AI and Machine Learning

By Steven Craig Bilow

Just as application domains such as e-commerce, autonomous vehicles, personal assistant devices and the Internet of Things (IoT) have felt the impact of advances in artificial intelligence (AI) and machine learning (ML), our industry will also see changes brought on by these advances. This is due in part to the fact that we have similar issues and analogous needs for automation and algorithmic support.

Much of what is happening in the AI world today is not new. Modern "deep learning" algorithms sit on the shoulders of neural network research begun decades ago. The difference is in memory, processing power, and the unique application of graphics processing units (GPUs) for extremely high-performance mathematics. This power presents myriad opportunities for both use and misuse.

Just the information security and privacy issues involved in this domain could fill an entire issue of the journal. The issue of "deep fakes" alone could enormously affect our credibility throughout our value chain. Recommendation engines in content delivery, algorithmic bias in media search and retrieval, and automatic speech recognition and transcription are all hot topics.

What all of the talk indicates is that AI and ML are not theoretical abstractions. They are already the cornerstones of billions of dollars in business and, as you will see from the articles that follow, these technologies can provide media businesses with new ways of doing things we have been doing for decades as well as entirely new applications. The technology is proven and it is applicable now.

AI is a vast topic covering everything from computational neuroscience to application-specific reasoning by computers, to the ever elusive general-purpose AI, to ML. ML is just a piece of a much bigger universe. Several articles presented here discuss deep learning. This is a method for building and training models based on multilevel neural networks. It is getting most of the "airplay" today but, be aware, it too is just a small subset of everything going on in the AI world. It is even just a small subset of the discipline of ML.

It would be nice to cover everything, but AI is a vast topic. It is both new and old, it has positive aspects and negative ones, and the best way to understand its media applications is to narrow it down, provide some unique use cases, and keep it positive.

This issue of the *Journal* will focus on the positive aspects of AI and ML. This issue does not look at such things as "deep fakes" and the ethics of privacy. Rather, the articles presented here demonstrate the exciting promise of these technologies to production, post-production, and delivery. Here is what to expect.

"Rotoscope Automation with Deep Learning" by Oscar Estrada, Nicholas Peretti, and their faculty advisor at Rochester Institute of Technology (RIT), Ricardo Figueroa, is a marvelous, well documented, description of a deep learning-based algorithm that can automatically rotoscope people on a given scene, without any user input. The authors begin with a review of the foundations of matting and manual rotoscoping and go on to describe their very pragmatic application of convolutional neural networks to automate what seems a time-consuming task.

In "AI in Production: Video Analysis and Machine Learning for Expanded Live Events Coverage," Craig Wright, Jack Allnutt, Rosie Campbell, Michael Evans, Ronan Forman, James Gibson, Stephen Jolly, Lianne Kerlin, Zuzanna Lechelt, Graeme Phillipson, and Matthew Shotton of the British Broadcasting Corp. (BBC) present their algorithmic solution for automatically framing, sequencing, and selecting shots to create single-operator multicamera event coverage. Their use case is drawn from the Edinburgh Fringe Festival where only a small fraction of the 50,000 performances could be recorded by human crews. The article proposes an AI approach to greater event coverage.

"AI Driven Smart Production" is presented by Hiroyuki Kaneko, Jun Goto, Yoshihiko Kawai, Takahiro Mochizuki, Shoei Sato, Atsushi Imai, and Yuko Yamanouchi of Japan Broadcasting Corp. (NHK). The article covers their AI-driven technique for collecting and evaluating a wide variety of information from social media, other broadcasters, and other available

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data sources. Their goal is to extract valuable information via speech and image recognition, to automatically transcribe audio and generate metadata, and to deliver that data to producers who can subsequently offer high-quality content to a wide audience.

Rotoscope automation, algorithms that expand live events, and enhanced information extraction from video for applications from production to delivery are but a few of the possibilities that AI brings to the SMPTE community. Media applications of these new technologies are in their infancy. The impacts will continue far into the future. SMPTE will be there and these articles certainly explain why.

About the Author

Steven Craig Bilow has over 30 years of experience in broadcast news, media asset management, control room design, and education. He first published in SMPTE Journal in 2001 and is a member of the Board of Editors. Bilow is a member of SMPTE and a senior member of the Association of Computing Machinery (ACM), where he serves on several USACM committees. He is currently the product marketing manager for BlueVolt in Portland, OR.