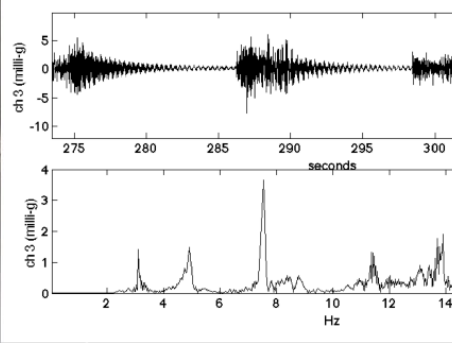




**TRUSS**  
[www.trussitn.eu](http://www.trussitn.eu)

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 7**



Project Title:  
**RAILWAY  
WEIGH-IN-  
MOTION FOR  
BRIDGE SAFETY**

*Electronic Monitoring of a bridge*

**Host**

Full Scale Dynamics Limited (FSDL)

**Address**

University of Exeter, North Park Road, Exeter EX4 4QF

**Country**

United Kingdom

**Main Supervisor**

Prof. James Brownjohn (email for informal enquiries on this project:  
[j.brownjohn@fullscaledynamics.com](mailto:j.brownjohn@fullscaledynamics.com))

**Background**

There are many technologies to monitor the traffic load in both the road and rail sectors, i.e., weighing vehicles while they are in motion. These so called Weigh-in-Motion (WIM) systems are used to collect data on gross and axle weights and can be used to reduce the *uncertainty in load models* employed in bridge design and assessment. A subset of the many WIM technologies is Bridge WIM, a concept whereby an instrumented bridge is used as the scales to weigh vehicles as they pass overhead. Bridge WIM was first introduced in the 1970's, and then further developed by UCD and others, being currently in commercial use in the road industry. It is not established in the rail sector although there have been some limited trials. *The idea of combining the concept of Bridge WIM with condition assessment*



*has not been tested, but there are indications that the component of a signal relating to one axle of a vehicle is much more sensitive to changes in bridge condition than the entire signal.* This would suggest that there is potential to apply the Bridge WIM equations to a measured bridge signal and to use that component as an indicator of bridge condition. **FSDL will test this approach based on their experience in dynamic measurements for health monitoring.**

### Objectives

It is proposed to apply techniques of structural identification (St-Id) to railway bridges by combining known information about train loading and measurements of structural deformation and time derivatives during train passage. Known train loads and bridge responses will be used to identify the structural characteristics of the bridge. Then techniques of Moving Force Identification (MFI) - the dynamic equivalent of Bridge WIM will be used to estimate to the forces applied by the passing train. This method can be used to assess either anomalous loads or changes in bridge condition and safety. A combination of data from high quality optical tracking system and accelerometers will be used for the measurements.

### Expected Results

**Innovative methods for estimating and updating the condition and safety of railway bridges** based on train load and bridge condition data from measurements on selected bridges.

### Secondment

The position involves a secondment of some months to University College Dublin (*UCD*). The ESR will apply a MFI and St-Id methods developed by *UCD* and *FSDL* to develop assessment procedures and estimate their reliability. In *UCD* (s)he will build a bridge Finite Element (FE) model and take relevant lectures in the bridge engineering module.

### Specific Requirements

- At the date of closure of appointments, candidates must have obtained, or finalize within 3 months, a 4-yr Bachelor's or a Master's degree in Engineering, with a strong background in Structures or Dynamics.
- Prior knowledge and skills in Matlab programming are desirable but not mandatory.
- Solid written and oral communication skills in English are prerequisites for a 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 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)**