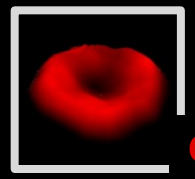

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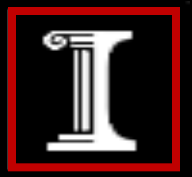

Intelligent Image Trigger Acquisition (IITA)

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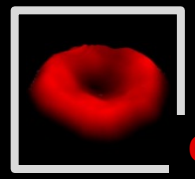
Outline

1. Background and Motivation
2. Imaging System Schematic
3. Network Architecture and Loss Plots
4. Trigger Workflow
5. Results and Demo
6. Summary and Future Work



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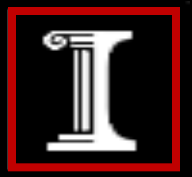

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Background

- Acquisition of frames that do not contain any information is a waste, both in terms of **time** and **storage space**.
- This is especially true when the cell cultures are **sparse** as most of the frames don’t have any cells at all or contain very few cells that provide no benefit to the analysis.
- Other triggers - **Live Cells**, **Cancer regions**, etc.

Motivation

Selectively picking which frames to acquire does not only save in storage space, but also aids biologists in only focusing on interesting frames - frames that meet a certain condition.

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Imaging System Schematic

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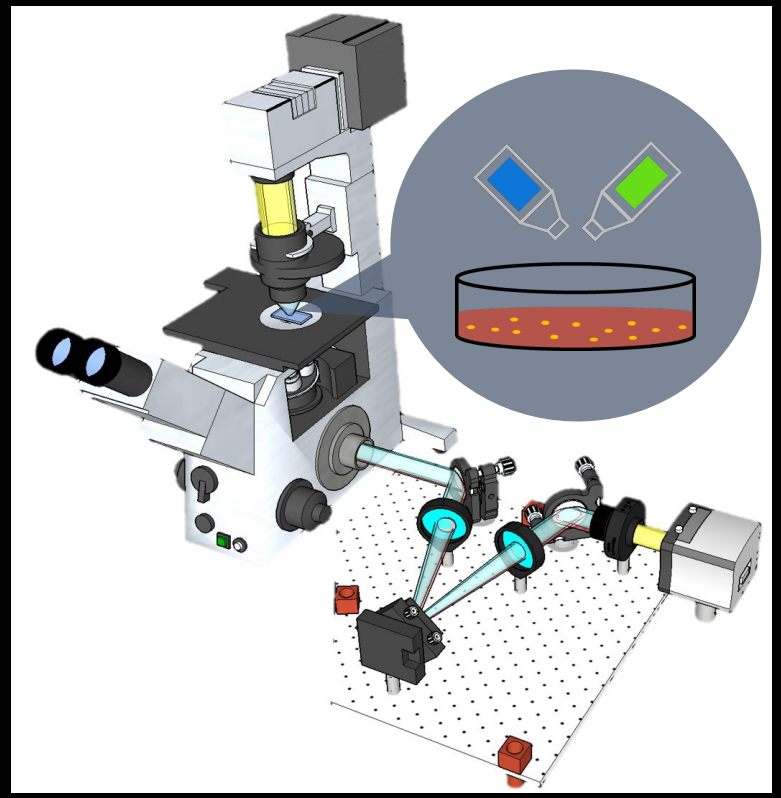

