



PRESS RELEASE

Better cataract surgery thanks to AI video analysis

Study: Automatic evaluation of cataract surgery videos for optimized training & competition

Bonn, May 21 - Although manual small incision cataract surgery (SICS) is widely practiced in countries of the global South, there is no publicly available surgical video dataset for this operation, leaving a critical gap in cataract surgery research. Therefore, an international research team at Sankara Eye Foundation India led by the University Hospital Bonn (UKB) and the University of Bonn has developed the first automated phase detection using AI in SICS. The results of the study have now been published in the renowned journal "Scientific Reports". In parallel, the international research team is now launching a global AI competition at the MICCAI 2025 conference in Daejeon (South Korea), in which Al algorithms for surgical phase detection will compete against each other. The submission deadline is 15th of August 2025.

Cataracts are the most common cause of blindness worldwide, particularly affecting people in low- and middle-income countries such as India. The low-cost and effective SICS surgical method is preferred in these countries, but is often associated with poorer results due to limited resources and training opportunities. "In addition, the application of AI on this technique has not yet been researched enough," says Dr. Maximilian Wintergerst, head of a working group at the UKB Eye Clinic and principal investigator of the study. While algorithms for AI-supported video analysis of the individual surgical phases have already been developed for the predominant cataract surgery technique in high-income countries, known as phacoemulsification, neither data sets nor algorithms have been available for SICS to date. The new study now makes videos of manual small incision cataract operations publicly available for the first time with the "SICS-105" data set. The data set is based on operations performed on 105 patients at Sankara Eye Hospitals in India.

The study shows that the innovative deep learning model "MS-TCN++", developed in the group of Prof. Dr. Jürgen Gall at the University of Bonn, can recognize different surgical phases such as preparation of the surgical approaches to the eye and the various surgical steps on the lens with over 85 percent accuracy. "The analysis of surgical phases is important because it enables a quantitative comparison between different surgeons, feedback on identified critical steps and the detection of deviations from surgical protocols. It is therefore the first step towards automatic assessment of surgical quality," says Dr. Kaushik Murali, president of medical administration at the Sankara Eye Foundation India. The transdisciplinary approach that enables such progress is also represented by Simon Mueller, first author of the study: After finishing a MSc degree in Life Science Informatics at the University of Bonn, he is now studying medicine in Maastricht; in parallel, he works on a PhD project in close collaboration between the Computer Science Department in Bonn and the UKB Eye Clinic.

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SICS-155 Challenge: New milestone for education and research

The research consortium is currently calling for an AI competition to analyze such surgical videos. To this end, the research team has expanded the study's first public data set for SICS with surgical videos and hand-marked (annotated) surgical phases to a total of 155 operations with 18 different phases. The software for annotation has been developed by researchers at Microsoft Research India and Sankara Eye Foundation. Subsequently, the annotations have been created by ophthalmologists at the Sankara Eye Foundation. "With the 'SICS-155 Challenge', we are inviting international teams to test their AI algorithms for phase recognition in 155 SICS operations," says Prof. Dr. Thomas Schultz from the b-it and Institute of Computer Science at the University of Bonn and the Lamarr Institute for Machine Learning and Artificial Intelligence. He is also a member of the Transdisciplinary Research Areas (TRA) "Modeling" and "Life and Health" at the University of Bonn. The international research team expects participants to submit an algorithm for predicting surgical phases based on the video data provided and to write a short paper on their approach. "With the competition, we want to accelerate progress in the automatic analysis of surgical videos from middle- and low-income countries and thus improve the training of surgeons and cataract surgery outcomes in the long term," says Wintergerst.

Development of algorithms for instrument and complication detection follows

In addition to the "SICS-155 Challenge", as the next step, computer scientists at Microsoft Research India and University of Bonn are developing algorithms for automated surgical instrument and complication detection, which will further advance automated surgical video analysis for SICS.

Partners and funding

The project is a cooperation between the University Hospital Bonn, the University of Bonn, the Sankara Eye Foundation India and Microsoft Research India. The project is funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and the Else Kröner-Fresenius Foundation (EKFS) as part of an academic hospital partnership of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). The AI competition is also supported by the Lamarr Institute for Machine Learning and Artificial Intelligence.

Publication: Simon Mueller et al.: Phase Recognition in Manual Small-Incision Cataract Surgery with MS-TCN++ on the Novel SICS-105 Dataset; Scientific Reports; DOI: https://doi.org/10.1038/s41598-025-00303-z

Further information on the challenge and registration: https://medvisbonn.github.io

The deadline for submitting algorithms is August 15, 2025, and the best entries will be presented and awarded prizes at the MICCAI Conference 2025 in South Korea.





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Image material:



Caption: Cataract surgery at Sankara Eye Hospital is recorded on video.

Picture credits: Sankara Eye Foundation India & University Hospital Bonn

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About Bonn University Hospital: The UKB treats around 500,000 patients per year, employs around 9,500 staff and has total assets of 1.8 billion euros. In addition to the 3,500 medical and dental students, 550 people are trained in numerous healthcare professions each year. The UKB is ranked first among university hospitals (UK) in NRW in the Focus Clinic List, had over 100 million third-party funds in research in 2023 and has the second highest case mix index (case severity) in Germany. The F.A.Z. Institute awarded the UKB first place among university hospitals in the category "Germany's Training Champions 2024".