UROP - Available Projects

The UROP is designed to support undergraduates studying at the University of Cambridge who are going to return for at least one more year of undergraduate study.

Final year undergraduates and postgraduate students should not apply.

Some projects with external funding have additional restrictions, such as those funded by EPSRC.

If you have any questions please contact Joe Goddard, Industrial Placements Coordinator, who administers UROP projects for the Department of Engineering.

Further information can be found below:

- Student click here.
- Staff click here.

Available Projects

Inertial Navigation on a Smartphone

Primary Supervisor Details

Professor David Cebon, Engineering, dc29@cam.ac.uk

Co-Supervisor

Professor Xiaoxiang Na, Engineering, xnhn2@cam.ac.uk

Project Description

Cambridge researchers have conducted extensive research into methods to help reduce energy consumption and carbon emissions of HGVs. Part of this work involves novel methods for measuring and analyzing vehicle performance in-service. A high-resolution data logging system has been developed for Android phones to monitor GPS location and speeds of vehicles, driver control inputs, fuel/energy consumption, engine torques and speeds, weather, traffic, etc.

The phone also measures accelerations and angular velocities as well as having a compass and gravity sensor. In principle, these sensors can be used to measure accelerations in the vehicle's frame of reference. But to achieve this, the relationship in 3D space between the vehicle's orientation and the phone's orientation needs to be known accurately.

There are a few open-source software projects that have used Android phones for inertial navigation ('dead reckoning'), with reasonable success. The approach taken for this project will be to implement the orientation component of one of those dead reckoning systems in the Android data logger, test its performance in the lab and in test vehicles and improve the system until the necessary accuracy is achieved. This will provide the student with some excellent experience with real-time Android programming, Android sensing, software engineering, experimentation, and analysis of experimental errors.

Essential Knowledge, Skills, and Attributes

This project will suit a 2nd or 3rd year student studying engineering, physics or mathematics, with an interest in navigation, geometry, and coding.

Timing

- Closing date 1st June
- UROP to take place from 1st July to mid/end September.

Supporting Information

Publication describing the data logger here: https://doi.org/10.1016/j.trd.2022.103501

Application Details

If you would like to apply, please send your CV and a short cover letter to Professor David Cebon, dc29@cam.ac.uk.

Deadline for applications: 1 June, 2026

Lorry Eco-Driving: Coasting Adviser

Primary Supervisor Details

Professor David Cebon, Engineering, dc29@cam.ac.uk

Project Description

Cambridge researchers have conducted extensive research into methods to help reduce energy consumption and carbon emissions of HGVs, through advanced eco-driving assistance. A phone app has been developed to advise drivers of opportunities to coast with zero energy consumption – such as over hills (‘gradient coasting’) and in the run-up to cross-roads and roundabouts (‘event coasting’). It can be used to reduce fuel consumption of diesel HGVs and to increase the range of electric lorries. Up to 15% reduction in fuel consumption has been achieved in a consistent and regular way in the most recent trial of the app. The drivers also retained good coasting performance after the app was taken away at the end of the trial.

The next stage of the project is to run an in-service trial with 25 truck drivers in collaboration with our industry partner Turners Transport, a leading UK fleet operator. The trial will run for six months, starting in the Autumn 2026.

This UROP project will involve 8-10 weeks work over the summer setting-up the trial vehicles, and drivers and planning the testing. The vehicles will be instrumented with high-resolution data logging systems that monitor GPS location and speeds, driver control inputs, fuel consumption, engine torque and speed, etc. The student will need to work closely with the industry partners.

For the right student, this UROP project can be followed by a Part IIB project spent analysing the test data. All the data collected by the trial will need to be processed and analysed to determine the effectiveness of the coasting adviser approach. The data will also be used to develop metrics that can warn drivers of safety-issues, like nearness to rollover.

Essential Knowledge, Skills, and Attributes

The student needs to be well organized, handy with a screwdriver and soldering iron and able to work with industry partners.

Timing

- Closing date 1 June, 2026
- July, August, September, Ideally 10 to 12 weeks

Continuation Opportunities

This UROP project is ideally linked to a 4th year project.

Application Details

If you would like to apply, please send your CV and a short cover letter to Professor David Cebon, dc29@cam.ac.uk.

Deadline for applications: 1st June, 2026

Bilt - novel low order physical systems modelling tool

Primary Supervisor Details

James Emberton, Aviation Impact Accelerator, Whittle Lab, Dept of Engineering

Project Description

Bilt is a novel low order computational modelling tool. We are developing a completely novel approach to support analysis of complex physical systems, in an accessible way, based on functional programming principles. This project is based at the Aviation Impact Accelerator at the Whittle Lab and supports work to de-carbonise aviation. However, we anticipate that the Bilt tool can be applied more generally in the world of systems modelling.

A number of potential projects are available depending on the student's skills and interests. These could include:

- design and evaluation of novel computational and static analysis infrastructure
- prototyping new physical systems toolboxes
- developing cloud compute and data workflows

This is an opportunity to help shape the future of a novel open-source computational tool with enormous potential.

Essential Knowledge, Skills, and Attributes

All projects require strong familiarity with Python as a minimum and a strong interest in sustainable aviation.

Depending on the project the following skills may be useful:

- Programming languages such as Rust, OCaml, or Haskell
- Knowledge of computational graphs, compilers, computer algebra, or functional programming
- Array computation (e.g. JAX), compiler infrastructure (e.g. LLVM), or symbolic mathematics (e.g. CasADi)
- A background in Chemical, Mechanical, Electrical, Aerothermal Engineering or Computer Science
- Interest in open-source software development

Timing

Applications will be assessed on a rolling basis

Any applicants will be expected to start their 8–12-week placement in July

Continuation Opportunities

There is potential to support continuation work for undergraduate thesis or MSc projects.

Supporting Information

https://aiazero.org/

Application Details

If you would like to apply, please send your CV and a short cover letter to Anna Petrosyan, ap2522@cam.ac.uk.