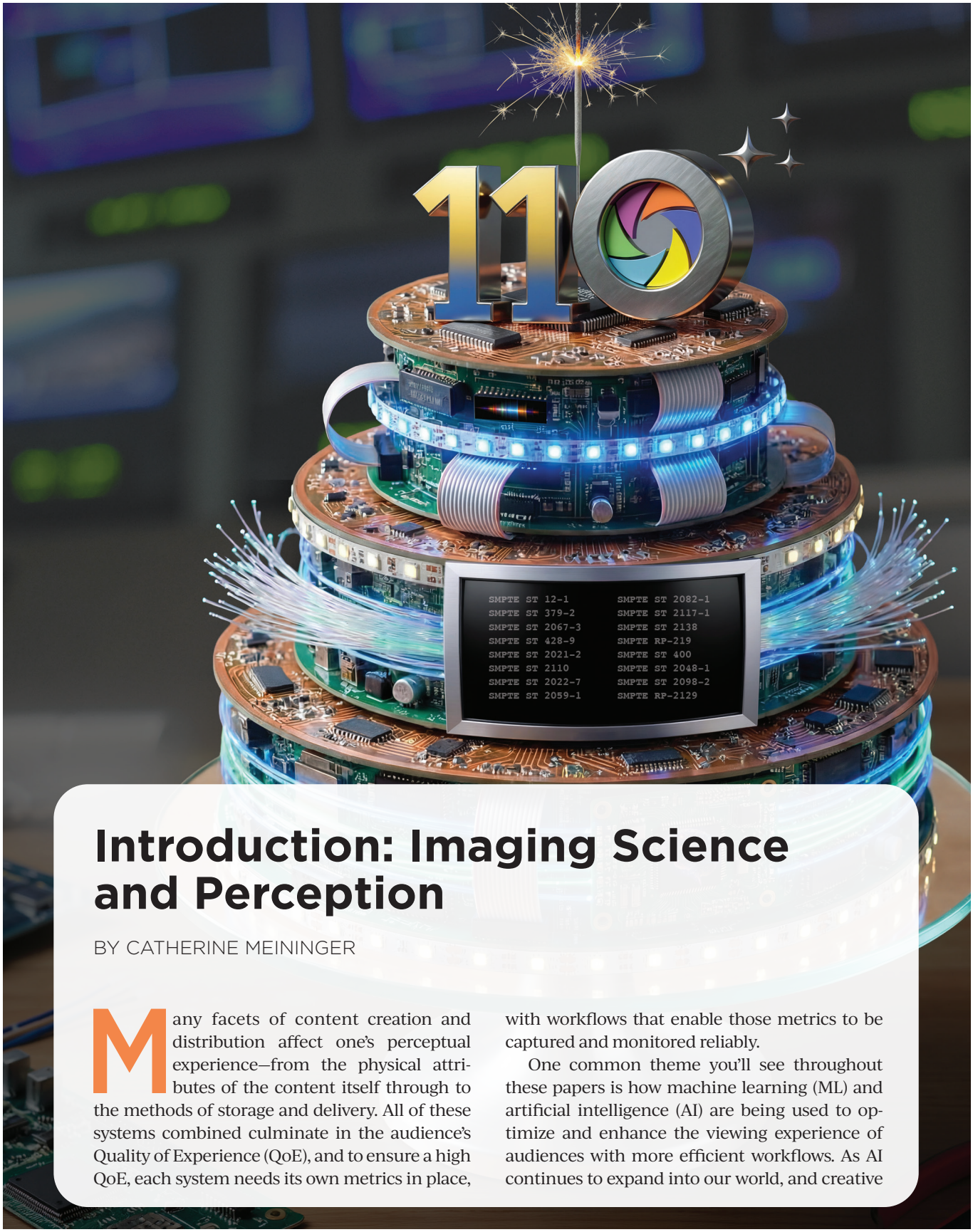

Introduction: Imaging Science and Perception

BY CATHERINE MEININGER

Many facets of content creation and distribution affect one's perceptual experience—from the physical attributes of the content itself through to the methods of storage and delivery. All of these systems combined culminate in the audience's Quality of Experience (QoE), and to ensure a high QoE, each system needs its own metrics in place, with workflows that enable those metrics to be captured and monitored reliably.

