

**University of Glasgow**  
**Fioranelli**  
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### **University Partner**

University of Glasgow

### **Academic Supervisor - Name and Email Address**

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### **Suggested Project Title**

Recovering losses: transfer and dictionary learning for restoring damaged radar/RF data

### **Suggested Project Summary**

This project will investigate techniques to make radar systems and their data more resilient to the loss of data for malfunctioning, accidental interference, and active jamming. With the increasing number of transceivers and radar systems, for example on autonomous cars or integrated in IoT and 5G based devices, the likelihood of mutual interference becomes rather high, i.e. the situation where two or more users mutually damage their data. This can have detrimental effect on the performance and capabilities based on those data, for example to detect, track, and classify targets and provide situational awareness. Novel techniques from the machine learning community can potentially help restore these missing data based on manipulation of data and knowledge previously acquired (like people, able to recognise a known or expected face even if part of it is covered by a hat), and keep acceptable performance. The student will perform a mix of software development and experimental validation work in this project. Novel implementation and adaptation of these techniques to the specific format and characteristics of radar data will be needed, and these will have to be validated with experimental work using the radar and software defined radio platforms available in the research group.

### **Collaboration Sought for the Project**

We would welcome inputs of two kinds. First, applications and users-case scenarios, given that radar/RF sensing is becoming ubiquitous (automotive radar, autonomous vehicles for automation of robots or agriculture, gesture recognition for smart devices, estimation of healthcare parameters from gait to respiration, heartbeat and blood pressure). Second, inputs from machine learning perspective. As radar/RF engineers, we sometimes use machine learning tools without a full and comprehensive understanding of its potential and how to develop novel algorithms that can suit a specific application.

## **Benefit to the Industry Sponsor**

With the current technological development, radar and RF sensing is generating smaller yet more powerful devices for a variety of sensing applications. So there is wide scope for innovation (and perhaps patents) in terms of products/service based on this technology, which is no longer limited to traditional long-range defence and security. At the same time, expertise in radar/RF sensing (hardware and signal processing) is not widespread, but in our research group at Glasgow University we can provide and contribute that.