Real-time Procedural Visual Aids

ELECOMP Capstone Design Project 2025-2026

Sponsoring Company:

Boston Scientific
300 Boston Scientific Way
Marlborough, MA 01752
Advancing Science for Life - US - Boston Scientific

Company Overview:

Boston Scientific Corporation (BSC), headquartered in Marlborough, Massachusetts, is a biomedical/biotechnology engineering firm and multinational manufacturer of medical devices used in various interventional medical specialties. These specialties include:

- Interventional radiology
- Interventional cardiology
- Peripheral interventions
- Neuromodulation
- Neurovascular intervention
- Electrophysiology
- Cardiac surgery
- Vascular surgery
- Endoscopy
- Oncology
- Urology

Boston Scientific is dedicated to transforming lives through innovative medical solutions that improve the health of patients around the world. Our core values of Caring, Meaningful Innovation, High Performance, Global Collaboration, and Diversity; guide our work, define our culture, and empower our employees.

With 48,000 employees worldwide**,** Boston Scientific invests significantly in research and development, with $1.4 billion allocated to R&D. We offer 15,000+ products that change lives and treat over 37 million patients each year across 140 countries.

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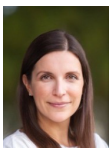

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Project Motivation:

Endoluminal surgery (ELS) is an evolving clinical space in advanced endoscopy. Procedures require significant clinical knowledge, concentration, skill and dexterity, and advanced tools to complete in a safe and effective manner. Real-time visual aids to help ease the burden of the physician / endoscopist are needed to minimize training and barrier to entry, cognitive load, and likelihood of complications or mistakes.

The ELS Procedural Visual Aids project is aimed to analyze endoscopic video records of existing ELS procedures like full-thickness resection (FTR), endoscopic submucosal dissection (ESD), endoscopic mucosal resection (EMR), peroral endoscopic myotomy (POEM) and variants, polypectomy, hemostasis, and other procedures. Technical advisors will provide conceptual visual aids and clinical background for students to explore technical solutions, prioritization of concepts will be based on existence of similar solutions, benefit to physician and patient, technical feasibility, and ease of implementation (no hardware changes preferred).

The utilization of software, coding, artificial intelligence (AI), image analysis, and other technical suggestions by the team may be used on provided procedure videos. Familiarity with procedures and medical devices will be learned throughout the project but there is no expectation of integration into current products; feasibility should be done with a combination of university and company tools and equipment.

Anticipated Best Outcome:

The Anticipated Best Outcome (ABO) of the ELS Procedural Visual Aids is:

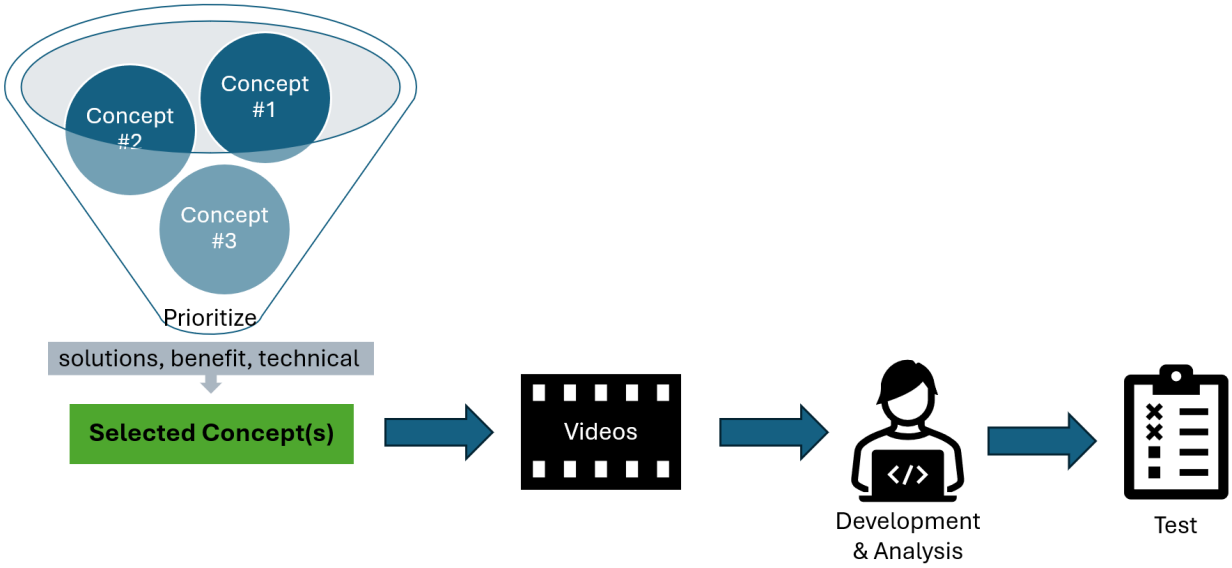
1. Provide proof-of-concept solution(s) to prove feasibility of real-time visual aid concepts
2. Recommend possible technology modifications or enhancements to support concepts