One common theme you'll see throughout these papers is how machine learning (ML) and artificial intelligence (AI) are being used to optimize and enhance the viewing experience of audiences with more efficient workflows. As AI continues to expand into our world, and creative

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industries approach it with well-deserved caution, these papers demonstrate how AI can be used in the motion picture industry in a way that enables our professionals to spend more time focusing on content creation and artistic decisions, and less so on time-consuming tasks like manual review, quality control, and data entry.

We start off our issue with a paper that uses OpenAI's Whisper model to improve active monitoring of broadcast audio quality:

"*Using Generative-AI Speech-To-Text Output to Provide Automated Monitoring of Television Subtitles*" by Michael Armstrong focuses not on creating audio subtitles but on how the audience actually perceives them. The paper presents proof-of-concept techniques using machine learning to measure subtitle timing and word rates, where the results highlight notable quality issues that demonstrate the need for more automated subtitle monitoring in broadcast workflows.

Next up, we turn to the visual aspects of perception with a paper that seeks to improve current video quality metrics through ML techniques:

"*An Efficient Quality Metric for Video Frame Interpolation*" by Daly et al. describes the development of a novel video quality metric that detects temporal inconsistencies in interpolated motion content at lower computational cost and with improved accuracy compared to existing metrics. The authors demonstrate the metric's performance through a detailed evaluation against known subjective quality datasets.

Continuing with the theme of visual perception, the next paper transitions from the physical attributes of the content to methods of archival storage. This paper is the black sheep of the group, as it is the only one that does not feature any ML or AI models – instead, it simply relies on good old-fashioned color management principles:

"*A Multispectral Scanning and Post-Processing Workflow for Historical Film Colors*" by Flueckiger et Al. discusses techniques for preserving the perceived color appearance of historical color films as they would have been seen through the physical interaction of projector lights with film dyes and pigments. The paper describes an improved scanning system that captures more spectral characteristics of color film and proposes various color management workflows that render its digital appearance through different illuminants and styles. The goal of the system is to provide a digital rendering as it was truly intended to be perceived through the physical qualities of the film and projector systems of its time.

ONE COMMON THEME YOU'LL SEE THROUGHOUT THESE PAPERS IS **HOW MACHINE LEARNING (ML) AND ARTIFICIAL INTELLIGENCE (AI)** ARE BEING USED TO OPTIMIZE AND ENHANCE THE VIEWING EXPERIENCE OF AUDIENCES WITH MORE EFFICIENT WORKFLOWS.

The next paper tackles perception as it relates to the overall delivery experience of streamed content:

"*Efficient and Self-Optimizing Multi-Source Media Streaming Using CMMF*" by Cloud et al. focuses on improving the QoE of streamed media. The paper describes a solution that uses multi-source coding to deliver media efficiently, and presents results that demonstrate a notable reduction across various performance indicators such as start-up time, rebuffering, and playback failures. The authors also provide examples of how the technology can be implemented today in existing workflows and infrastructure.

And finally, our last paper allows me to stretch the theme of "perception" in a way that feels quite meta, given the ML-heavy topics in this issue:

In "*Implementing an AI Teaching Assistant for a Class in Motion Picture Engineering*" by O'Regan and Kokaram, the authors present a study into the development of an AI assistant trained specifically on educational content for motion picture education. The study explores how students used AI, measures its impact on exam performance, and analyzes its perceived effectiveness using survey feedback from student users. The paper provides readers with a variety of perspectives on the uses of AI in an educational environment, including its technical development and applications, as well as a philosophical reflection on its human impact.

As you first read through this issue, you may see a lot of ML and AI applications—but consider how these modern technologies are being thoughtfully implemented to enhance the overall quality of the audience's media experience. This issue can provide a perspective into the positive ways AI is being used in the creative industry without sacrificing our artistic qualities – the qualities that make us human. And while AI can certainly benefit us in many applications, but AI cannot fully replace human interaction.

About the Author

Catherine Meininger is the Sr. Director of Color Science at Portrait Displays, where she leads the design and development of color calibration algorithms.

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