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# Semi-Automated Creativity: Software as a Creative Collaborator

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## **Extended Abstract**

Creativity support tools are important to professionals and amateurs alike. Typically, these tools abstract away the mundane details of creative design to allow the user to focus on her creative process. However, emerging techniques in data mining, machine learning, and artificial intelligence all have the potential to enhance the efficiency, productivity, accessibility and usability of these tools. Leveraging these techniques, creativity support tools are poised to move from the role of an assistant carrying out chores for the user to a role as a creative collaborator.

The proliferation and importance of creativity support tools has never been so evident as it is now, with millions of Internet users generating creative works through image, sound and video editing software. At the same time, engineers leverage a different set of tools to design and engineer structures, electronics and cities (using a different, but no less valid mode of creativity). It is the aim of these tools, in the words of Ben Shneiderman, to have "more people, more creative, more of the time" [1].

At the same time, research into machine learning and artificial intelligence has accelerated in recent years, with industrial and academic organizations advancing both algorithms and applications in the field. Artificial Intelligence (AI) research has created systems capable of varying degrees of natural language understanding, game playing, planning, and problem solving. Machine learning (ML) and data mining techniques, including neural networks, genetic algorithms and support vector machines (SVM), have been leveraged to process audio and visual streams as well as large knowledge bases. All of these technologies have the potential to support the creative design of the user, not only in assuming mundane tasks that are seen to impede the creative process, but also to aid in the search for creative solutions.

In the past few years, several applications have emerged that have sought to elevate the role of software in the creative process. MySong [2] (now Songsmith) generates accompanying music to singers by mining databases of existing music. It substitutes the complexity of the song writing process with a few simple controls, which affect the parameters of the ML models responsible for generating the songs. In doing so, it empowers novices to participate and stokes the professionals' creativity in the song-writing process. Picbreeder [3] is a large scale, Internet-based experiment in Collaborative Interactive Evolution (CIE). It allows a user to evolve images by selecting ones that she likes, employing an evolutionary algorithm to produce the next generation. When the user is satisfied with her image after several generations, she can then publish it to the site, where other users can "branch" that image, thus copying it and continuing its evolution. This process begets a collaborative cycle of branching and publishing, resulting in a proliferation of interesting images. It too can serve as a tool to empower amateurs and inspire professionals. Both of these applications are indicative of a trend in using advanced machine learning technologies to augment the creative process, and they will hopefully encourage future development in this area.

Applications like these can force us to rethink our traditional models of how creativity works. The *Geneplore* model of creativity [4], for instance, bifurcates creative thought into two frequently interleaving phases, *Generation* and *Exploration*. But how is the creative process changed when one of these phases is externalized to a piece of software, as in Picbreeder? Social models of innovation will also be impacted by the availability of these new tools. How

will creative collaboration be affected when it can happen on an Internet-wide scale, or with one or more intelligent agents in the mix? Our already nascent models of the creative process will have to take these mechanisms into account to build a truly comprehensive understanding of creativity.

Creativity support tools will have numerous opportunities in the future to take advantage of AI, ML and data-driven techniques. Word processors may offer natural language processing and data mining techniques to help alleviate writer's block. CAD tools may employ evolutionary algorithms to suggest sound design alternatives that the designer may not have considered. And students may flesh out creative ideas using intelligent, interactive agents. Building these kinds of applications will require intensive, innovative and cross-disciplinary research. But considering the importance of creative endeavor in driving our society forward, the benefits will surely outweigh the costs.

## References

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