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Do-it-yourself with and against Artificial Intelligence

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Everybody's Song Making

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S I S S I L I U

Song, a standalone piece of music with or without words to be sung or hummed, is innately social. Songs in a myriad of forms – ballad, folk song, hymn, work song, ritualistic song, show tune, national anthem and so on – are created to be heard, passed on and to bring people together. The making of a song usually consists of the writing, performance or production, and circulation of the song. Before the era of mass printing and recording, the three processes integrated, as troubadour-like song makers wrote and performed the songs themselves while travelling around to make themselves heard. Industrialization and mass production separated the three processes and song makers became primarily big recording companies who are able to hire composers, lyricists, performers and producers to make profit. The advent of the digital age provided individual musicians who proficiently engage in all song-making processes with various digital media platforms, thus blurring and integrating the three processes again.


Song making, I propose, is originally and organically a DIY (do-it-yourself) activity. The term 'do-it-yourself', though not new to the ordinary working person, was added to the American lexicon only in 1912, when Garrett Winslow wrote about home decoration for the magazine *Suburban Life* (Gelber 1997), and for decades DIY referred to cost-saving measures in home improvement. In the late 1960s, DIY became associated with the spirit and lifestyle of counterculture. DIY ethos has been defined by the 'structure of feeling' underlying DIY production, a cultural reaction against passive consumption but not necessarily anti-capitalist (Frank 1997; Heath and Potter 2005; and Luvaas 2012). More recently, DIY has been regarded as a democratizing effort – a form of political participation through critical making and doing (Ratto and Boler 2014). In this article I use DIY to describe anti-consumerist independent song-making activities (writing, producing and distributing one's own songs) in the

modern post-phonograph era that not only use whatever resources available but also emphasize self-expression, originality and goals of social change. The myriad folk song traditions – with or without instrumentation – since the beginning of human civilization, though demonstrating DIY characteristics, are not considered in this article. DIY is a human effort, but 'DIY' with scare quotes I use to indicate independent song-making attempts made by Artificial Intelligence.

DIY song making has always been technology driven. Accessibility to technological tools and platforms has been crucial to the DIY song maker. The most up-to-date technology in song making – Artificial Intelligence (AI) that makes songs – however, seems to be taking over from human song makers. There has been a growing trend of AI 'DIY' songs in recent years. The world's first AI 'DIY' musical, *Beyond the Fence*, premiered in London's West End in 2016. The world's first AI 'DIY' song album, *I AM AI*, was released in September 2018. As AI quickly learns and upgrades song-making skills, human beings are developing new ways of working with and against AI to expand the forms of song making for Homo sapiens. In this article, I start with a very brief history of technology-driven song making and the representative DIY efforts in each period. I then examine the research progress and technological advancements in AI 'DIY' song making from the 1970s to the present. Informed by recent scholarship on algorithm bias and AI domination, I offer three reasons on three different scales why human song makers need to work against AI, and explore two AI-assisted apps that make such an effort accessible.

A VERY BRIEF HISTORY OF TECHNOLOGY-DRIVEN DIY SONG MAKING

The modern history of song making is highly technology driven, and is largely divided into four periods: the acoustic period (1877–1925), the



electric period (1925–45), the magnetic period (1945–76) and the digital period (1976–present). The acoustic period started with Thomas Edison's invention of the phonograph, which provided a mechanical and acoustic path to recording songs. Through the 1880s and the end of the First World War, three major labels – Columbia, Edison and Victor – dominated the recording industry. The electric period began when Columbia and Victor started issuing electrically recorded discs using Western Electric technology in 1925, which was more robust and efficient than the acoustic system. In the 1920s, commercial radio broadcasting began to take form as an important mass medium for song circulation in the next few decades.

During the early periods, an important precursor of contemporary DIY song making was seen in the rise of skiffle – a style of folk music with jazz or blues influences that was popular in the United States between the 1890s and the 1930s (and in the UK in the 1950s). This democratic form of music was played by amateur musicians with their home-made and improvised skiffle instruments such as kazoos, jugs, whistles and kitchen utensils. Paving the way for technology-driven DIY forms, skiffle contributed two significant attributes of DIY song making for all its successors: the making of one's own accessible instruments and a break away from dominant forms of music production.

The magnetic period began with the introduction of the German magnetic tape recording technology to the United States in 1945. This refined recording system sonically surpassed all prior systems and inspired multi-track recordings as well as two inventions that were particularly significant in song circulation. In 1948 Columbia introduced the LP ('long play') vinyl record, which became a very popular storage medium, and in 1963 Philips released two kinds of compact cassette – one pre-recorded, the other 'blank' and recordable. These technological advancements greatly popularized home recording and made song making more technologically accessible. Subsequently, cassettes, electric instruments, amplifiers and synthesizers propelled musical personalization and DIY song making.