Project Details:

Overall system concept:
URI Capstone team and Boston Scientific Inc. team to work jointly to establish overall system concept, including:

- Scope of the initial effort
- Selection of appropriate concepts
- Optimal approaches for coding, databases and networking
- Training or analysis of program on provided procedural videos
- Overlay of visual aids to highlight relevant clinical information to user/physician
- Testing of visual aids on additional videos
- Identification of hardware upgrade suggestions
- Potential future efforts

Block Diagram:



Initial list of concepts; URI Capstone team and Boston Scientific Inc. team to work jointly to develop further.

Hardware/Electrical Tasks:

- Investigate requirements for hardware, processors, servers, databases, peripherals necessary to run software/code
- Recommend possible technology enhancements to improve existing software/code

Firmware/Software/Computer Tasks:

- Draft software/code that automates image/video recognition
- Develop AI or algorithm that identifies recognized image/video for features and patterns related to real-time visual aid concepts
- Overlay the real-time visual aid onto video

Composition of Team:

2 Computer Engineers

- URI Capstone: Primarily Computer Engineers, but possible Electrical Engineers with high computer engineering skills
- Boston Scientific Inc: Fellow Engineer/Manager (team lead) and necessary supporting Project Engineers and Product Manager

Skills Required:

Electrical Engineering Skills Required:

- NA

Computer Engineering Skills Required:

- Coding & Programming; including but not limited to some or all of the following - JavaScript, Python, Java, TypeScript & C#
- Knowledge and experience in the software development lifecycle (SDLC) – planning, prototyping, testing, deploying & maintaining
- Secure coding – knowledge of common vulnerabilities and countermeasures o Cryptography – secure coding, common security techniques & methods
- Code reviewing – ability to review and understand existing coding
- Artificial intelligence, machine learning, image analysis, image modification and overlay
- Database knowledge – SQL, NoSQL, etc., knowing how to query and effectively store big data
- Communication skills: Ability to perform and effectively communicate within a team structure
- Resilience – the ability to knuckle down, work under pressure and roll with the punches

Anticipated Best Outcome's Impact on Company's Business, and Economic Impact

This software will provide an initial feasibility and proof-of-concept that can eventually be integrated into existing or future products to provide advanced endoscopists in ELS visual aids that reduce cognitive burden, enhance anatomical identification, reduce clinical complications, and provide value to the physician and patient. Boston Scientific manufacture's many medical device products that could be integrated with the project for future upgrades and new features.

Broader Implications of the Best Outcome on the Company's Industry:

Some visual aids exist in endoscopy or are in development in the industry, Boston Scientific would like to be a leader in this area to provide customers with the necessary solutions to efficiently perform the respective procedures. Endoluminal surgery is rapidly growing and becoming more complex, providing a visual aid solution will help ELS grow and make procedures adopting quicker or allow for advancement on new procedures.