

Diamond

Introduction

It is often said that the jobs of tomorrow do not even exist today.

DIAMOND embraces this challenge by building a **Doctoral Training Network** designed to equip a new generation of researchers with the skills to thrive in the fast-evolving world of computing, sensors, and their transformative applications across multiple sectors.

At the heart of DIAMOND lies the convergence of cutting-edge activities – **advanced sensing, edge computing, Internet of Things** and **artificial intelligence** – brought together in a uniquely interdisciplinary environment.

The network focuses on new ways of monitoring and interacting with the world around us, from smart infrastructure and intelligent machines to asset tracking and beyond, where **AI-powered edge technologies** will play a crucial role in shaping the future.

The DIAMOND consortium brings together leading partners from **academia and industry**, fostering strong collaboration and knowledge exchange to advance both **fundamental research** and **real-world innovation**.

The project is coordinated by **University College Dublin**, with participation from **Politecnico di Milano** (Polimi), **Loughborough University** (UK), **University of Bologna** (Italy), **University of Thessaly** (Greece), **University of Oulu** (Finland), **Queen's University Belfast** (Northern Ireland), and **Eidgenössische Technische Hochschule Zürich** (Switzerland).

Introduction

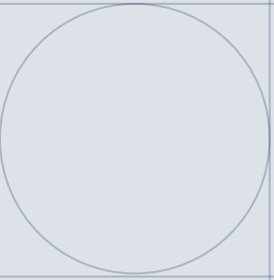
The industrial partnership within **DIAMOND** is exceptionally strong, featuring leading companies and institutions from across Europe. Among them are **Ramboll** (Denmark), **Commissariat à l'Énergie Atomique et aux Énergies Alternatives** (France), **Microflow AVISA** (Netherlands), **Arteria** (Italy), **Pragma IoT AE** (Greece), **Stryker European Operations Limited** (Ireland), **STMicroelectronics** (Italy), **Innatera Nanosystems** (Netherlands), **AVL** (Austria), the **Ministry of Cultural Heritage** (Italy), **Hyundai Motor Europe** (Germany), and **IBM Zurich** (Switzerland).

The project will host **16 highly talented doctoral researchers**, each working on cutting-edge applications spanning **industrial and civil engineering**, **cultural heritage preservation**, and **biomedical devices**. They will operate in a truly **interdisciplinary and inspiring environment**, where collaboration across sectors and disciplines fuels innovation and scientific excellence.

The two positions enrolling at POLIMI will be devoted to two important applications:

- new approaches in SHM of civil structures (mainly at Polimi)
- cultural heritage asset tracking (mainly at Arteria)

Arteria is a world leader in the transportation of artworks, having a wide experience and a deep technical background to face new and challenging projects



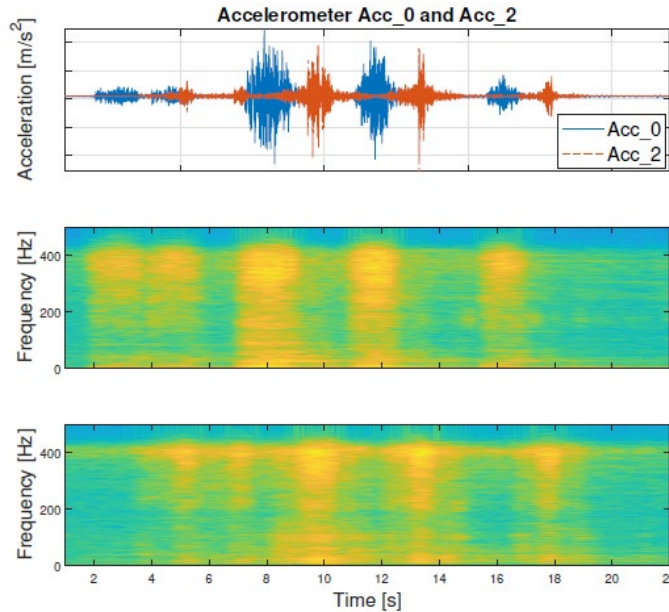
PhD: position 1

PhD position 1: description

Structural Health Monitoring is a well-known approach to assess infrastructure health. In its leading idea, it tries to mimic the human behavior: humans have sensors, a network leading data to the brain, where they are immediately evaluated with the immediate possibility to react for safety, recovery, risk reduction. Electronic systems are not so prompt, but they are more careful than humans. The step forward we want to move in this project is as if a human hand were able to manage data and take decisions, bypassing the brain. Cleverness is therefore distributed in many different parts inside the human body, reducing every request poll to the central unit to a minimum information flow. The project will deal with local sensor fusion approaches, with a special care to the possibility of inferring traffic induced loads, at the same time bypassing the complex installation and management of Weigh in Motion (WIM) systems.

