MASTER THESIS PROPOSAL

TITLE

**Development of a Bayesian prediction model
for the arrival of donors in a blood collection center**

CANDIDATE CHARACTERISTICS

The thesis is for a master student (*tesi di laurea magistrale*).
The ideal candidate is a Master student of Mathematical Engineering
with a Statistical Curriculum.

GENERAL INFORMATION

Blood is an important resource in all healthcare systems, and a proper management of blood supply chain is required to both avoid blood shortage and unit wastage. The first step of the blood supply chain is the collection of blood from donors in the collection centers. An unbalanced and unplanned arrival of donors may determine a non-optimal management of all chain. In this light, predicting the future arrivals of blood donors is fundamental in order to better planning donations sessions and to develop any stochastic or robust optimization model. In the literature, blood donation data have been often analyzed, but only within the frequentist framework. As far as we know, the only exception is [1]. The goal of this work is developing a new approach to the problem (starting from [1]), which handles blood donations as recurrent events in the framework of Bayesian analysis. In particular, the work will consider a class of autoregressive semiparametric Bayesian models for gap times between consecutive blood donations [2,3]. The proposed models will be compared and evaluated on a real dataset provided by the Milan department of the *Associazione Italiana Volontari Sangue* (AVIS), which contains data on blood donations given between 2010 and 2016.

DURATION

The expected duration of the thesis is about 6 months.

PARTNERSHIP

This is a joint Thesis Project in collaboration with:

- **Politecnico di Milano, Department of Mathematics, Milan, Italy;**
- **Consiglio Nazionale delle Ricerche (CNR), Istituto di Matematica Applicata e Tecnologie Informatiche (IMATI), Milan, Italy;**
- **Assocazione Italiana Volontari Sangue (AVIS), Milan department, Milan, Italy.**

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REFERENCES

[1] Gianoli. **Analysis of gap times of recurrent blood donations via Bayesian nonparametric models**. Tesi di Laurea Magistrale in Ingegneria Matematica, Politecnico di Milano, 2015/16. Relatore: A. Guglielmi - Correlatore: E. Lanzarone.

[2] R. Argiento, A. Guglielmi, E. Lanzarone, I. Nawajah. **Bayesian joint modeling of the health profile and demand of home care patients**. IMA J Management Math 2017; DOI 10.1093/imaman/dpw001; with Supplementary Material; ISSN 1471-678X.

[3] R. Argiento, A. Guglielmi, E. Lanzarone, I. Nawajah. **A Bayesian framework for describing and predicting the stochastic demand of home care patients**. Flex Serv Manuf J 2016; 28(1-2): 254-79; ISSN 1936-6582.