the material created more to the styles of music I typically compose in.

4. Conclusions

If I was to compose another funk track, I would maybe use the Magenta Groove tool to enhance my MIDI drumbeats. Otherwise, this AI songwriting tool is not beneficial to the composition of my future songwriting portfolio.

5. Actions

Although, I enjoyed the songwriting process with this AI, I will not use it again.

<u>Song 5 – 18th November – Amper AI "Mirror"</u>

1. Description

I began this process by naming the track and choosing the duration of one minute and fifteen seconds, then choosing a base track from the existing pieces on Amper. I had the option at this point to change the instruments, key and section lengths, however I chose to keep them at the default. I then used These Lyrics Do Not Exist with the input 'mirror' to generate some lyrics similar to the original prompt "gazes met in a mirror, and he smiled at me". I chose the emotion 'happy' and the genre 'pop'. I composed the top line melody but left every other element as authentic to the AI material as possible.

2. Feelings

I felt like I'd cheated the songwriting process by choosing a pre-generated track and just adding a top line. However, it was satisfying to have an almost completed song so quickly. It made me concerned that if I was to use this song commercially, there is a possibility that others would use the same pre-generated track as therefore have a similar finished product.

3. Evaluation

Amper is a simple platform to use and its effective and quick at producing basic pop backing tracks, it is ideal for budding musicians who wouldn't be too confident using a DAW to create their music. However, I don't believe it would pass for the high-quality production standards that are found in the popular music charts. The export only allows for audio files rather than MIDI, so you are forced to use their instrument sounds, which are not necessarily the best quality or suit the genre best.

4. Conclusions

I would personally not use Amper again, but I see its validity and purpose for music creators who need a helping hand with starting to produce and write their own songs.

5. Actions

Don't use Amper again.

Song 6 – 30th November – Scaler 2 AI "Innocence"

1. Description

I began with the lyrics, using the AI GPT-3 text generator Bored Humans. This AI doesn't allow for input data so I couldn't use the phrase I have with the previous songs and the theme of the song is different to all the previous tracks. I randomly generated two separate lyrics and made a combination of the two for the final track. With the lyrics compiled, I used Scaler 2 to compose and arrange a piano and string section. I decided to use Bb mixolydian as the key and chose a pre-determined chord sequence intended for a Future Bass track. I then used the melody generator in Scaler 2 to compose a melody and used the same chord sequence in various performances as the string section parts.

2. Feelings

I felt that this was the most unique and commercially viable song out of the six created, it made me happy that I had a finished product with an arranged string section fairly quickly compared to the time it would have taken to manually arrange the string section. The Bored Humans lyric generator is trained on poetry and so

3. Evaluation

Scaler 2 gives more in-depth options than the previous AI songwriting tools I've used, different scales, time signatures, genres and instrument sounds make it the most versatile software I've used so far. The lack of input for the lyric generator is frustrating as you would have to refresh and generate new lyrics to get a specific topic, however the lyrics that it creates are the best and most creative I've seen so far.

4. Conclusions

I would use both of these programs again, both separately and in conjuncture with one another. This song was the most creative and quickly completed out of the six I composed.

5. Actions

I will use these two AI models as the basis for the start of my songwriting portfolio, using Scaler 2 I can experiment with irregular time signatures and various modes and with Bored Humans my lyrics will have a wider range of topics.

Appendix B – Timeline of AI and music

padlet

AI and The Music Industry

A history of arti cial intelligence and the popular music industry

RACHEL_MEDDINGS OCT 19, 2021 03:59PM

1951

Alan Turing creates the rst computer generated music. Several melodies were created, including "God Save the King" and "Baa, Baa Black Sheep".

1957

The rst musical work written by a computer, developed by Lejaren Hiller and Leonard Isaacson, the Illinois Automatic Computer (ILLIAC I) generated compositional material that was entirely written by AI. The resulting piece was named 'Illiac Suite for String Quartet'.

1960

The rst academic paper on algorithmic composition was published by Russian researcher, R. Kh. Zaripov. He focused on music composed using the URAL-1 computer and the paper was titled "An algorithmic description of a process of musical composition".

1965

The rst instance of computer-generated piano music. Ray Kurzweil, an American inventor, premiered a piano piece that was composed by a composer that was capable of pattern recognition in a variety of musical compositions. This computer was then able to analyse and use these patterns to compose and create new melodies.

