



## HUMAN RESOURCES – JOB POSITION

### WORKPLACE

Researcher in Machine Learning/Artificial Intelligence for biomedical applications.

### RESEARCH GROUP LINE:

Big Data and Machine Learning, Health data analysis

### PROJECT

*2021 PROD 00129 UNA EINA BASADA EN TECNIQUES D'APRENTATGE AUTOMÀTIC PER A LA PREDICCIÓ DE L'EXIT DE L'EXTUBACIÓ EN PACIENTS CRÍTICS AMB VENTILACIÓ MECÀNICA INVASIVA (T22371S)*

The main goal of this project is to develop AI-based decision making tools to help intensivists improve clinical outcomes in critical patients receiving Invasive Mechanical Ventilation (IMV).

IMV is used to ensure the gas exchange necessary to preserve life when the lungs and respiratory muscles are unable to spontaneously maintain adequate ventilation and lung oxygenation. IMV is not a treatment in itself but a therapy that is used to allow the patient to recover from the underlying cause of the respiratory failure. Although IMV has demonstrated to be a life-saving procedure, it has significant risks and potential complications usually identified under the term “ventilator-induced lung injury” (VILI). Moreover, prolonged IMV has been linked to atrophy of muscles responsible for breathing and other long-term physical, cognitive, and mental health problems in Intensive Care Units (ICU) survivors.

In this context, intensivists are faced with the task of determining the ideal time for withdrawal of ventilatory support. Premature withdrawal increases the likelihood of failure of spontaneous breathing, while late extubation increases the likelihood of the patient suffering from problems associated with excessive mechanical ventilation. The appropriateness of this procedure is decided according to the results of the Spontaneous Breathing Test (SBT) used to assess the patient's ability to breathe spontaneously. On some occasions, despite having passed the SBT, extubated patients are unable to breathe autonomously and end up being reintubated.

To help intensivists decide on the appropriateness of extubation, the team developed a model based on Machine Learning techniques capable of predicting with 94% accuracy the probability of a successful extubation [1]. This decision support tool should increase the rate of successful extubations and thus reduce the impact associated with reintubation on critical patient outcomes.

In the aforementioned work, the team used data consisting of (1) ICU monitor time-series, (2) patient demographics and (3) clinical records, from a single Intensive Care Unit belonging to the Hospital Universitari Joan XXIII (HJXXIII) located in Tarragona



(Catalonia). The specific goal of this project is to re-evaluate the model in [1] using an extended database that includes, not only an updated database from the ICU at HJXXIII, but also data from another 5 Catalan hospitals including (i) Vall d'Hebron - Barcelona, (ii) Germans Trias - Badalona, (iii) Doctor Trueta - Girona, (iv) Verge de la Cinta - Tortosa i (v) Arnau de Vilanova - Lleida. The candidate will be responsible for assessing the model's robustness and test its performance by deploying them as an integrated feature in the control panel of the HJXXIII. This stage is key in future efforts directed to prototyping these tools as commercial products.

[1] A Machine Learning decision-making tool for extubation in Intensive Care Unit patients, Fabregat et al., Computer Methods and Programs in Biomedicine, 200, 2021

### **JOB POSITION DESCRIPTION**

The candidate will develop the following tasks:

- Process the updated database in order to generate a new working dataset and patient cohort.
- Review and rewrite the original code written in R into Python.
- Test the code performance with the updated working dataset and compare the new results with those reported in [1].
- Deploy the model within the HJXXIII control panel.
- Assess the performance of the model as a decision-making tool by comparing the observed and the predicted extubation outcome. Estimate the degree of improvement with respect to the HJXXIII successful extubation rate.
- Start the license process of the model to be incorporated into the control panels of some of the main vendors of Clinical Information Systems used to generate the Electronic Health Records.

### **PROFILE OF THE CANDIDATES:**

- Data Science, Mathematics, Physics, Engineering, Biomedical Sciences or related disciplines.

### **REQUIRED SKILLS**

- Have obtained a doctoral degree in the last 10 years or have enrolled in a doctoral program before March 2022.
- must be familiar and have experience using Machine Learning/Artificial Intelligence techniques and have strong programming skills.
- must be a highly motivated individual capable of developing his/her entrepreneurial facet in the field of biomedicine; he/she must be motivated to acquire the necessary skills to transform the research product into a viable commercial product.
- Experience using Python (scikit-learn, pandas) and/or R (tidyverse, mlr) for Machine Learning applications.
- Ability to work in a team and independently in a dynamic and versatile research environment often characterized by strict deadlines and data confidentiality.



- Catalan and/or Spanish - Level B2

### **ADDITIONAL SKILLS**

- He/she must identify this project as an opportunity for professional development in the field of innovation and knowledge transfer.
- Interpersonal relations skills, flexibility and adaptability.
- Motivation, creativity, initiative and proactive attitude.
- Commitment to quality, optimisation of resources and achievement of results.
- Experience in health data management is a plus.

### **WORKING CONDITIONS**

- Full time position.
- Possibility of full/partial remote work depending on requirements.
- Location: ETSEQ / Hospital Universitari Joan XXIII de Tarragona
- Type of contract: Indefinite scientific-technical activities (art. 23 bis of the Science Law).
- Category: Grup 1
- Duration: 15 month
- Retribution: 2.677,27\*€/month (pre-tax)
- Starting date: Jan 9th 2023 or earlier.

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### **SELECTION PROCEDURE:**

- Selection of CVs: Identification of suitable and unsuitable CVs according to required skills. Applicants who do not meet the requirements indicated will not proceed to the next phase
- CV Evaluation (5 points):
  - Academic formation and background (2,5 points)
  - Experience (scientific papers published, participation in research projects and similar research items) (2,5 points)
- Personal interview (5 points)

In the event of a tie between people of different gender, the person of the least represented gender in the work group will be hired.

### **SELECTION COMITEE:**

- President: . Alexandre Fabregat Tomàs (Principal Investigator)
- Member 1: Anton Vernet Peña (Researcher)
- Member 2 : Josep Gómez Álvarez (Researcher)

### **SUBSTITUTES:**

- Josep Anton Ferré Vidal (Researcher)
- Alejandro Rodríguez (Researcher)
- Mònica Magret (Researcher)
- Lluís Vázquez Vilamajó (Research Support Staff)



### **CANDIDATURES**

Send your CV through the FURV website

(<https://www.fundacio.urv.cat/ca/fundacio/borsa-treball/>)

**DEADLINE FOR RECEIPT OF CV** 09/12/2022

### **COMUNICATIONS**

FURV will publish on its website the list of admitted and excluded applicants, as well as the final report with the scores obtained by them.