Project title: "Developing AI and Computer Vision Tools for Diagnosis and Monitoring of Cutaneous Angiosarcoma and Rare Skin Malignancy"

Project Summary:

Cutaneous angiosarcoma (cAS) is a rare, aggressive malignancy with poor prognosis, challenging diagnosis, and high recurrence rates. In addition, rare skin malignancies—including in-transit melanoma metastases, radiotherapy-associated sarcomas, and dermal involvement in advanced breast cancer—exhibit clinical heterogeneity and are often difficult to diagnose and monitor.

This PhD project will develop novel artificial intelligence (AI) and computer vision tools to improve detection, delineation, and monitoring of such malignancies. Using a rich dataset from the Royal Marsden Hospital, comprising annotated clinical photographs of angiosarcoma and associated metadata from these and other rare skin cancer patients, the project will construct high-fidelity segmentation models based on diffusion and transformer architectures. These models will be designed to function across primary, recurrent, and therapy-altered disease states.

Optimised imaging protocols and viewpoint-aware diagnostic frameworks will be explored to standardise image acquisition. Synthetic data generation will be employed to overcome the inherent rarity and diversity of disease appearances. Furthermore, 2D imaging will be integrated into 3D reconstruction workflows to visualise disease extent and therapeutic response, enabling augmented reality-based visual tools for surgical planning and patient education.

The project will leverage established industry collaborations with Holocare for augmented and mixed reality integration, and incorporate existing proprietary algorithms developed at RMH/ICR. It will also evaluate novel biosensor platforms in collaboration with engineering partners (e.g. Ladame Laboratory in Imperial College) to support multimodal diagnostics and assessment.

Grounded in patient and public involvement (PPIE), this work will contribute open-source tools and datasets. It aims to deliver clinically integrated diagnostic solutions, improve personalised treatment planning, and lay the foundation for AI-driven stratification in clinical trials targeting rare and complex cutaneous malignancies.

Supervisory Team:

1. Mr. Myles Smith, Consultant Surgical Oncologist, Royal Marsden Hospital; Reader at ICR
2. Dr. Stamatia Giannarou, Lead Cognitive Vision in Robotic Surgery Lab, Senior Lecturer at the Hamlyn Centre for Robotic Surgery (Department of Surgery & Cancer), Imperial College
3. Prof. Andrew Hayes, Consultant Surgical Oncologist, Royal Marsden Hospital; Professor at ICR

Clinical Specialities:

General surgery, surgical oncology, breast surgery, plastic surgery, dermatology