1973

MIT's Experimental Music Studios (EMS) was founded by professor Barry Vercoe and became the rst institute to have digital computers solely dedicated to researching the creation of computer-generated music. EMS were responsible for the development and research of many crucial computer music technologies such as: real-time digital synthesis, live keyboard input, graphical score editing, programming languages for music composition and synthesis.

1974

The rst International Computer Music Conference was held in Michigan State University, it is now yearly international conference for computer music researchers and composers. The conference for 2021 was held at Ponti cia Universidad Catolica de Chile from July 25th-31st.

1975

Researchers from the MIT Experimental Music Studio published a paper "Machine perception of musical rhythm" and developed software for intelligent music perception that could register and infer a count, tempo and note duration as a musician played on an acoustic keyboard.

1980

Experiments in Music Intelligence (EMI) had a major breakthrough in 1980. EMI could generate new and unique music compositions based on generative models that analysed existing music. Using the speci c framework of music genres, EMI has created thousands of different works based on countless composers.

1988

Sony Computer Science Laboratories were founded to solely conduct research relating to computer science. This company would later be considered as on the milestones for utilising AI in music research and Sony would later produce Flow Machines, one of the current industry leaders for AI composition.

1995

David Bowie and Ty Roberts develop an app named the "Verbasizer". This, similar to the cut-up method, took literary source material and randomly reordered the words to develop new combinations and potential lyrics.

1997

The music research team project at Sony Computer Science Laboratory Paris was founded by Francois Pachet. He started research that focused on music and AI, his team wrote and pioneered many technological advancements and filed more than 30 patents focused on AI and electronic music distribution, audio feature extraction and music interaction.

2002

A new algorithm "Continuator", designed by Francois Pachet, could learn and interactively play with musicians when performing live. Once a musician stopped playing, Continuator could continue to write a piece of music from the place where the live music stopped.

2009

A program named Emily Howell composed an entire musical album aptly named "From Darkness, Light". Emily Howell is an interactive interface that registers and takes into account feedback from listeners and creates its own compositions from a database.

2010

Iamus Computer, an AI, creates it's first musical composition named "Iamus' Opus One". It is the first instance of professional contemporary classical music to be composed by a computer AI using its own unique style.

2012

Emily Howell, the aforementioned program releases 'her' second album named "Breathless".

2016

Researchers at Sony create "Daddy's Car", an AI-generated pop track entirely composed by AI. Sony's software "Flow Machines" drew from a large database of songs to compose new music, in this instance the track was mostly based on The Beatles' catalogue.

2016

An AI generated track composed with artist Alex Da Kid enters the Top 40 charts in the USA. The AI software, IBM Watson, analysed a large number of articles, blogs and social media data to feature the most current and up-to-date topics to characterise the overall emotional mood.

2017

Taryn Southern released her album "I AM AI", a collaborative project between Southern and AI music composer tool Amper. Amper created the music structures but the rest of the work, including lyrics, were added by Southern.

2019

AI meets death metal! Dadabots set up a constant 24/7 livestream YouTube channel playing heavy death metal music that is completely generated by AI algorithms. To train neural networks using machine learning, the developers used the music of "Archspire" a Canadian metal band. The resulting compositions sounded like real death metal music.

2019

Björk collaborated with Microsoft to create AI-generated music named "Kórsafn", which is based on the changing weather patterns and position of the sun. Kórsafn used Björk's back catalogue of 17 years to create new arrangement in a familiar style.

*****

Appendix C – Annotated Lyric Sheets

I know it's raining
I'm not complaining
I can see it bounce off the light
Makes the night-time seem alive

High heels and baggy jumpers
Standing too close for comfort, I don't mind
Walk home at 4am
Too tired to comprehend what's going on

Streetlamp spotlights
Illuminate the way we walk home
You're by my side
Makes me feel like I'm invincible
Something's implied
By the way you're holding me tonight

You make me nervous
That makes it worse 'cause
I trip over everything I say
There's a stutter inside my brain

High heels and baggy jumpers
Standing too close for comfort, I don't mind
Walk home at 4am
Too tired to comprehend what's going on

Chorus

High heels and baggy jumpers
Standing too close for comfort, I don't mind
Walk home at 4am
Too tired to comprehend what's going on

Chorus

"Silhouette"
© 2022 Rachel Meddings (PRS),
Written in collaboration with Audoir (25%)[1]

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I see your silhouette on the walls
I can feel the marks you left through the scars
I still leave the lights on so it's never dark
So I can watch the shadows dance around till dawn

I feel like a dying light
Am I losing my mind?
Searching for the marks you left behind?

