

Thesis Project Portfolio

Volumetric Assessment of Pulmonary Artery Thrombus Burden
(Technical Report)

**Digitizing the Tapestry of Teaching: An Investigation into the Integration of Technology in
Education through the TPACK Framework**
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

My capstone research addresses the significant challenge of accurately quantifying thrombus burden in pulmonary arteries, a critical factor in the management and treatment of pulmonary embolism (PE). Current methods fall short in providing precise and timely assessments, often leading to suboptimal patient outcomes in a condition that significantly impacts mortality and morbidity. To address this issue, my team has developed an advanced AI-based imaging analysis software that utilizes deep learning techniques, specifically a U-Net architecture, to perform volumetric analysis of thrombi from computed tomography (CT) scans.

The integration of this technology into clinical practice necessitates consideration of both human and social dimensions, such as user acceptance, workflow integration, and impacts on patient care. These factors are crucial for ensuring that the technology not only performs well technically but also aligns with the practical and ethical standards of medical practice. Actor-Network Theory (ANT) serves as the primary theoretical lens to analyze these aspects, highlighting how various actors—both human and non-human—interact and influence the technology's adoption and effectiveness.

Structured surveys and observations were used to gather data on educators' perceptions and interactions with technology at Gaithersburg High School and Stone Ridge School of the Sacred Heart. This approach provided a nuanced understanding of the barriers and facilitators to technology integration within these distinct public and private educational environments, respectively.

There are significant opportunities for technology to enhance educational outcomes, but actual integration is often hampered by challenges related to resources, institutional support, and the specific educational context. These insights are crucial for informing the development and implementation of educational technologies, ensuring they are effectively adapted to meet the needs and conditions of different educational environments.

When considering the implications of my undergraduate thesis, it is evident that technological innovations in medical imaging can substantially improve clinical outcomes by providing more accurate and reliable diagnostic tools. However, the success of such technologies is contingent upon their integration into the complex sociotechnical systems within healthcare settings. Similarly, in education, the effective use of technology depends not just on the tools themselves but also on a supportive infrastructure and a holistic approach that considers the various human factors involved. Both domains demonstrate the need for a multidimensional approach to technology implementation that considers technical capabilities, user needs, and the broader social and institutional context. This integrated perspective is essential for realizing the full potential of technological advancements in both healthcare and education, potentially transforming practices and outcomes in significant ways.