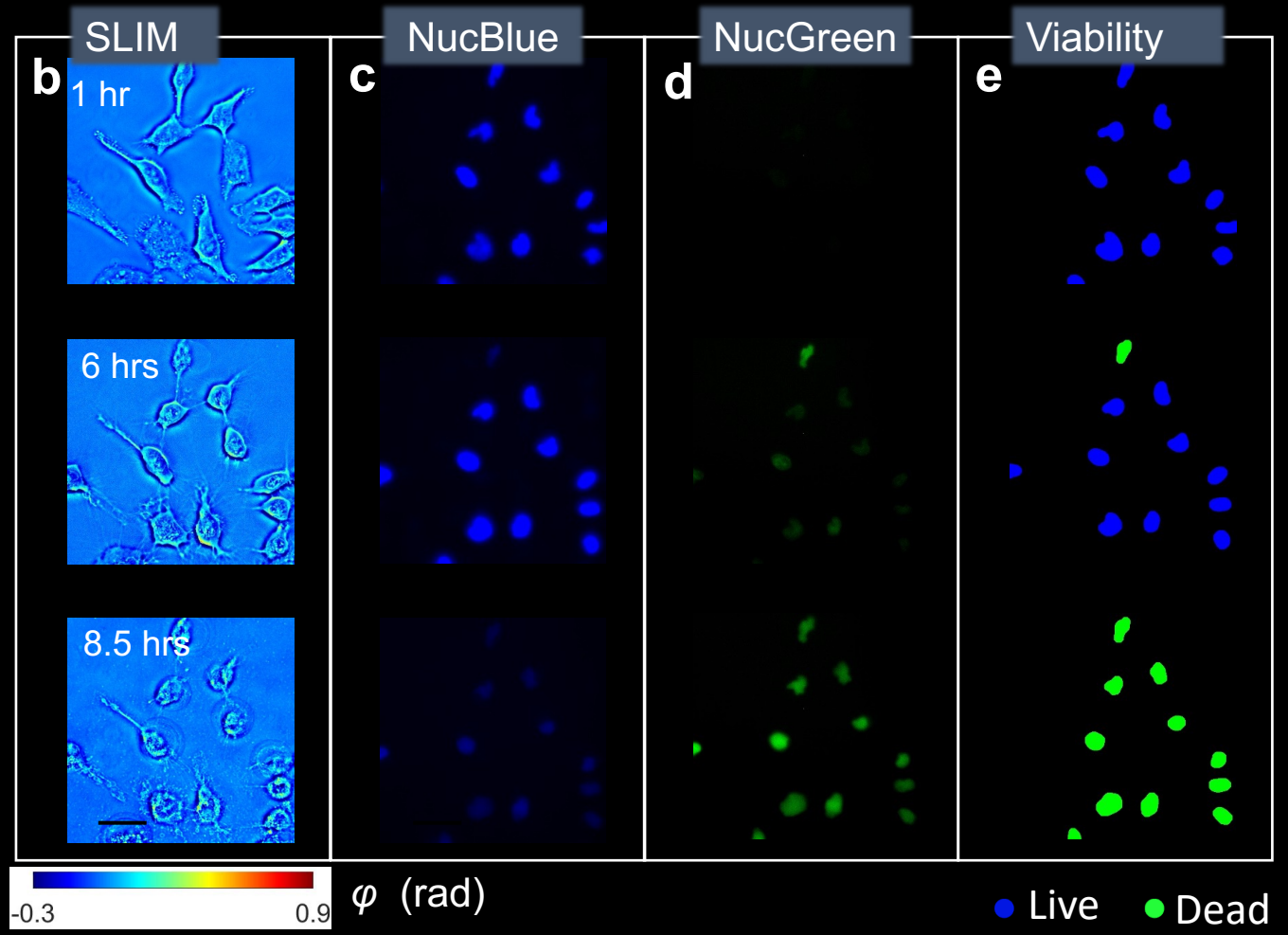

Hu, C., He, S., Lee, Y.J. *et al.* Live-dead assay on unlabeled cells using phase imaging with computational specificity. *Nat Commun* **13,** 713 (2022). https://doi.org/10.1038/s41467-022-28214-x

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Neural Network Design : Efficient U-Net