I was happy in the dark
Wishing I've never known a spark
To watch it burn out like a star

Lately I've been thinking I should turn off the lights
But I can't let myself fall asleep at night

Chorus

I think I'm still dreaming
But I feel your suffering
I'm out in the cold with a broken wing

Lately I've been thinking I should turn off the lights
But I can't let myself fall asleep at night

Chorus

[Instrumental]

Chorus

---

[1] AI Contribution Italicised

"Nevermind"
© 2022 Rachel Meddings (PRS),
Written in collaboration with Scaler 2 (25%)

I'm overthinking, been reminiscing
What I've been missing and how you listen

So who am I calling? At one in the morning
The drinks I've been pouring, mean I'm oversharing

> **But you don't seem to mind**
> **Dramatized, recollections of my night**
>
> **Not surprised, you've advised**
> **I get home safe tonight**
>
> **Got your name, on my mind**
> **Every letter capitalised**
>
> **But if I see my call declined?**
> **Never mind**

Any room that you're in would be a distraction
That's why I'm asking if you feel the attraction?

So who am I calling? At one in the morning
The drinks I've been pouring mean I'm oversharing

Chorus

Two messed up people getting messed up together
Had to go through the motions to know that it gets better

Two messed up people living two hours apart
I call you when I'm drunk when the distance is too far

Chorus

It's you that I'm calling at one in the morning
The drinks I've been pouring mean I'm oversharing

Chorus

"Homesick"
© 2022 Rachel Meddings (PRS),
**Written in collaboration with Machine Learning Generator,
powered by GPT-2, TensorFlow, NVIDIA and Scaler 2 (50%)[2]**

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I hide *no bones about it*
I'm a pragmatist
Never weakened by steel
I can't take it back
Like *a* hole in *a punch card*
Make it disappear

I made a pact not to fall in love with you
I'm used to looking at a sea of red flags
But with you

**I don't miss you,
I feel homesick
wherever you are
Is where my home is**

I break my rules every time
when you look at me and
hang the stars from the sky
chasing after the elusive
I know this *could* be the
night I try to justify

I made a pact not to fall in love with you
I'm used to looking at a sea of red flags
But with you

Chorus

---

[2] AI Contribution Italicised

"Only One"
© 2022 Rachel Meddings (PRS),
**Written in collaboration with Machine Learning Generator,
powered by GPT-2, TensorFlow and NVIDIA and Scaler 2 (75%)[3]**

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https://www.scalerplugin.com/

You know that she might not like the idea of
You telling her *to shut up and*
Stop acting like you're fine while making me feel weak
And I don't breathe

So I just stay still
And forget about the situation

On the way back
You're the only one that's in my head
When I close my eyes,
that's time well spent

*I'm not sure if I want*ed *this to end*
It's not complicated

I'm *not surprised*
That *you've never been this far*
So I've been trying to be honest

So I just stay still
And forget about the situation

Chorus

[Instrumental]

Chorus

---

[3] AI Contribution Italicised

"On The Run"
© 2022 Rachel Meddings (PRS),
Written in collaboration with Bored Humans and Scaler 2(75%)[4]

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https://www.scalerplugin.com/
https://boredhumans.com/lyrics_generator.php

If only you'd let me live in peace tonight
We could breathe in their air tonight
We could live our lives on the run
And I'll be waiting at the station

And I'll watch the skies from the window
With an empty suitcase nobody's seen for a lifetime
So charming and so wise
To pull the wool over the men's eyes

Whoa
You must be tired of living your life on the run
It's your life you can't let go
It's your life you can't let go so light the shadow

I can't help feeling as if I've been in love
Skeleted for a forgotten man
So enraptured by a love of play
You've heard all the words I wanted to say

Chorus

It's your life you can't let go
You gotta live your life on the run
It's your life you can't let go
Win *the bread, the light the shadow*

Chorus

---

[4] AI Contribution Italicised

"Under My Skin"

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I'm not built like you think I am
Built like you don't need me
Put my heart and soul into war
And you have me defeated

Acre my feet, tired and weak
On my knees, think logically
I watched your every move
I watched your every move

Sitting on my hands and knees
Outside mired in mystery
I watched your every move
I watched your every move