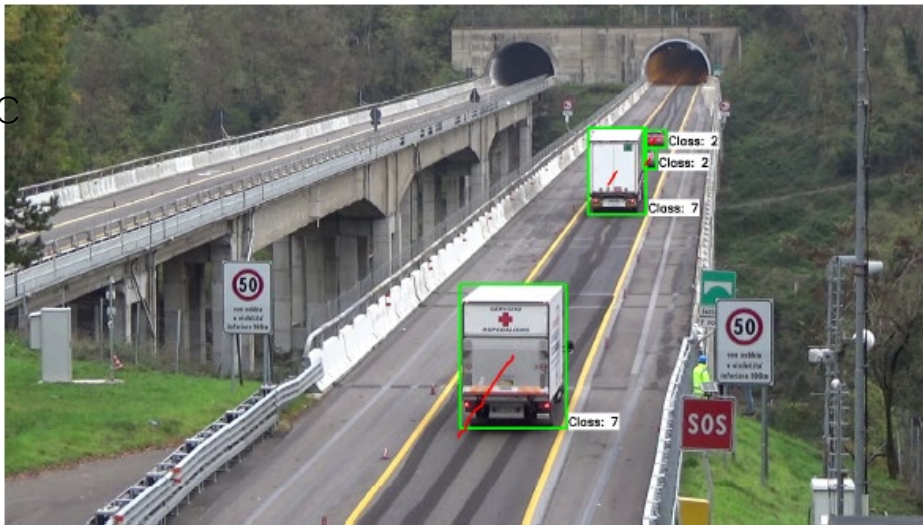
This will require sensing and instrumentation skills, AI, software and structural basic knowledge to master the new powerful tools to get to a working prototype, to add some new “bricks” in building efficient monitoring systems. ST Microelectronics, partner of the project, will offer support to the development of the project.

PhD position 1: new approaches for SHM; sensor fusion substituting WIM



Accelerations recorded on joints

Vehicle automatic recognition



PhD Enrolment: Politecnico di Milano

Duration: 36 Months

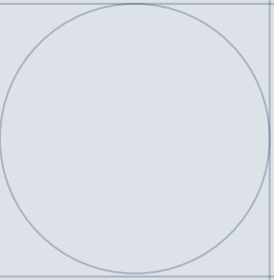
Secondments:

Host: Ramboll Dk, Tobias Friis; **Host:** University of Thessaly, Costas Papadimitriou

Decentralized Cumulative Damage for Novel Smart Bridges

Context

Estimating the weight of vehicles in transit, known as Weigh In Motion (WIM), is not just important for freight but also for estimating features from these responses to be related to bridge structural health monitoring (SHM) and similar infrastructure. Several challenges exist in road infrastructure SHM and using vehicular passage to estimate their health, including uncertainty bounds and variabilities from sensors/detection tools. The variabilities adversely impact historically calibrated results or degradation scenarios.



PhD: position 2

PhD position 2: description

Artworks are getting higher attention due to the increasing interest in cultural heritage, with a lot of new expositions being advertised everyday. In turn this requires the need to develop new tools, mainly aiming at the improvement of safety and security, from theft, from accidental actions, from vibration threats, always addressed in the official documents, but with few or no recommendations at all.

Moving and showcasing precious artworks is becoming a challenge and it is thought that the new tools of edge sensing can offer a giant step forward in their control, as distances are a major issue and do not allow the deployment of traditional monitoring sensing networks.

Arteria, the host institution for this PhD project, is a leading company worldwide for the transportation of artworks: the company not only moves crates, but is very much engaged in finding new tools to control the health status of artworks in showcases and during transportation: research spans from the choice of materials to the design of new structures offering protection of precious objects, at the same time taking care of the need to fight for a greener world, for instance trying to recycle the materials used for transportation. Although data loggers for transportation already exist it is thought that edge will offer the chance to have distributed cleverness and redundancies to increase safety and security levels, giving prompt information about any mechanical excitation reaching an artwork for any reason.

The PhD is required to have cross discipline skills in programming, sensing and instrumentation, in the design of new measurement systems, not excluding passion for art. STMicroelectronics will offer some technical support to the project, as well as the restoration school of the Italian Ministry of Cultural Heritage, which has already led projects on the effects of vibrations in recent years

Cultural heritage asset tracking

Moving precious artworks
(by ARTERIA)



Basic research
on the filtering
capabilities of
crates
(project
POLIMI-
ARTERIA)



PhD Enrolment: Arteria

Duration: 36 Months

Secondments:

POLIMI, Alfredo Cigada, Innatera, George Joseph

Local Sensing for Artworks

Context

The PhD candidate will demonstrate and develop open benchmarks on capabilities of edge sensing for cultural heritage with high cultural and commercial value, underpinning transformative digital transformation at the intersection of art and engineering.