

# Mapping Smart Contact Lens Research: Thematic Analysis of Trends, Current Challenges and Future Directions

Muhammad Mujtaba Syed,<sup>1,3,\*</sup> Lianxi Zheng,<sup>1,3</sup> Kin Liao<sup>2,3</sup> and Haider Butt<sup>1,\*</sup>

<sup>1</sup>*Department of Mechanical and Nuclear Engineering, Khalifa University of Science and Technology, Abu Dhabi, 127788, United Arab Emirates*

<sup>2</sup>*Aerospace Engineering, Khalifa University of Science and Technology, Abu Dhabi, 127788, United Arab Emirates*

<sup>3</sup>*Research & Innovation Center for Graphene and 2D Materials (RIC-2D), Abu Dhabi, 127788, United Arab Emirates*

\*Email: [haider.butt@ku.ac.ae](mailto:haider.butt@ku.ac.ae) (H. Butt), [mujtaba6146@gmail.com](mailto:mujtaba6146@gmail.com) (M. M. Syed)

Received: 09 September 2025; Revised: 22 November 2025; Accepted: 05 December 2025

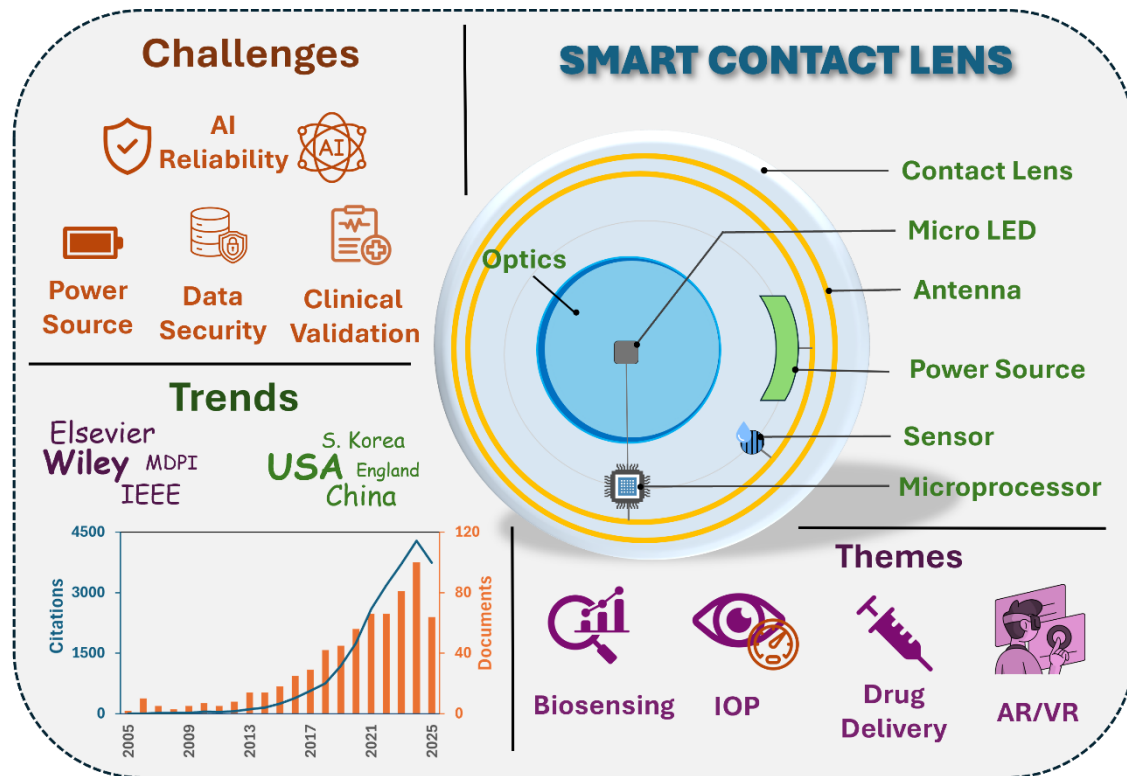
Type: Review article.

## Abstract

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Smart contact lenses (SCLs) bring transformative developments in ophthalmology beyond vision correction. For advanced diagnostic and therapeutic purposes, SCLs integrate biosensing, drug delivery, artificial intelligence (AI), and augmented reality (AR) technologies. Despite rapid progress in this technology, no prior study has systematically mapped the recent progress and trends using thematic approaches. This review integrates the bibliometric indicators with thematic analysis to highlight the publication trends, collaboration networks, and emerging applications in this field. We identified key research themes related to SCL, including diabetes monitoring and management, intraocular pressure monitoring, drug delivery, AI-driven diagnosis, and AR-enabled human-machine interaction. The current challenges, *i.e.*, encrypted wireless communication, compact but efficient power solutions, clinical validation, and data interpretation, are also discussed. Moreover, this study also provides insights into potential future directions to mitigate these challenges.

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*Innovative Description:* This review maps two decades of smart contact lens research, revealing transformative trends in biosensing, AI integration, and wearable healthcare for next-generation ophthalmic technologies.