Supervisor Project Idea

Supervisor

Insert a brief CV and/or external link, the total number of publications, the ORCID link, 5 of the most significant/recent publications, and a list of funded projects and awards. max 300 words

Prof. Fabrizio Gara is **Full Professor** of Structural Engineering at the Department of Construction, Civil Engineering and Architecture (DICEA) of UNIVPM. He used to teach Analysis and Design of R.C. and Steel Structures, Earthquake Engineering, Material and Structure Testing and Control, and Advanced Structural System; now he teaches Structural Rehabilitation, Structural Engineering, and Design of Bridges.

His main **research topics**:

- Analysis and modelling of steel-concrete composite bridges, soil-structure dynamic interaction for seismic design of pile foundations and superstructures, dynamic characterization of buildings and bridges through dynamic testing and ambient vibration measurements, seismic and structural health monitoring.

His **publications** consist of a large number of scientific papers, also with international co-authors, both published on International Journals (55 papers, 42 of them in 1st quartile journals) and presented at International Conferences (more than 110 papers).

ORCID: https://orcid.org/0000-0003-1272-0673

His main **research projects**, both Italian and European are:

- UNIVPM Unit **Scientific Coordinator** within the 2019-2021 and 2022-2024 ReLUIS projects (lines WP4-9, WP6-2, WP12-4) about risks, monitoring and assessment of bridges.
- **Principal Investigator** of the Cariverona national research project "PROTECT - maPping the seismic Risk Of straTEgiC consTructions".
- UNIVPM Unit **Coordinator** within two **European projects**: SERA 2019 ("DYMOBRIS - DYnamic identification and MOnitoring of scoured BRIdgeS under earthquake hazard") and ERIES 2022 ("ERIES- SCOUR&SHAKE - Structural Performance monitoring and evaluation of scoured bridges under dynamic actions").

Research Group Description

Provide the name the reference department and a brief description of the research group, including external links, and available instrumentations and infrastructures. max 300 words

The **research group** consists of: **Prof. Eng. Fabrizio Gara** (Full Professor), **Prof. Eng. Sandro Carbonari** (Associate Professor), **Prof. Eng. Laura Ragni** (Associate Professor), 2 post-doc fellows, 3 PhD students, 1 MSc research fellowships.

The **research group** has many years of research **experience on bridges**, which includes **theoretical studies, analytical and numerical modelling, construction processes and design** of new bridges, with particular focus on steel-concrete composite bridges. The group has also deep experience on existing bridges, and is actually involved in **on-site inspections, testing, and assessment** of the bridge structural performance following new code procedures. The group also has well-established and extensive experience in **static and dynamic testing of both laboratory mock-ups and real structures tested in situ**, and in static, dynamic and seismic monitoring of bridges and buildings in general. Moreover, the research group is involved in research activities relevant to the soil-structure interaction and the structural seismic protection through base isolation and dissipative devices.

The reference Department is the "**Department of Construction, Civil Engineering and Architecture**" (**DICEA**). It is among the mostly active departments of construction and civil engineering, as well as, architecture, in Italy, generating (research) and transferring (training) knowledge and value of the highest quality on such topics. DICEA is arranged in 4 main sections: Architecture, Constructions, Infrastructures and Structures. DICEA was ranked first in 2017 among the best University departments of Italy (Department of Excellence) and awarded with a grant of 6,6 M€ in the period 2018-2022. In 2022 the DICEA was again ranked first and then awarded with a new Department of Excellence grant (about 6,5 M€) for the period 2023-2027. DICEA brings together a wide range of disciplines, being leading contributor to the undergraduate programmes in civil and environmental engineering, building engineering, architectural engineering. DICEA also offers postgraduate programmes in civil, environmental, building engineering and architecture.

Title and goals

Provide the title of the topic and a short summary of the project idea. max 200 words

The project idea **title** is "**Structural Health Assessment of Bridges during and after FLOOD events** (**FLOOD-SHAB**)".

The proposed action "Structural Health Assessment of Bridges during and after FLOOD events" (FLOOD-SHAB) aims to investigate the **structural behaviour of critical infrastructures such as bridges**, focusing on the studying and assessing the structural response of bridges during and after flood events. The **main objective** is to **improve the understanding of bridge structural behaviour under various health conditions** and enhance the capacity to detect structural damage caused by component failure or foundation scouring.

Climate changes increasingly impact our life. Climate has become less predictable. Droughts, floods, and new temperature records are becoming more common worldwide, including in Europe. The rising global temperature intensifies the water cycle, which increases wet and dry extremes and affects the critical infrastructure essential for the functioning of a society and economy. Bridges are vital in transportation networks, enabling people, vehicles, and goods to move over rivers and other obstacles. Bridges are also necessary for allowing access to essential services such as healthcare, emergency response, education, and employment. Due to their significance, **bridges need protection from potential hazards, including natural disasters and ageing**. Flooding can significantly impact bridges. The increased water levels result in the additional force from fast-moving water, which can lead to structural damage, and scouring of bridge foundations. Regular inspections, continuous structural health monitoring (SHM) (especially during flood events), and maintenance programs are vital to ensure bridges' structural integrity and safety.

Contact details (*including email address of the supervisor*)

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