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MARCH 26, 2025
• **THEME:**
Artificial Intelligence:
A key technology of the 21st century
Deep learning, systemic innovation, and societal challenges

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SESSION.04
March 26, 2025

FOCUS SESSION #04

Background note for opticians and other eyewear professionals,
defining the current contexts

Artificial Intelligence (AI) is emerging as one of the most transformative forces of our time. Driven by the rapid advances in deep learning—a branch of AI based on complex neural networks—it no longer merely automates tasks: it learns, adapts, predicts, and even creates. Some compare its impact to that of electricity or the internet, while others call for ethical caution in the face of its growing power.

This briefing provides a comprehensive overview of AI's current contributions, especially through deep learning, while addressing its limitations, social implications, and future outlook.

1. AI: A central technology in today's transformations

AI is already deeply embedded across countless industries, often invisibly to the public. Its power lies in its ability to process, analyze, and learn from large volumes of data in real time—at a speed and scale far beyond human capabilities.

• Healthcare
AI is revolutionizing medical diagnostics by analyzing medical images, identifying tumors, customizing treatments, and monitoring chronic conditions. Systems like Google Health and IBM Watson have reached diagnostic precision on specific cases that rivals or surpasses human doctors.

• Mobility
Autonomous vehicles, predictive GPS systems, and smart city infrastructure rely on AI to anticipate human behavior and optimize traffic flow.

• Finance, services & media
AI powers personalized recommendations, fraud detection, algorithmic trading, and intelligent customer service chatbots across platforms like Netflix, Spotify, Amazon, and banks.

• Environment & agriculture
AI helps predict weather patterns, optimize irrigation systems, and detect crop diseases using satellite imagery and drones.

According to **Yann Le Cun**, Chief AI Scientist at Meta, it would be a mistake to slow down AI progress. In an interview with Le Monde newspaper (April 2023), he states that "wanting to halt AI research is like banning electricity to avoid domestic accidents." For him, properly guided AI is a unique opportunity to advance humanity.

2. Deep learning: The core of AI's capabilities

Deep learning, a subfield of machine learning, relies on **multi-layered neural networks** capable of learning from massive datasets without explicit rule-based programming.

• Image and sound recognition
Deep learning is behind breakthroughs in **facial recognition, autonomous driving, medical imaging,** and real-time speech translation. It also powers image-generation tools (e.g., DALL·E, Midjourney) and voice assistants (Siri, Alexa, Google Assistant).

• Natural Language Processing (NLP)
Thanks to architectures like **transformers** (sequence-by-sequence models), AI can now understand, summarize, translate, and generate text with remarkable coherence. Tools like ChatGPT, Bard, and Claude are all based on these models, transforming access to knowledge, education, and creativity.

• Adaptability
Deep learning systems **learn by example** from past data or simulations. They can detect weak signals, anticipate behaviors, and uncover patterns invisible to humans.

Geoffrey Hinton, deep learning pioneer and Turing Award laureate, believes this technology "changes everything: it is intuitive, logical, adaptive, and capable of discovering solutions humans cannot."
However, he has recently warned about the risks of overly autonomous systems and the need for robust oversight.

3. Major issues and current debates

While AI holds immense promise, it also raises critical challenges and ethical questions.

• Ethics and algorithmic bias
AI systems often **replicate or amplify biases** found in their training data, potentially leading to unfair decisions in hiring, lending, criminal justice, and more.

• Privacy and surveillance
AI enables the **mass collection and analysis of personal data**. Tools like facial recognition and smart speakers raise concerns over consent, anonymity, and potential misuse for surveillance.

• Employment and economic shifts
AI threatens certain routine jobs (e.g., accounting, call centers) but also creates new ones (e.g., data analysts, AI trainers, AI ethics officers).
The key challenge lies in upskilling and workforce adaptation.

• Risks of technological drift
Remain attentive and vigilant to possible abuses if AIs become capable of making autonomous decisions without human supervision, particularly in sensitive areas (defense, security, finance).