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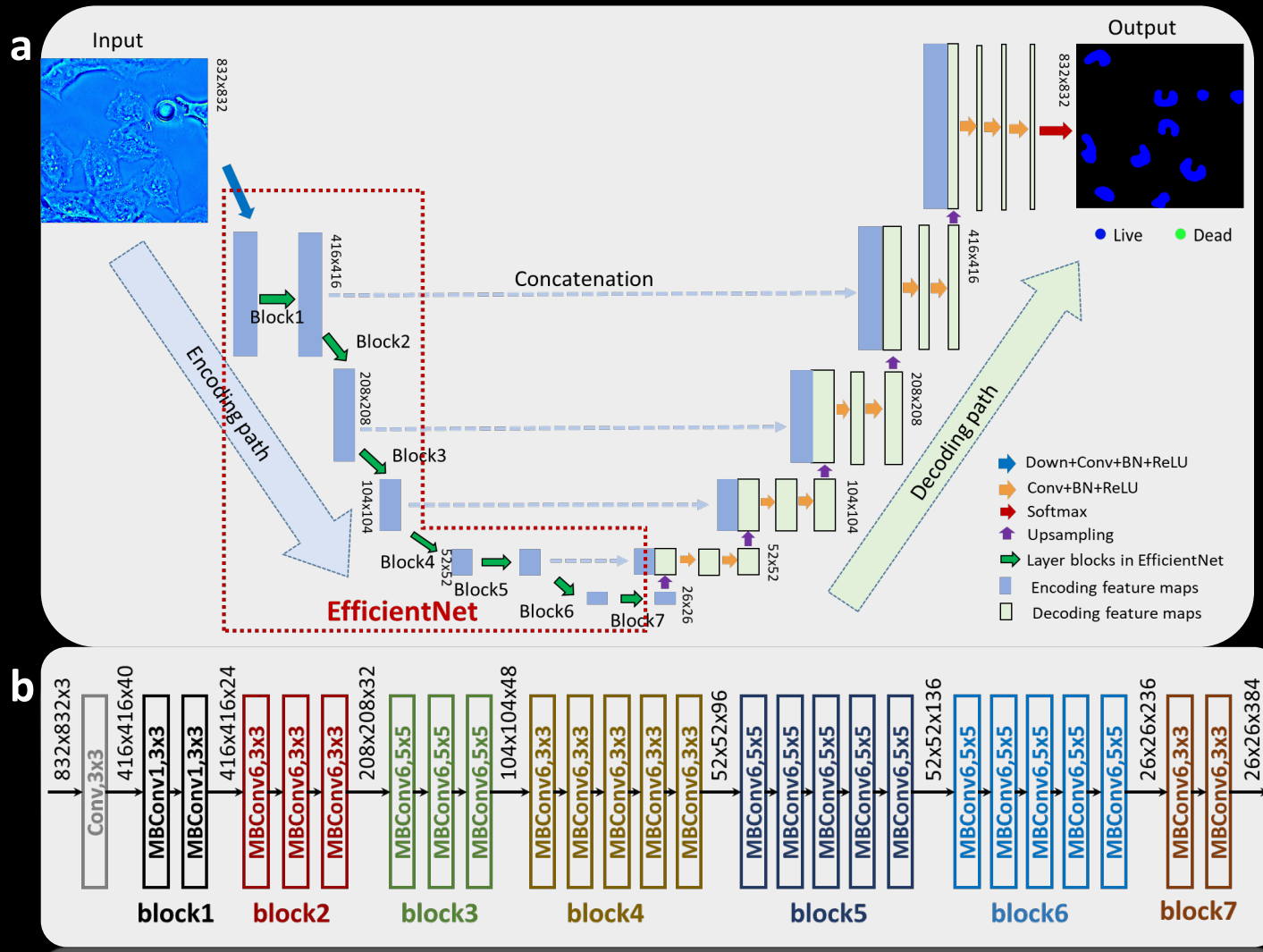
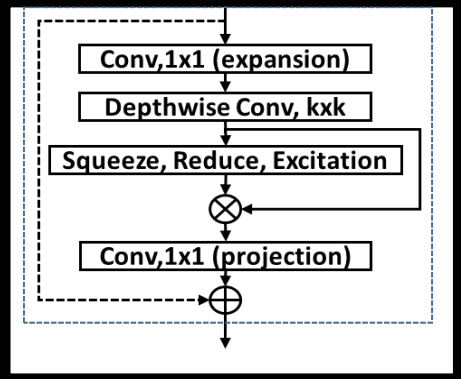
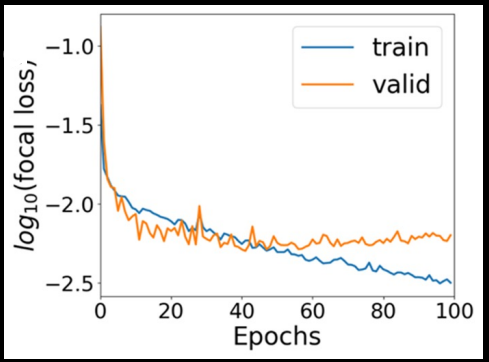
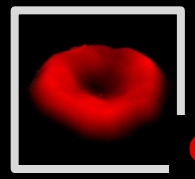






Efficient U-Net B5 Architecture with ImageNet pretraining and pre-processing for inference

Hu, C., He, S., Lee, Y.J. *et al.* Live-dead assay on unlabeled cells using phase imaging with computational specificity. *Nat Commun* **13,** 713 (2022). https://doi.org/10.1038/s41467-022-28214-x



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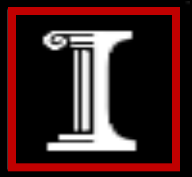

