

# The 3<sup>rd</sup> Summer School on AI-Powered Medical Imaging Informatics; Object Detection, Localization, and Classification in Medical Images

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## University of Pittsburgh AI Summer School 2025

The 3<sup>rd</sup> AI Summer School on Medical Imaging Informatics aims to provide a stimulating and unique opportunity for advanced high school students (grades 11–12) and early college learners to dive into the fascinating world of artificial intelligence (AI) and its application in medical imaging informatics. This summer school will be held Monday, June 9 through Friday, June 13, 2025, at the University of Pittsburgh. It is organized by the [Computational Pathology & AI Center of Excellence \(CPACE\)](#) within the School of Medicine, [Pitt HexAI Research Laboratory](#), the [School of Health and Rehabilitation Sciences](#), and IEEE Computer Society and IEEE Education Society at [IEEE Pittsburgh](#).

### Overview:

Computer vision as a subfield of AI has been around for several years dealing with how computers can understand digital images and video sequences. Advanced computer vision algorithms have already demonstrated successful applications in a variety of domains, including medical image interpretation, remote surgery, surveillance systems, security and biometrics, autonomous vehicles, and scene reconstruction. Medical imaging can use computer vision to tackle some exciting real-world problems. One of the most important is object detection and localization which trains AI to identify and pinpoint specific features in medical scans. Object detection and localization is now also widely associated with self-driving cars where automatic systems combine computer vision, LIDAR, and GPUs to generate a multidimensional representation of the road. This summer school will teach AI-powered computer vision techniques for object detection and localization in medical images. Through hands-on practices and Python programming, participants will learn from scratch, gaining practical skills to address this task. The program includes lectures and collaborative project assignments.

### Objectives:

The main objectives of this summer school are: (1) delivering a solid curriculum on AI-powered medical imaging informatics research, (2) enhancing the competitiveness of high school students for undergraduate level programs (e.g., computer science, data science, artificial intelligence), and (3) equip participants with the essential skills for pursuing professional careers in AI-powered medical imaging informatics.

### Program:

- **Dates:** Monday, June 9 to Friday, June 13, 2025.
- **Time:** 9:00am EDT to 3:00 pm EDT daily.
- **Address/Location (In-Person):** Forbes Tower, 3600 Atwood St, Pittsburgh, PA 15260. Room # 6048 (6<sup>th</sup> floor)
- **Zoom link (Online):** <https://pitt.zoom.us/j/99729095099>  
Meeting ID: 997 2909 5099  
Passcode: 1212
- **Cost:** \$0.00

- **Certification:** Upon successful completion of the summer school, students will receive a certificate of participation, recognizing their dedication and achievement in AI-powered medical imaging informatics.
- Web Page: <https://pitthexai.github.io/AISummerSchool>

### Prerequisite:

Basic Python programming (If not familiar with this prerequisite, follow the link here: <https://www.tutorialspoint.com/python/index.htm>)

### Topics included but not limited to:

- Introduction to AI and Introduction to Computer Vision
- Introduction to Deep Learning Computer Vision
- Deep Convolutional Neural Networks (CNNs)
- Introduction to Object Detection and Localization in Computer Vision
- Introduction to PyTorch
- Manual Annotation of Medical Images using the LabelImg Toolset
- Sliding Windows and Bounding Boxes in Object Detection, Non-max Suppression
- YOLO (You Only Look Once) and SSD (Single Shot Detector)
- Liner.ai; Liner is an end-to-end tool for training machine learning models without code

### Questions:

Questions should be sent to: Ann Vinski ([anv60@pitt.edu](mailto:anv60@pitt.edu)) and/or Nicole Myers ([ntm23@pitt.edu](mailto:ntm23@pitt.edu))

### Schedule:

Day	Time	Agenda	Speaker/Instructor
<b>Monday, June 9<sup>th</sup></b>	9:00 – 9:20	<ul style="list-style-type: none"> <li>• Opening Remark</li> <li>• Orientation</li> </ul>	Liron Pantanowitz, MD, PhD Ann Vinski, PhD
	9:20 – 9:35	<ul style="list-style-type: none"> <li>• Welcome Keynote</li> </ul>	Hooman Rashidi, MD, MS
	9:35 – 10:05	<ul style="list-style-type: none"> <li>• Introduction to AI</li> </ul>	Ahmad P. Tafti, PhD, FAMIA
	10:05 – 10:15	<ul style="list-style-type: none"> <li>• Break</li> </ul>	
	10:15 – 11:00	<ul style="list-style-type: none"> <li>• Introduction to Computer Vision</li> </ul>	Ahmad P. Tafti, PhD, FAMIA
	11:00 – 12:00	<ul style="list-style-type: none"> <li>• Digital Image and Digital Image Operation</li> </ul>	Ahmad P. Tafti, PhD, FAMIA
	12:00 – 13:00	<ul style="list-style-type: none"> <li>• Lunch (will be provided)</li> </ul>	
	13:00 – 14:00	<ul style="list-style-type: none"> <li>• Keynote; AI In medicine and Computational Pathology</li> </ul>	Matthew Hanna, PhD
	14:00 – 15:00	Hands-on-Practice: <ul style="list-style-type: none"> <li>○ Google Colab; What and Why?</li> <li>○ Basic Python Programming</li> <li>○ OpenCV; Open Computer Vision Library</li> </ul>	Ahmad P. Tafti, PhD, FAMIA Nickolas Littlefield, MS Fengyi Gao, MS
<b>Tuesday, June 10<sup>th</sup></b>	9:00 – 9:45	<ul style="list-style-type: none"> <li>• Keynote: Imaging and Digital Image Formation in Pathology Setting</li> </ul>	Lindsey Seigh, BS, M.Ed.
	9:45 – 10:30	<ul style="list-style-type: none"> <li>• Medical Image Filtering</li> <li>• Image Morphology</li> </ul>	Ahmad P. Tafti, PhD, FAMIA