4. Building an ethical, sustainable, and inclusive AI future

In response to these challenges, efforts are being made to ensure responsible AI development:

• Governance and Regulation
The European Union is leading with the **AI Act**, a pioneering regulation that classifies AI systems based on risk levels. Other countries such as Canada, Singapore, and the U.S. are developing their own frameworks.

• Responsible research
Research labs (OpenAI, DeepMind, INRIA, etc.) are implementing ethics committees and developing **explainable and auditable AI systems** to promote transparency and accountability.

• Education and digital inclusion
Widespread AI literacy is essential, not only for engineers but for society at large. Equitable access to digital tools must accompany innovation to avoid widening social divides.

• Environmental responsibility
Large AI models (type GPT-4, Gemini, Claude, Perplexity…) have **high energy demands**. The community is working on **lighter, more efficient architectures** through specialized models and sustainable training methods.

CONCLUSION

Artificial intelligence—and deep learning in particular—has become a defining force of the 21st century. It is transforming industries, reshaping professions, and raising fundamental questions about humanity's relationship with technology.

Rather than resisting this evolution, thought leaders like Yann Le Cun advocate for responsible acceleration: investing in open research, building strong regulatory frameworks, and ensuring broad access to knowledge.

The stakes are clear:
shaping AI not as a threat to humanity, but as a powerful ally one that reflects and upholds our collective values.

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SESSION #04
ARTIFICIAL INTELLIGENCE: A KEY TECHNOLOGY OF THE 21ST CENTURY
Deep Learning, Systemic Innovation, and Societal Challenges

SILMO FUTUROLOGY REPORT
BY THE SILMO NEXT EXPERT COMMITTEE

24/25

ARTIFICIAL INTELLIGENCE RESHAPING THE OPTICAL INDUSTRY:
Analysis and perspectives

At the latest meeting of the Silmo Next Expert Committee, specialists focused on the growing integration of artificial intelligence (AI) in the optical sector and its significant implications for professional practices and optical technologies..

AI at the heart of retinal imaging

The discussion opened with a focus on AI's contributions to retinal imaging. Participants highlighted its growing importance in medical diagnostics, particularly for the early detection of conditions such as glaucoma and diabetes.

International collaborations are underway to deepen understanding and provide a comprehensive overview of emerging technologies in this field.

AI driving innovation in smart eyewear

Recent innovations showcased at international events highlighted major advances in smart glasses, including models capable of real-time image analysis through embedded AI. These glasses offer rapid light adaptation and contextual information directly in the user's field of vision, enhancing the user experience.

Nonetheless, concerns were raised regarding the high energy consumption of AI systems. Solutions such as on-device data processing were suggested to improve energy efficiency and strengthen user privacy.
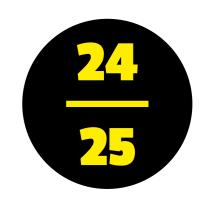
Impact and challenges for eye care professionals

The session also explored how these technological changes affect optical professions. The role of optometrists is expected to evolve toward a more central place in visual health pathways, despite regulatory constraints in some European countries.

Conversely, concerns were voiced about the potential transfer of responsibilities from general practitioners to opticians, especially for health screenings. This shift raises practical and commercial challenges, particularly in attracting consumers who don't require vision correction.

Smart glasses and mental health:
an emerging topic

A promising avenue of exploration was raised around the intersection of mental health and smart eyewear. Participants pointed out the regulatory obstacles limiting the integration of health-related technologies in connected eyewear, as well as the structural barriers to early disease detection via these devices.

Parallel evolution:
From eyeglasses to smart hearing devices

The conversation also addressed innovations in the hearing sector, particularly the rise of intelligent earbuds incorporating hearing aid functions.

In light of regulatory relaxations in some countries, these solutions are emerging as accessible alternatives for mild to moderate hearing loss.

Toward greater personalization through AI

Finally, the discussions highlighted AI's ability to personalize optical solutions based on users' behavioral and neurological responses.

This advanced customization is seen as a strategic lever for strengthening consumer engagement and revitalizing the optical market.

Conclusion

The Silmo Next Expert Committee confirms that AI is set to profoundly reshape the optical and eyewear sector—technologically, professionally, and commercially—with major implications in terms of ethics, regulation, and strategic development.

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