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AI Composing Music

Since their conception, computers have been divided from humans due to their intrinsic

lack of creativity. However, the rapidly growing field of artificial intelligence is challenging that

notion through music composition. For example, Flow Machines [2], uses AI algorithms to turn

styles of music into a computational objects. The project has produced many songs, including

Daddy's Car [2], which was generated from Beatles songs then rearranged and polished by a

human composer. In addition, folkrnn [2] is an AI algorithm which has ingested over 23,000

sheets of Irish folk music to produce over 100,000 of its own tracks. These two projects and

countless others have demonstrated great progress in closing the musical gap between computers

and humans.

AI music composition is entertaining to listen to, but the technology can be applied to

creating basic soundtracks and assisting composers. For example, Amper Music [2] composes

customizable soundtracks for commercials and short films. This is a cheap alternative for small

companies or indie filmmakers who cannot afford hiring a musician. Of course, this sacrifices

quality but still provides a useful resource. Another similar example is Jukedeck [2], which has

created over half a million unique tracks for big companies like CocaCola and Google. The free

production process involves selecting the length, mood, and tempo of the desired song, and the

finished product can even be edited. These programs can also help musicians themselves with

their work. An example is Alice [2], which is a program that first listens to a tune played on piano

and then plays a predicted series of notes. This could guide composers out of writer's blocks

when they need fresh suggestions. Thus, a collaboration between AI and composers rather than a competition, can be formed.

These machines employ various methods, all under the giant umbrella of machine learning. Machine learning is different from orthodox software in that the program is its own "programmer", changing its own performance. Through machine learning, coders no longer code, but rather train [3]. The subdivisions under machine learning include supervised, unsupervised, and reinforcement learning. Supervised machine learning [3] gives the machine a labeled set of data to analyze. For example, when writing music, if the program is provided with sections of many songs labeled intro, bridge, verse, etc., the program will know exactly what those parts sound like. Thus, a larger data set produces a more accurate product since the machine can pick out more patterns; however, this process is very labor intensive on the human's part, since it requires the labeling of ample data. On the other hand, unsupervised machine learning [3] does not require labeled data but picks out patterns on its own, so it may need some human intervention to put it on the right path. Nevertheless, it is a smarter approach especially for picking out patterns difficult for humans to detect. When composing, there may be complex music theory rules that these machines can pick up on that would be difficult for programmers to implement. Finally, reinforcement machine learning gives the machine a beginning state, end goal, and rules to follow. This is favorable for when the end product is clearly defined but the path is not. When writing music, one may already have a catchy hook for the middle of a song but no intro to get there. This method is particularly similar to how humans compose, since it's less restricted and relies on the computer's "creativity" to come up with a solution.

A major branch under machine learning [3] is deep learning, which uses neural networks, inspired by neuron connections in the human brain. Deep learning utilizes many layers information passes through before being outputted. Two major subsets of neural networks that apply to music composition are recurrent and convolutional networks. Recurrent neural networks[1] are based on a cycle that executes the same task for each input, while being dependent on previous outputs. In music composition, the AI can look at the previous few notes to predict future notes. A specific example of this is Alice, mentioned above. On the other hand, Convolutional networks [5]are more linear and do not work on a cycle or depend on previous outputs. They select overlapping regions to find specific regions of interest. This can help AI write songs when they analyze many songs, by cutting up the song into overlapping regions, and determining patterns within those regions to detect refrains, bridges, etc.

All these methods of machine learning have been applied to AI music composition but are still far from perfect. Drew Silverstein, CEO of Amper Music said, "Sometimes, neural networks and purely datadriven approaches are not the right answer" [2]. When humans compose, they are inspired by previous works but also involve spontaneous, unique segments. The ability to create something truly new is unattainable by current machines. Bob Strum, who worked on the folkrnn, said, "[folkrnn] is learning very abstract representations of Irish music which have very little to do with … how a composer puts them together" [2]. The program is not actually learning the style of folk music, but finding abstract patterns in data that may not translate well on a higher level. Even a large collection of data simply does not encapsulate everything about the music.

AI in the music industry will be prominent in the near future; however many musicians are apprehensive. Some are concerned with the replacement of jobs. Francois Pachet [2], who worked on Flow Machines, comforted them with an analogy between AI composers today and digital synthesizers in the 1980's. At the time, there was worry that computers would replace musicians. Pachet said, "but what happened was the exact opposite, … everyone took these new machines and hardware with them and learned how to use them productively" [2]. The same can be said for artificial music composition, which can become a tool for a new era of music. Although entrylevel jobs will likely fade away [2], developers of these AI programs believe talented human composers will stick around forever [2]. Their level of creativity is far too advanced for current machines to compete with. Musicians have also been concerned about how machines would impact human expression. When a band gathered to play a selection of folkrnn's pieces, Úna Monaghan [2], a researcher involved in folkrnn, noted that "their reaction [ranged] from slightly negative, to outright 'why are you doing this?'" [2]. Audience members found the songs devoid of soul and emotion [2], and others were unhappy with machines degrading Irish culture [2]. However, Strum settled this concern when releasing the volume of songs created by folkrnn. "Why have we done this?" he questioned. "We have not done this because we think the world needs 100,000 new but mediocre tunes. We have not done this because we believe the rich tradition of music from Ireland in the UK is so simple that "even a computer can do it." We have done this because we believe artificial intelligence can provide human creators and music practitioners with useful tools." [5]. Although controversial, the development of AI in the creative space has promising applications connecting artists with computers and continues to merge the gap between man and machine.

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