		<ul style="list-style-type: none"> <li>Shape Analysis in Digital Images</li> </ul>	
	10:30 – 10:45	<ul style="list-style-type: none"> <li>Break</li> </ul>	
	10:45 – 12:00	<ul style="list-style-type: none"> <li>Introduction to Deep Learning Computer Vision</li> </ul>	Ahmad P. Tafti, PhD, FAMIA
	12:00 – 13:00	<ul style="list-style-type: none"> <li>Lunch (will be provided)</li> </ul>	
	13:00 – 15:00	Hands-on-Practice: <ul style="list-style-type: none"> <li>Image Operation in OpenCV</li> <li>Image Filtering in OpenCV</li> <li>Shape Analysis in OpenCV</li> </ul>	Ahmad P. Tafti, PhD, FAMIA Nickolas Littlefield, MS Fengyi Gao, MS
<b>Wednesday, June 11<sup>th</sup></b>	9:00 – 10:00	<ul style="list-style-type: none"> <li>Introduction to Deep Convolutional Neural Networks (CNNs) in Computer Vision</li> </ul>	Ahmad P. Tafti, PhD, FAMIA
	10:00 – 10:45	<ul style="list-style-type: none"> <li>Keynote: AI and evidenced based practice</li> </ul>	Rose Olson, DC, M.ed
	10:45 – 11:30	<ul style="list-style-type: none"> <li>Introduction to PyTorch</li> </ul>	Ghazal Mashhadiagha, MS
	11:00 – 12:00	<ul style="list-style-type: none"> <li>Keynote: Career Development in AI-Powered Healthcare</li> </ul>	Taylor Cronauer, MS
	12:00 – 13:00	<ul style="list-style-type: none"> <li>Lunch (will be provided)</li> </ul>	
	13:00 – 14:00	<ul style="list-style-type: none"> <li>Keynote; Generative AI in Medicine</li> </ul>	Yanshan Wang, PhD, FAMIA
	14:00 – 15:00	Hands-on-Practice: <ul style="list-style-type: none"> <li>Medical image annotation (manual annotation)</li> <li>LabelImg</li> <li>IoU</li> <li>ITK-SNAP</li> </ul>	Nickolas Littlefield, MS Fengyi Gao, MS
<b>Thursday, June 12<sup>th</sup></b>	9:00 – 10:00	<ul style="list-style-type: none"> <li>Sliding Windows</li> <li>Convolutional Implementation of Sliding Windows</li> <li>Bounding Box Prediction</li> </ul>	Nickolas Littlefield, MS
	10:00 – 10:15	<ul style="list-style-type: none"> <li>Break</li> </ul>	
	10:15 – 11:15	<ul style="list-style-type: none"> <li>Non-Max Suppression</li> <li>YOLO (You Only Look Once)</li> <li>SSD (Single Shot Detector)</li> </ul>	Azita Ramezani, MS
	11:15 – 12:00	<ul style="list-style-type: none"> <li>Liner.ai</li> </ul>	Fengyi Gao, MS
	12:00 – 13:00	<ul style="list-style-type: none"> <li>Lunch (will be provided)</li> </ul>	
	13:00 – 14:00	Keynote: Computational Social Science in Resilient Economy	Arezou Farzaneh, MS
	12:45 – 14:00	Hands-on-Practice: <ul style="list-style-type: none"> <li>Object Detection and Localization in Medical Images and Model Analysis (IoU measurement)</li> </ul>	Nickolas Littlefield, MS Fengyi Gao, MS

		○ Working with Liner.ai	
<b>Friday, June 13<sup>st</sup></b>	9:00 – 9:30	• Keynote: Recent Advances in Medical Imaging	Jamie Gramz
	9:30 – 9:45	• Description of the Team Project • Team Arrangement	Ahmad P. Tafti, PhD, FAMIA Nickolas Littlefield, MS Fengyi Gao, MS
	9:45 – 11:30	• Teams will be working on their projects	
	11:30 – 12:00	• Team Presentations	Ahmad P. Tafti, PhD, FAMIA Nickolas Littlefield, MS Fengyi Gao, MS
	12:00 – 13:00	• Lunch (will be provided)	
	13:00 – 14:15	Team Presentations	Ahmad P. Tafti, PhD, FAMIA Nickolas Littlefield, MS Fengyi Gao, MS
	14:15 – 15:00	• Certificate of Participation • Closing Remark	Hooman Rashidi, MD, MS Bambang Parmanto, PhD David C. Beck, EdD Kathleen Kelly, PhD Ann Vinski, PhD Nicole Myers, MS, RN Michele Viola Ahmad P. Tafti, PhD, FAMIA

#### Organizing Committee

- Ahmad P. Tafti, PhD, FAMIA
- Hooman H. Rashidi, MD, MS
- Liron Pantanowitz, MD, PhD

#### Program Directors

- Ann Vinski, PhD
- Nicole Myers, RN, MS