Summer Student Research Program
Project Description

**FACULTY SPONSOR'S NAME AND DEGREE:** ***Yingda Xie, MD***
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**PROJECT TITLE (200 Characters max):**

***Imaging Signatures of Early TB***

## HYPOTHESIS:

***Our central hypothesis is that an imaging-based signature can detect early TB at or above the WHO target performance profile.***

## PROJECT DESCRIPTION **(Include design, methodology, data collection, techniques, data analysis to be employed and evaluation and interpretation methodology)**

***High resolution imaging such as computed tomography (CT) is a powerful tool to capture tuberculosis (TB) radiomic features and clinically-relevant treatment responses to TB. We apply advanced machine learning approaches to determine CT imaging phenotypes that detect early TB lesion anatomy, heterogeneity, and disease evolution.***
***Using artificial intelligence (AI) we will train field-deployable computer aided detection algorithms (CADs) to detect early TB in chest X-rays (CXRs). By integrating clinical and epidemiologic risk variables, deep learning methods, and imaging datasets of early TB in the model, we will improve the minimum target performance of a progression test. This CXR CAD will help clinicians make predictions for widespread TB screening and targeted preventive therapy with high accuracy and precision.***

**SPONSOR'S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:**

***Xie, Yingda L et al. "Xpert MTB/RIF Ultra versus mycobacterial growth indicator tube liquid culture for detection of Mycobacterium tuberculosis in symptomatic adults: a diagnostic accuracy study." The Lancet. Microbe vol. 5,6 (2024): e520-e528. doi:10.1016/S2666-5247(24)00001-6***

***Xie, Yingda L et al. "Fourteen-day PET/CT imaging to monitor drug combination activity in treated individuals with tuberculosis." Science translational medicine vol. 13,579 (2021): eabd7618. doi:10.1126/scitranslmed.abd7618***

***Xie, Yingda L et al. "Transmission of Mycobacterium tuberculosis From Patients Who Are Nucleic Acid Amplification Test Negative." Clinical infectious diseases : an official publication of the Infectious Diseases Society of America vol. 67,11 (2018): 1653-1659. doi:10.1093/cid/ciy365***

**IS THIS PROJECT SUPPORTED BY EXTRAMURAL FUNDS?**
**Yes ☐X or No ☐**
***(IF YES, PLEASE SUPPLY THE GRANTING AGENCY'S NAME)***

***NIH***

**THIS PROJECT IS: X☐Clinical X☐Laboratory ☐ Behavioral ☐ Other**

**THIS PROJECT IS CANCER-RELATED☐**

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**Please explain Cancer relevance**

**THIS PROJECT IS HEART, LUNG & BLOOD- RELATED** ☐
**Please explain Heart, Lung, Blood relevance**

**THIS PROJECT EMPLOYS RADIOISOTOPES** ☐

**THIS PROJECT INVOLVES THE USE OF ANIMALS** ☐
**PENDING** ☐ **APPROVED** ☐ **IACUC PROTOCOL #**

**THIS PROJECT INVOLVES THE USE OF HUMAN SUBJECTS** ☐**X**
**PENDING** ☐ **APPROVED X**☐ **IRB PROTOCOL # M Pro2020003026**

**THIS PROJECT IS SUITABLE FOR:**

| | | | |
|---|---|---|---|
| UNDERGRADUATE STUDENTS | ☐ | ENTERING FRESHMAN | ☐ |
| SOPHMORES | ☐ | ALL STUDENTS | X ☐ |

**THIS PROJECT IS WORK-STUDY:** **Yes** ☐ **or** **No** ☐**X**

**THIS PROJECT WILL BE POSTED DURING ACADEMIC YEAR**
**FOR INTERESTED VOLUNTEERS?:** **Yes** ☐ **or** **No** ☐**X**

**WHAT WILL THE STUDENT LEARN FROM THIS EXPERIENCE?**

***The students will have the opportunity to gain hands-on experience in medical imaging analysis, clinical research, and data management. They will learn CT scan segmentation techniques, identifying anatomical structures and abnormalities using specialized software. They will also develop chest X-ray interpretation skills, recognizing key radiological findings relevant to conditions like tuberculosis. Additionally, students will engage in clinical data management using REDCap, designing and handling Case Report Forms (CRFs) while ensuring data quality and compliance with research protocols. This experience provides a unique intersection of imaging, data science, and clinical research, preparing students for careers in medicine, radiology, or biomedical informatics.***