One of the most significant DIY song makers of this period was African American artist-producer

Prince (1958–2016). In the mid-1970s, it was very rare for a new artist to self-produce. A self-taught musician who played the guitar, drums and the piano, Prince not only blended different musical styles including gospel, funk, soul, R&B, rock and pop, but also taught himself arranging and production skills in his late teens using two cassette machines. His rare talent was discovered by multiple labels, and at age nineteen he released his first album, *For You*, with Warner Bros. Records. The album was a success and reached number 21 on the *Billboard* R&B Albums chart. Collaborating with a major label increased accessibility to his DIY music. The album featured the credit that all tracks were 'produced, arranged, composed, and performed by Prince' with a listing of the twenty-seven instruments he played and this solo talent and endeavour was a brand-new phenomenon at the time (Hawkins and Niblock 2011).

The digital period commenced with a first digital recording in Santa Fe in 1976 using the Soundstream Digital system. Sony Walkman, MTV and CD were launched in 1979, 1981 and 1982 respectively, changing the ways songs were marketed and distributed. In the late 1980s and early 1990s, MIDI (Musical Instrument Digital Interface) and the ADAT (Alesis Digital Audio Tape) digital eight-track machine, which recorded to S-VHS tape, were big steps towards the democratization of the song-recording and producing process. The introduction of the World Wide Web in 1990 propelled digital sharing in many forms, such as digital downloads and streaming audio. Myspace, Facebook, YouTube and Twitter were launched in 2003, 2004, 2005 and 2006 respectively. By allowing performance video to be uploaded and shared, social media and social networking created entirely new channels for DIY song production and circulation.

Among the many important DIY song forms in this period, such as punk, indie pop and alternative rock, one stands out because of its inventive use of production technology – hip hop. With musical and cultural roots in West Africa, hip hop is considered to have emerged in the South Bronx in the 1970s. Kool Herc, a Jamaican immigrant, started to extend and combine sections of different recordings – the technique, now known as breakbeat, involves

‘spinning the same section consecutively using two copies of a record on separate turntables’ (Burgess 2014). Influenced by this technique, Grandmaster Flash invented punch phasing, and instead of juxtaposing breaks from different records, he played one break over another. Flash’s protégé Grand Wizard Theodore built on these techniques and started the turntable technique – he spun and mixed, using the sound of the scratching and backspin as rhythmic elements in his performance. These innovative production techniques formed the foundation of hip hop.

In the digital period, technological advances have provided DIY song makers with means of production and distribution, which enable them to make hits from a microphone, a DAW (digital audio workstation), a computer, Wi-Fi and a YouTube account. Never before have song makers had the opportunity to reach such a massive audience. Musical talents at the top of the song-making industry such as Lady Gaga, Erykah Badu and Janelle Monáe started out as DIY song makers who wrote, performed and produced their own songs. Rising stars such as Asian American rapper Awkwafina used such digital platforms as YouTube to launch themselves to stardom. As technology provided more accessibility, the bar for making songs – especially hit songs – also became higher. It was inevitable that people would yearn for more advanced technology that could reveal the secret formulas of hits, which in turn gave birth to AI that makes songs.

ARTIFICIAL INTELLIGENCE’S ‘DIY’ SONG MAKING

Non-human objects like machines had exhibited their ‘DIY’ capacities long before the first electronic computer was invented. One of the first such machines was Eureka. Invented by John Clark (1785–1853), it was first put on show in London in 1845. It contained eighty-six wheels, which drove a large collection of ‘cylinders, cranks, spirals, pullies, levers, springs, ratchets, quadrants, tractors, snails, worm and fly, heart-wheels, eccentric-wheels, and star-wheels’ (Walsh 2018:239). It generated one of a possible twenty-six million Latin hexameter verses each

time it was operated. Clark charged a one-shilling entrance fee at Piccadilly, and Eureka’s popularity allowed the inventor to retire comfortably (Walsh 2018).

Machines are expected to do much more – not only to think and make decisions independently, but also to do all the things humans can do. After the first electronic digital computer was invented in the 1930s, research on Artificial Intelligence famously began at Dartmouth College in the United States in 1956. In 1959, Arthur Samuel coined the term ‘Machine Learning’ to describe the computer’s ability to learn from and make predictions on data without being explicitly programmed.

The idea of a ‘DIY’ song-making computer came shortly after that. In 1963 Max V. Matthews (1926–2011), a pioneer of computer music, published a foundational article in *Science* titled ‘The Digital Computer as a Musical Instrument’. In it he predicted that ‘A computer can be programmed to ... compose unaided’ (1963:553). Research on computer music and algorithmic composition carried on and in February 1977 MIT Press launched the key journal in the field of computer music studies, *Computer Music Journal*, and published its inaugural issue. Over the next two decades the majority of research in the field focused on Western classical music. In 1997, composing AI had developed to such an extent that in the world’s first human–machine contest in composition, an AI named EMI (Experiments in Musical Intelligence, pronounced ‘Emmy’) defeated a human composer – Dr Steve Larson, a music theory professor at the University of Oregon. EMI’s compositions were deemed to sound more like Bach than those by Dr Larson. The man behind EMI, computer scientist and composer David Cope, had EMI analyse musical samples and compile a ‘dictionary’ of Bach’s characteristic chords, melodies, rhythms along with rules of syntax using pattern-matching algorithms (Johnson 1997). Building on Cope’s work, AIVA (Artificial Intelligence Virtual Artist), created in February 2016, has become the current state-of-the-art AI composer of contemporary classical music, and is known for composing soundtracks for films, video games and commercials on commission.¹ AIVA is the first AI composer to have her creations registered with

¹ Music samples are accessible at <https://aiva.ai>.

