



**TRUSS**  
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TRUSS (Training in **R**educing **U**ncertainty in **S**tructural **S**afety) is a Marie Skłodowska-Curie Innovative Training Network funded by the European Union under the Horizon 2020 Programme. TRUSS is structured into taught modules combined with original and impactful research supported by secondments that will give the successful candidates significant insights and exposure to research and innovation in both academia and industry.

**EARLY STAGE RESEARCHER VACANCY:**

**ESR 14**



Project Title:

**REDUCTION OF UNCERTAINTY THROUGH REGULARIZED,  
AUTOMATED ROAD INSPECTION**

**Host**

University College Dublin (UCD)

**Address**

School of Civil, Structural and Environmental Engineering; UCD, Newstead, Belfield, Dublin 4

**Country**

Ireland

**Main Supervisor**

Prof. Debra Laefer

**Background**

*Road inspection, repair, and the affiliated time delays due to traffic jams can significantly impact a country's gross domestic product. To reduce these costs, an inexpensive, reliable, non-intrusive road monitoring is needed to enable local governing authorities to identify and monitor small road defects. Instead of large-scale repairs, the extension of a road's life could arguably be achieved with the allocation of substantially fewer resources. If this is achievable, it makes sense from several perspectives: economically – in terms of direct cash expenditure; and environmentally – in terms of only repaving where it is absolutely necessary. The key to such an approach is rapidly, regularly, and inexpensively acquiring such data and automatically detecting emerging defects. To address this problem from the ground is simply inefficient, as each kilometre of road would have to be driven for every inspection. Aerial laser scanning offers the necessary resolution for defect detection, but at a high cost per square kilometer (> €2,000/km<sup>2</sup>). This technology also requires aviation authority approval for each flight, thereby making regular data collection cumbersome. As alternative, unmanned aerial vehicles (UAVs) offer satellite imagery's low cost combined with aerial laser scanning high accuracy. While the term UAV encompasses a large range of commercial options weighing as much as 40 kilograms, there is a class of the devices that*



weight on a couple of kilograms. **TRUSS will investigate the use of these devices** (i.e., ebee Sensefly UAV shown in the figure) **for monitoring road condition**. The recruited ESR, supported by *UCD* expertise in aerial laser scanning, will follow the methodology: (1) create a set of algorithms to programme multiple UAVs to maximize efficient data capture and minimize overlap and occlusions for road monitoring; (2) establish options for synchronization to allow time specific positioning to allow such things as traffic changes; (3) develop a graphical user interface (GUI) appropriate for control of multiple UAVs, and (4) devise a means for temporal-based change detection for automated defect identification and characterization.

### Objectives

The objective is to create set of algorithms and GUI to control multiple UAVs to maximize efficient data capture with options for synchronization to allow time specific positioning and a means for temporal-based change detection for automated defect identification and characterization in road infrastructure.

### Expected Results

An inexpensive, **non-contact method to conduct regular road inspections** with an automated means to identify and characterize emerging road defects.

### Secondment

This position involves a secondment of some months to *ARUP*. This will give the candidate the opportunity to see how the developing technology could best be integrated into the life-cycle of road building.

### Specific Requirements

- At the date of closure of appointments, candidates must have obtained, or finalize within 3 months, a 4-yr Bachelor or a Masters degree in Engineering, with a strong background in Remote Sensing, Electrical Engineering, and/or Computer Science. The student will register in the relevant doctoral programme and be co-supervised by Dr. Eleni Mangani in Computer Science
- Demonstrated programming skills are a requirement
- Demonstrated experience with robotics would be highly advantageous
- We are looking for candidates with a strong motivation to pursue a career in engineering and an open mind for new approaches and a lot of team spirit. Creativity and level of independence will be considered.
- Solid written and oral communication skills in English are prerequisites of any successful application.

### Eligibility Criteria

- Researchers can be of any nationality and age.
- All recruited researchers **must be Early-Stage Researchers (ESRs)**. A ESR shall, at the time of recruitment by the host organisation, **be in the first four years of their research careers** and not yet have been awarded a doctoral degree. The four years start to count



**from the date when a researcher obtained the degree which would formally entitle him/her to embark on a doctorate.**

- Researchers are required to undertake transnational **mobility** (i.e. move from one country to another) when taking up their appointment. One general rule applies to the appointment of researchers: **At the time of recruitment by the host beneficiary, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host beneficiary for more than 12 months in the 3 years immediately prior to the reference date. Note that the *mobility* rule applies to the beneficiary where the researcher is recruited, and not to beneficiaries to which the researcher is sent or seconded.**
- For all recruitments, the eligibility and mobility of the researcher will be determined at the time of their (first) recruitment in the project. The status of the researcher will not evolve over the life-time of a contract.

### Salary and Working Conditions

- Each position is for a period of 36 months. These positions will be available from August/September, 2015. The Marie Skłodowska-Curie programme offers highly competitive and attractive salary and working conditions. Exact salary will be confirmed upon appointment. It consists of a living allowance (= 37320 euro/year [the Marie Skłodowska-Curie rules apply a correction factor to this amount to allow for the cost of living in different countries]) + a monthly mobility allowance (= 600 to 1100 euro/month depending on the family situation).
- Furthermore, PhD tuition fees for the ESR are covered and the research project is aimed at defending a thesis and obtaining a PhD degree. In addition to their individual scientific projects, all positions will benefit from further continuing training, which includes internships and secondments (All ESRs will be seconded at least once during this period at another partner site), a variety of training modules as well as transferable skills courses, active participation in workshops and conferences, and exposure to large enterprises, SMEs and Universities from different European countries involved in TRUSS.

### Application Procedure

- (1) Check you meet **Eligibility criteria** and **Specific requirements for the ESR position** project/s you are applying for.
- (2) Prepare the following **application documents** (in English):
  - a. **A curriculum vitae**, including contact details, education (at University level and other), work experience, prizes/awards, language skills, etc... (max. 2 pages). The CV should reflect a representative array of achievements and qualifications appropriate to the post for which application is being made.
  - b. **Official academic record** of undertaken courses & grades for Bachelor (and Master if required in specific criteria) degree.
  - c. **A motivational letter** in which the applicant describes his or her motivation to pursue postgraduate studies and to conduct the research project/s applied for. Mention the ESR project number or numbers (in the latter indicate order of



preference if any) on your motivational letter and the subject of the email.

d. **A reference letter.**

- (3) Email your application documents as attached files to: [trussitn@ucd.ie](mailto:trussitn@ucd.ie) **before the 1<sup>st</sup> May 2015 deadline** and mention the ESR project number/s you are applying for in the subject line.
- (4) The documents provided will be used to select the best candidates. Successful candidates will be informed **before 29<sup>th</sup> May 2015**.

**For more information on a position with TRUSS, please check [www.trussitn.eu/vacancies](http://www.trussitn.eu/vacancies) or email [trussitn@ucd.ie](mailto:trussitn@ucd.ie)**