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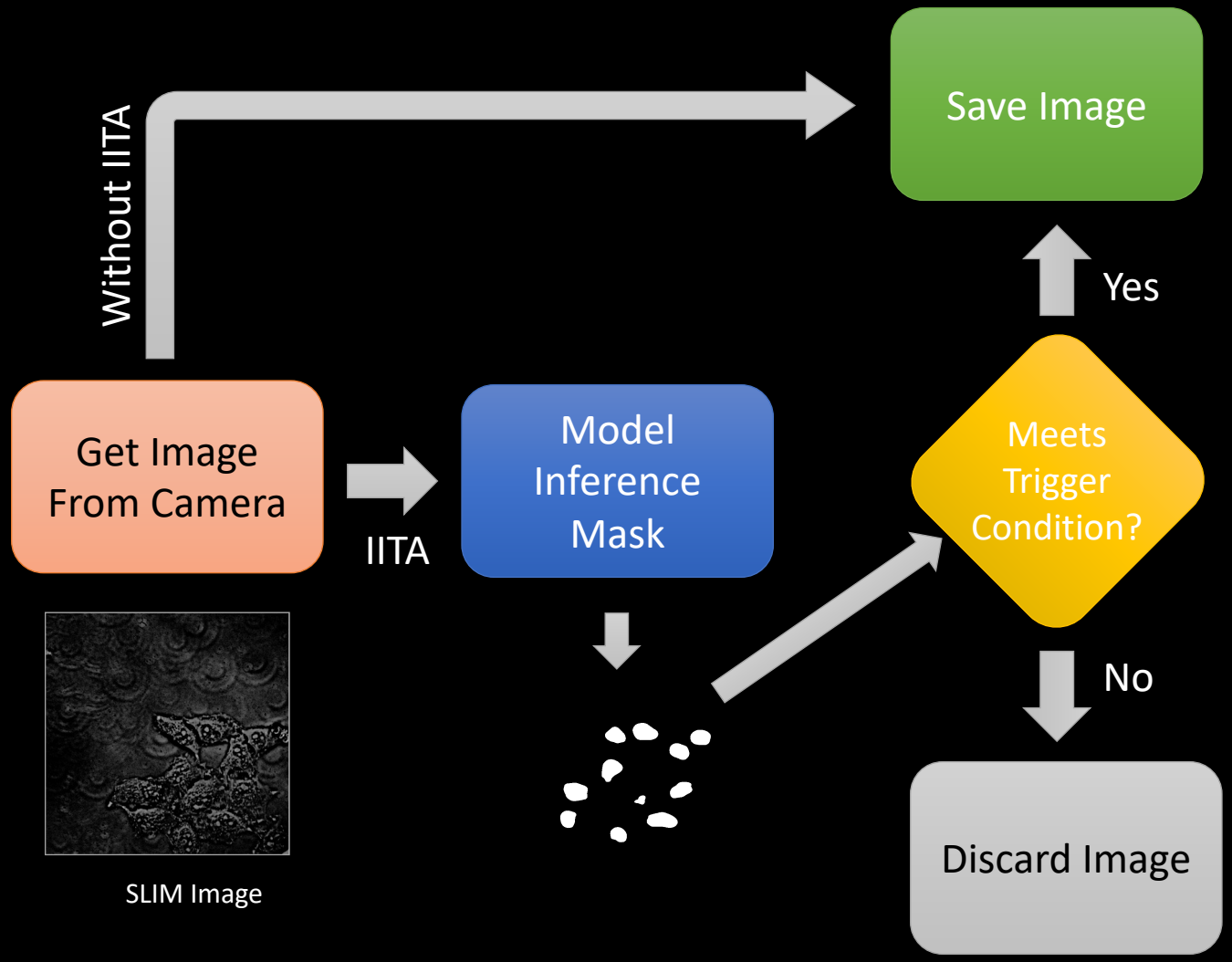
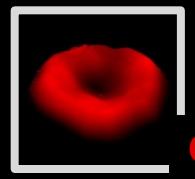
Trigger Workflow





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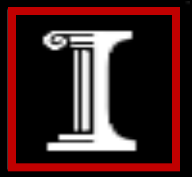