You told me you loved watching me fall
There's been a burnout for too long
You told me I'm damned if I let you in
You're the only one who gets under my skin

I'm beyond frustrated
I guess I'm not surprised
We're back in this situation
Struggle to find a guide

Acre my feet, tired and weak
On my knees, think logically
I watched your every move
I watched your every move

Sitting on my hands and knees
Outside mired in mystery
I watched your every move
I watched your every move

Chorus

---

[5] AI Contribution Italicised

"Wednesday"
Written in collaboration with Machine Learning Generator,
powered by GPT-2, TensorFlow and NVIDIA, trained on data from Maisie Peters[6]

Email: rachel_meddings@yahoo.co.uk
https://rachelmeddings.journoportfolio.com/
https://www.maisiepeters.co.uk/USTour

High heels and baggy jumpers, ripped jeans in two tone colours
You said you need me to get over some things
You say you missed the boat and that you try to fix me
I don't remember that, I let it wash over me

I was your backseat driver, I was your therapist
A new year's resolution, we sealed it with a kiss
The sun is on my outfit, this is a feeling I've missed

> *Oh it's midnight on a Wednesday and I'm staring into the sea*
> *It felt like it should have been easy to make sure that I was asleep*
> *We're dancing beneath the stars now and the waves are crashing in*
> *Is there a right or wrong when you got away with it?*

You have such a dark side that even the brightest days
Get lost in translation and slowly fade away

So now who are your friends who got you into this?
They're the ones who invited you on the red carpet
The ones who let you in, the one that got away
They said that you were funny, I see it differently

> *Oh it's midnight on a Wednesday and I'm staring into the sea*
> *It felt like it should have been easy to make sure that I was asleep*
> *We're dancing beneath the stars now and the waves are crashing in*
> *Is there a right or wrong when you got away with it?*

You have such a dark side that even the brightest days
Get lost in translation and slowly fade away

---

[6] AI Contribution Italicised

Take me back to where the trees once stood
And paint a picture of myself with all the freckles that I never loved
Now I'm breaking at the seams
You're like the rain pouring down my back, I'm *feeling a little like a teen*

I tried to have a conversation, but you just sulked like a child
Saying you wanted to be tamed but you grew up buck wild

It's ***the way we are perceived***
Kissed go unspoken
But the way our minds are wired
Makes it hard to make **any** ***progress***

We kissed we broke the silence
Shake hands like hands don't get anything like this
When the lies are worse than sins
You'll never have to confess as long as you're comfortable with it

I tried to have a conversation, but you just sulked like a child
Saying you wanted to be tamed but you grew up buck wild

Chorus
Put me in a car
Get out of my mind
Drive me insane
An eye for an eye

Chorus

Chorus (a capella)

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[7] AI Contribution Italicised

Appendix D – Prototype of Machine Learning Lyric Generator

Based on code by Max Wolff, a copy of the machine learning lyric generator can be

trained and used here:

https://colab.research.google.com/drive/1eU2Z6xIgfcz_GUnkYNVYINeaUANZkjfY?usp=sharing

Machine Learning Lyrics Generator

Retrain an advanced text generating neural network on any text dataset **for free on a GPU using Collaboratory** using `gpt-2-simple`!

To get started:

1. Copy this notebook to your Google Drive to keep it and save your changes. (File -> Save a Copy in Drive)
2. Make sure you're running the notebook in Google Chrome.
3. Run the cells below:

```
[ ]  !pip install -q gpt-2-simple
     import gpt_2_simple as gpt2
     from datetime import datetime
     from google.colab import files
```

Downloading GPT-2

If you're retraining a model on new text, you need to download the GPT-2 model first.

There are three released sizes of GPT-2:

- `124M` (default): the "small" model, 500MB on disk.
- `355M`: the "medium" model, 1.5GB on disk.
- `774M`: the "large" model, cannot currently be finetuned with Colaboratory but can be used to generate text from the pretrained model (see later in Notebook)
- `1558M`: the "extra large", true model. Will not work if a K80/P4 GPU is attached to the notebook. (like `774M`, it cannot be finetuned).

Larger models have more knowledge, but take longer to finetune and longer to generate text. You can specify which base model to use by changing `model_name` in the cells below.

The next cell downloads it from Google Cloud Storage and saves it in the Colaboratory VM at `/models/<model_name>`.

