

Video-based assessment of surgical skill in the operating room

- Video-based assessment of surgical skill for phacoemulsification, a critical step in cataract surgery
- **What Students Will Do:**
 - Use an existing annotated video dataset
 - Implement and validate off-the-shelf deep learning code to predict skill labels and skill scores
 - Develop and validate new deep learning algorithms
- **Deliverables:**
 - Minimum: Binary skill class label prediction
 - Maximum: 5-item label prediction
- **Size group:** 1 or 2
- **Skills:** Deep learning, computer vision, Python
- **Mentors:** Shameema Sikder & Swaroop Vedula
- **contact info:** swaroop@jhu.edu & ssikder1@jhmi.edu

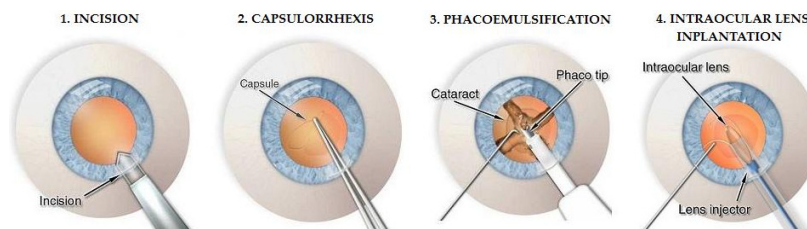
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Cataract Surgery 101



Narrated cataract surgery procedure:
<https://youtu.be/oCR-86CdC6l>
tiny.cc/cataract1

Acta Ophthalmologica, Volume: 94, Issue: A2, Pages: 1-34, First published: 25 April 2016, DOI: (10.1111/aos.13055)

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Currently Active Work in Cataract Surgery

PI: Shameema Sikder, MD Wilmer Eye Institute,
Swaroop Vedula, MBBS, PhD Pooled Professor's Fund*
Gregory Hager, PhD

Activity recognition (steps in surgery)
Video-based skill assessment for individual steps
Feedback on performance
(Crowdsourced skill assessments)

*Unrestricted research grant from Research to
Prevent Blindness to the Wilmer Eye Institute

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Skill in Capsulorhexis: Deep learning-based methods (code available)

Temporal Convolutional Network (TCN)



Keypoint prediction + TCN
Attention modules

One manuscript in review

Kim TS, et al. Int J Comput Assist Radiol Surg. 2019;14(6):1097-105.

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