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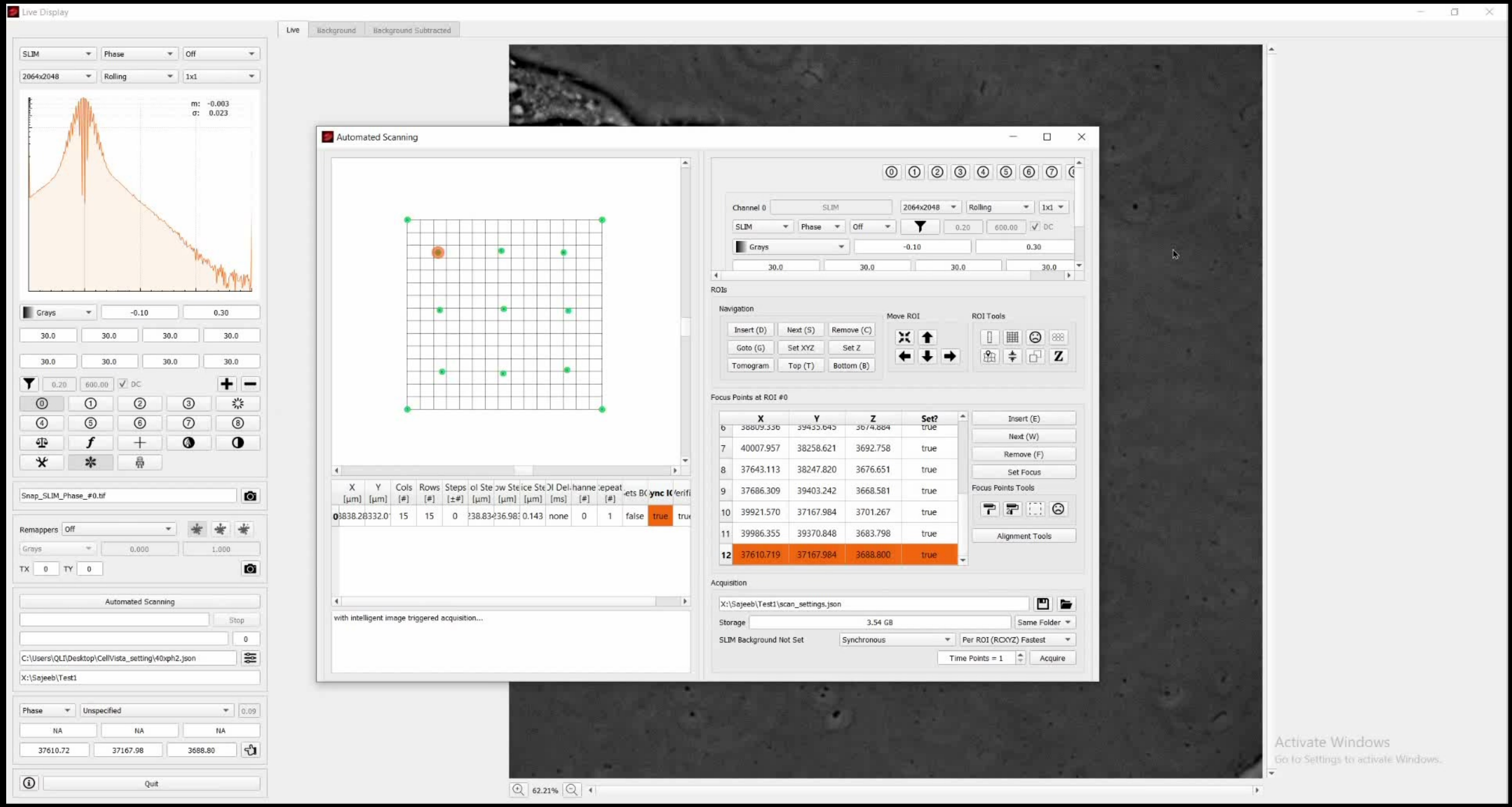
Results and Demo: Real Time



Trigger on 7 or more cells per FOV

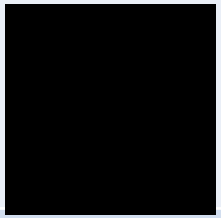
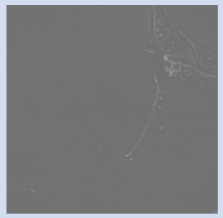
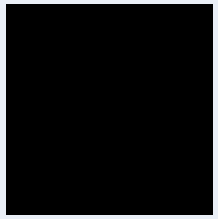
Image	Mask	Cell Count	Acquired in IITA Mode	Acquired in non-IITA mode
		7	Yes	Yes
		0	No	Yes
		4	No	Yes
		0	No	Yes

Image is out of focus

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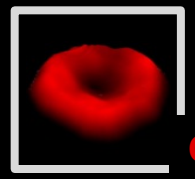

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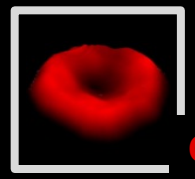
Summary and Future Work

- Intelligent Image triggered → intelligent microscopy systems
- Examples: confluency threshold, viability, cell count, etc
- Reduced analysis time/ effort, storage space, etc → real-time data curation

Future Plans

- More cell lines: e.g., neurons to study the effects drug treatment
- Extend to timelapse imaging: e.g., trigger when growth-cone forms
- Develop other triggers: culture confluency, cancer regions, etc



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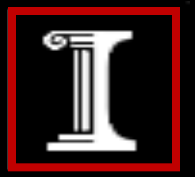

Acknowledgements

Quantitative Light Imaging lab

- Yuchen He
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- Shenghua He
- Edward M. Kong
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