PROGETTO DI RICERCA E PIANO DI FORMAZIONE PER UN ASSEGNO DI RICERCA ANNUALE L. 240/2010, D.R. N. 416 DEL 19/04/2011 (AGGIORNATO AL 16/11/2016) ART. 3 B (ASSEGNO AUTOFINANZIATO) E ART. 5 B (PROGRAMMA DI RICERCA SPECIFICO)

TITLE:

DEVELOPMENT OF OPEN PLATFORMS FOR INTEROPERABILITY OF DATA AND METHODOLOGIES IN APPLIED SCIENCES, ENGINEERING AND INDUSTRY

TUTOR:

Prof. Emanuele Ghedini

WORKING SITE:

DIN - Dipartimento di Ingegneria Industriale (viale Risorgimento 2 and via Saragozza 8. Bologna)

RESEARCH PROJECT:

The **Department of Industrial Engineering** (**DIN**) of the **University of Bologna** (**UNIBO**) is participating to several H2020 projects:

SimDOME "Digital Ontology-based Modelling Environment for Simulation of materials"
H2020-DT-NMBP-09-2018 Accelerating the uptake of materials modelling software (IA)
Budget: **4.5M€** (UNIBO **1.2M€**), Periodo: 01/02/2019 – 31/01/2023

OntoTrans "Addressing materials challenges by an Ontology driven Translation Environment"
H2020-DT-NMBP-10-2019 Adopting materials modelling to challenges in manufacturing processes (RIA)
Budget: **5M€** (UNIBO **630k€**), Periodo: 01/04/2020 – 31/03/2024

OpenModel "Integrated Open Access Materials Modelling Innovation Platform for Europe"
H2020-DT-NMBP-11-2020 Open Innovation Platform for Materials Modelling (RIA)
Budget: **5.2M€** (UNIBO **361k€**), Periodo: 01/02/2021 – 31/01/2025

OntoCommons "Ontology-driven data documentation for Industry Commons"
H2020-DT-NMBP-39-2020 Towards Standardised Documentation of Data through taxonomies and ontologies (CSA)
Budget: **4.2M€** (UNIBO **292k€**), Periodo: 01/11/2020 – 31/10/2023

DOME 4.0 "Digital Open Marketplace Ecosystem 4.0"
DT-NMBP-40-2020 Creating an open market place for industrial data (RIA)
Budget: **4.0M€** (UNIBO **153k€**), Periodo: 01/12/2020 – 30/11/2024

These projects share the aim to build **innovative approaches based on ontologies**, to connect together the knowledge (e.g., data, methodologies) coming from different disciplines, and position UNIBO as an important actor for the EC strategies on **Data Documentation**, **Digital Industrial Transition** (Industry 4.0/5.0) and **Industry Commons**.

Formal ontologies are a powerful tool to provide a structure (terminological and relational) to the vast amount of knowledge already available in EU, providing information in a structured form so that it can be **processed automatically by machines**. Ontologies are also a way to facilitate human conceptualization of challenges to bring them on digital platforms (i.e., **Digital/Cognitive Twins**). Moreover, the combination of structured data and inferencing can yield much information not explicitly stated.

UNIBO is the main developer of the **Elementary Multiperspective Material Ontology (EMMO)**[1] that is adopted by several projects as reference ontology for the applied sciences, supported by the **European Materials Modelling Council (EMMC)**[2].

1 https://github.com/emmo-repo/EMMO
2 https://emmc.info/

Ontology based approach requires several competencies that span across philosophy, computational sciences and engineering. For this reason, the activities within this research fellowship will be **defined according to the research fellow competencies**, and may comprise: materials modeling simulations (SimDOME), programming within Open Simulation/Translation platforms frameworks (OntoTrans, OpenModel, DOME4.0), ontology development (both theoretical in First Order Logics and/or using OWL-2 language), analysis of existing standards for domain ontology development (e.g., ISO 9000, IUPAC Goldbook, Metrology Vocabulary, CIF Cristallography Vocabulary).

ACTIVITY PLAN:

The Research Associate will take part to the activities of UNIBO-DIN in the *above*-mentioned European H2020 projects, and will be defined following the Description of Action of each project, according to the competencies of the research fellow.

At the end of the fellowship, the research fellow is expected to have acquired a multidisciplinary perspective to innovation challenges in science and industry, and aware of the current EC actions towards digitalization of knowledge.

The fellowship is 1 year, but it can be renewed up to the 2025.

REQUIREMENTS:

Applicants must meet **at least one** of the following mandatory **requirements**:

- Experience in scientific computational modeling
- Experience in industrial engineering
- Experience in semantic web application development
- Experience in formal ontology analysis or development (even if only at theoretical level)
- Experience in data management systems

Moreover, the following **preferred requirements** will be considered during evaluation of the applicants:

- Multidisciplinary curriculum
- Experience in materials modelling
- Experience in AI or BigData
- Linux systems knowledge

TRAINING PLAN:

A dedicated training plan will be scheduled during the first months of the collaboration in order to overcome the lack of knowledge in one or more of the above-mentioned preferred requirements.

RELATIONS WITH OTHER ENTITIES:

Interactions with several academic and industrial partners within EU are foreseen:

- CNR (Italy)
- HELMHOLTZ-ZENTRUM (Germany)
- ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE (Switzerland)
- TECHNISCHE UNIVERSITAET WIEN (Austria)
- UNIVERSITETET I OSLO (Norway)

- ECOLE NATIONALE D'INGENIEURS DE TARBES (France)
- UNIVERSIDAD POLITECNICA DE MADRID (Spain)
- NATIONAL UNIVERSITY OF IRELAND GALWAY (Ireland)
- INDUSTRY COMMONS FOUNDATION (Sweden)
- NORSK HYDRO ASA(Norway)
- SINTEF AS (Norway)
- COMPUTATIONAL MODELLING CAMBRIDGE LIMITED (UK)
- UMICORE (Belgium)
- TOYOTA MOTOR EUROPE (Belgium)
- SIEMENS INDUSTRY SOFTWARE NV (Belgium)
- FRAUNHOFER (Germany)
- PROCTER & GAMBLE SERVICES COMPANY NV (Belgium)
- ARCELORMITTAL INNOVACION INVESTIGACION E INVERSION SL (Spain)
- ROBERT BOSCH GMBH (Germany)

Relations with US entities are foreseen.

THE TUTOR
Prof. Emanuele Ghedini

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