This studentship is linked to an exciting new Doctoral Training Initiative "UK Semiconductor Industry Future Skills" (UK-SIFS). UK-SIFS will provide valuable and highly practical skills relevant to the UK semiconductor industry such as formal cleanroom fabrication training, vacuum systems, process control (six sigma) in semiconductor manufacturing, semiconductor supply chains and export control, semiconductor packaging, and technology translation in the semiconductor sector. This PhD will be part of two cohorts of students in 2024 and 2025 across Swansea University and the University of Leeds, the Royce Institute, and partners including KLA, and the National Physical Laboratory (NPL), amongst others. Our partners will co-deliver the training content, plus co-supervise PhD research projects, and supervising a programme of secondments at partner sites. UK-SIFS provides not only the considerable benefits of research training and collaboration across a multidisciplinary cohort working in areas such as semiconductor devices, device characterisation and metrology, power electronics, clean energy, bioelectronics and sensing, THz devices, optoelectronics, molecular semiconductors, quantum technology, electronic glass and advanced heterogeneous integration, but is also a unique opportunity for those students who may want to connect closely with the semiconductor and related industries for their PhD and aspire to be the future leaders of the sector in the UK and beyond.

The project focuses on optimizing device processes and predicting defects using KLA metrology tools, and employing data-driven machine learning that embrace human-in-the-loop learning. These innovative approaches facilitate have the potential for early identification of wafer materials and device process-induced defects, reducing costs and enhancing power device yields in automotive applications.

The PhD will seek to establish state-of-the-art defect prediction in new materials. This will need to consider creating models from; low volumes of data, methods such as transfer learning (from large volume data on silicon devices); and one-shot learning; or hybrid data-driven combined with analytical modelling techniques.

The predicative models will aim to target material and process-induced defects, mapped using KLA tools, – increasing knowledge of new material device defects, their impacts on utility and reliability and ultimately reducing process costs and improving power devices yields in automotive applications.

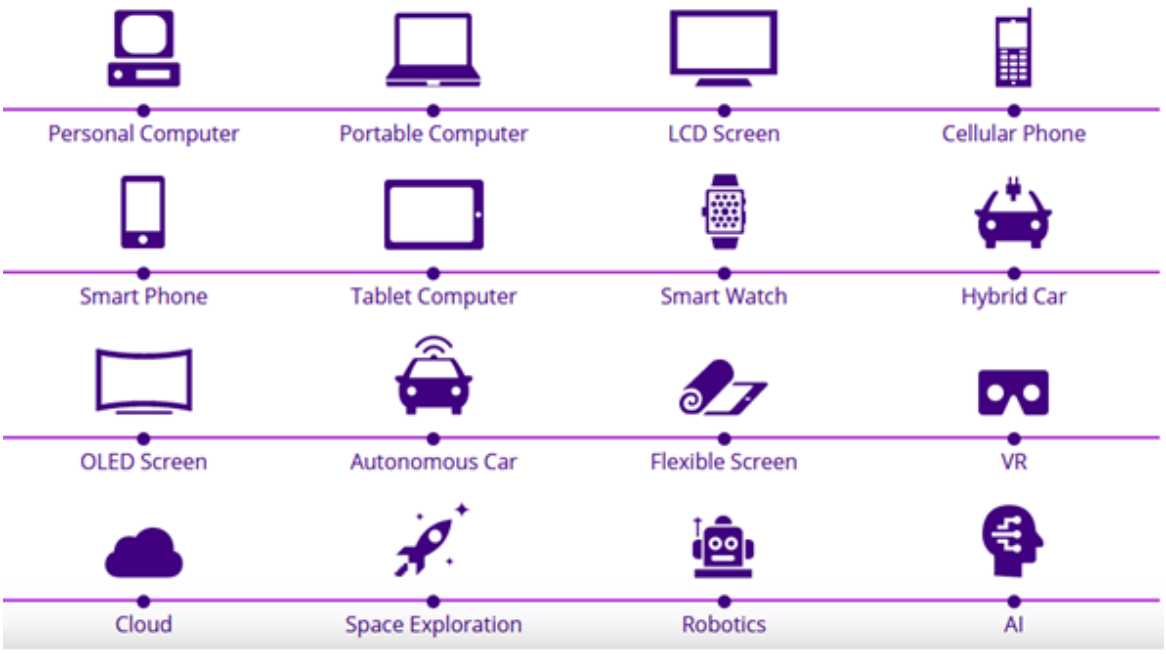

Figure 1: Applications using semiconductors and SPTS / KLA technology.

This key strategic project, combines expertise from Computer Science, Electrical Engineering and Mechanical Engineering. The PhD is sponsored by KLA, a strategic partner in Swansea's Centre for CISM and Compound Semiconductor Cluster – the UK's largest semiconductor cluster. The PhD offer excellent career prospects for applicants targeting the global semiconductor industry, with opportunities for international travel.

KLA is undergoing a huge expansion in South Wales and this project is critical in strengthening KLA's strategic relationship with Swansea.

This PhD project is also twinned with a PhD at the National Physical Laboratory (NPL) in a UK strategic drive around semiconductor defects.