² See ‘FlowComposer: composing with AI’ at <https://bit.ly/2FnwFb>

³ See ampermusic.com.

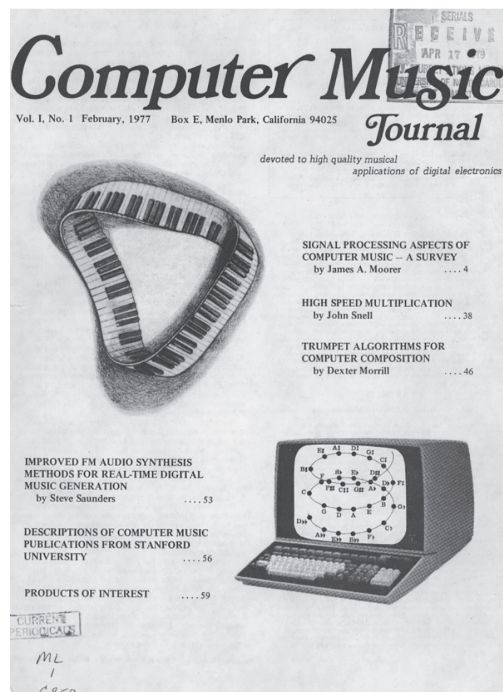
⁴ See ‘IBM Watson Beat’ at <https://ibm.co/2PYOXru>

⁵ See ‘Have yourself an AI Christmas’ at <http://bit.ly/2Ws2yZt>

the authors' rights society SACEM (Société des auteurs, compositeurs et éditeurs de musique (Society of Authors, Composers and Publishers of Music)), an honour that some established human composers have not yet received.

In the field of computer music, computer scientists' interest in popular songs began to grow in the late 1980s. In 1988, an article in *IEEE Transactions on Consumer Electronics* explored how a computer music system on a personal computer can transcribe a song, determine chord progression and generate a three-part accompaniment (Tsuruta et al. 1988). The first *Computer Music Journal* article to use computational methods to analyse popular songs (in this case Russian folk songs) appeared in 1997 (Bakhmutova et al. 1997). A major breakthrough in AI song making was made in the late 2000s and early 2010s by FlowComposer, funded by the European Research Council under the European Union's Seventy Framework Programme (EP7/2007–2013) and coordinated by François Pachet at Sony Computer Science Laboratories (Sony CSL Paris) and Sorbonne University.

FlowComposer features Automatic Composition (or AI 'DIY') and Interactive Composition. For the former program, the user may inform FlowComposer of the style (Beatles, Kurt Weil, Michel Legrand, etc.) and the track length they are looking for, and the AI will independently generate a song right away. The latter has the same rationale: the user opens an empty score, selects from the menu the song-set style and tunes parameters (on a scale of 1 to 20) of harmony (loose–strict), note durations (short–long), chord changes (many–few) and inspiration (song–corpus). The user then clicks on 'compose' and the AI will generate a one-part melody score on the screen right away. The user may edit it as they see fit, or command the AI to generate a new one. After the melody is set, the accompaniment is next. Again there are hundreds of styles and musical instruments to choose from. The user adds the accompaniment to the melody to make a complete song. For the users who make minimal changes to the AI melody and accompaniment, the Interactive Composition Program constitutes an additional AI 'DIY' song-making program with more user options.² In 2015 FlowComposer collaborated with Android



■ The cover of *Computer Music Journal* inaugural issue in 1977. Photo courtesy of The MIT Press and Brown University Library

Lloyd Webber – another AI composition system based on machine learning analyses of musical theatre hits – and composed the world's first AI 'DIY' musical, *Beyond the Fence*, which premiered in London's West End in 2016 to mixed reviews (Liu 2017).

Several AI companies in North America are also working on AI 'DIY' song making. The Google Brain team's Magenta, for instance, uses deep learning and reinforcement learning algorithms to generate songs, and releases their models and tools in open source on GitHub. Amper Music, similar to FlowComposer, offers two versions – the 'simple' and the 'pro' to compose songs. The simple version generates background music after the user selects the style (as of June 2018 only five styles are available: hip hop, cinematic, classic rock, modern folk, and nineties pop), the mood (inspired by music streaming service, seven available: driving, exciting, happy, playful, reflective, sad, tender) and the track length. The pro version offers users more choices and chances to edit after the AI has generated new songs.³ IBM's Watson Beat invites the user to input 10 seconds of melody, analyses the melody and then generates a song with comprehensive accompaniment.⁴ The University