This model isn't permanently saved in the Colaboratory VM; you'll have to redownload it if you want to retrain it at a later time.
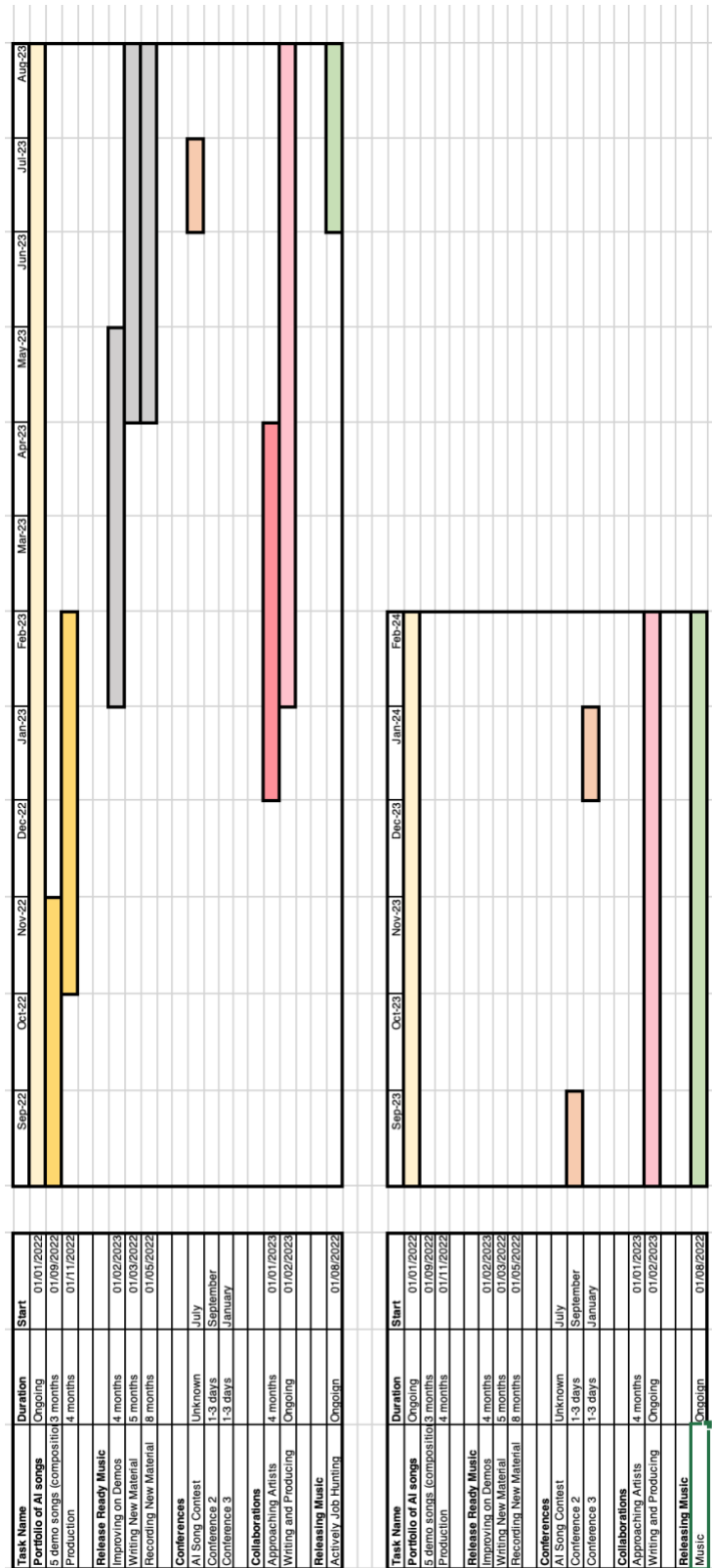
Appendix E – Website
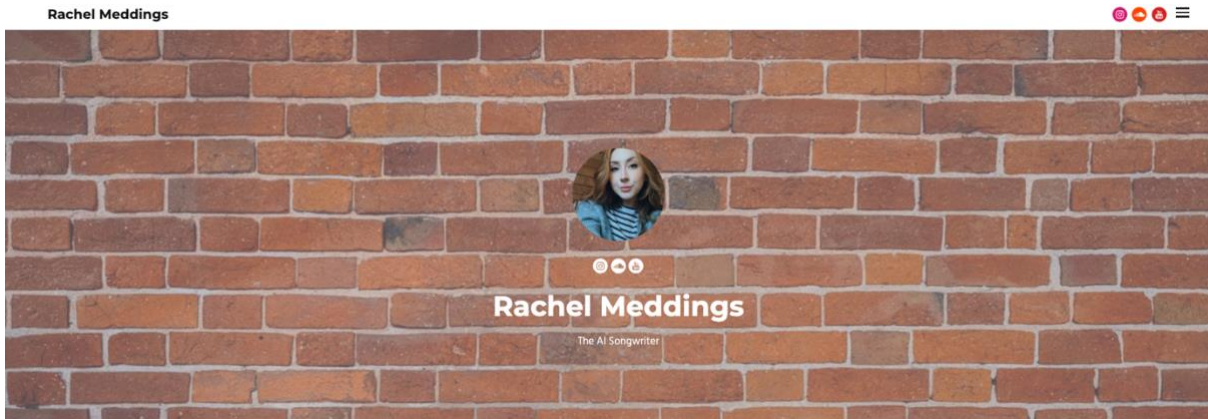
https://rachelmeddings.journoportfolio.com/

Appendix F – 18-month GANTT Chart

Appendix G – Music Tribe Job Description

musictribe

We Empower. You Create.

We at Music Tribe believe that our sole purpose is to empower you to become the most creative you can be.

We believe in obsessively* empowering you through our Brand Tribes – Midas, Klark Teknik, Lab Gruppen, Lake, Tannoy, Turbosound, TC Electronic, TC Helicon, Behringer, Aston Microphones, Bugera, Oberheim, Auratone and Coolaudio.

Empowering you to create and receive appreciation is the key to our happiness.

That's why we exist.

Uli Behringer (Founder/CEO)

*Obsession = The domination of one's thoughts or feelings by a persistent idea, image or desire.

Job Description

Job Title, External	: Music creation specialist / resident artist	**Location** : UK
Job Title, Internal	: Music creation specialist	**Travel** : 0-5%
Profession	: Songwriter, music producer, musician	**Employment Type** : Full-Time
Role Type	: Specialist	

Purpose : We are looking for a resident music composer/performer/producer, with an interest in digital music production techniques and AI, to join our highly skilled Advanced Signal Processing and Artificial Intelligence (ASPAI) research team. In the context of digital transformation of the music equipment and audio equipment industry, together we research and develop the audio processing features of the future, with direct impact across the whole range of Music Tribe products. This involves constantly checking and reporting on the relevance, desirability and useability of the innovative music performance and production solutions researched and developed by our team.

If you have a Bachelor's, Master's or higher degree in music practice and production, with evidence of achievements as a singer/songwriter/musician, please join our team of talented individuals.
We look forward to talking to you soon!

We at Music Tribe's Advanced Signal Processing and Artificial Intelligence research team (RESE ASPAI) believe that delivering life-changing Signal Processing and Machine Learning Algorithms will empower our Customers as well as Music Tribe.

Roles and Responsibilities :
- Use the devices and software solutions resulting from our team's R&D, as well as solutions from competitors, to make your own music. Report on the relevance, desirability and useability of these.
- Help the team to shape its research roadmap towards what musicians really want and need.
- Liaise with the worldwide music creation community and report on relevant new trends in music production, songwriting, music performance, consumption, commercialization etc.
- Support the team's social presence, e.g., by interviewing researchers, blogging on music creation trends, representing the company at music creation events etc.
- (If non-male candidate) Contribute to female and other non-male empowerment initiatives across the company.

Qualifications, Minimum :
- Minimum BA in music practice or relevant field e.g. music performance, composition, arrangement, production, with proof of significant achievements in the field.
- Proficiency with one or several DAWs. Demonstrated interest in using electronic equipment and computer software to perform (e.g. synths, MID controllers), produce (DAWs, VSTs) and/or record music (audio interfaces, consoles, room acoustics).
- Proficiency with standard music production techniques such as equalization, compression/expansion plus all the standard effects (reverb, delay etc.) and their effects on the rendering of a music piece.
- Personal attributes: creative, collaborative, proactive, good communicator.

Qualifications, Preferred :
- Masters degree in music or related field.
- Familiarity with music publication strategies and music making as a commercial career. Evidence of commercial success in music.
- Computer programming, preferably Python.
- Interest for the usage of AI in music production.

Tools :
- Logic Pro, Ableton, Reaper, Python, Google Magenta, iZotope, Sonible, Melodyne.