

# Dealing with Belief Uncertainty in Domain Models<sup>\*</sup>

Lola Burgueño<sup>1,2</sup>[0000-0002-7779-8810], Paula Muñoz<sup>2</sup>[0000-0003-2939-5803],  
Robert Clarisó<sup>1</sup>[0000-0001-9639-0186], Jordi Cabot<sup>2,3</sup>[0000-0003-2418-2489],  
Sébastien Gérard<sup>4</sup>[0000-0003-0295-0520], and Antonio  
Vallecillo<sup>2</sup>[0000-0002-8139-9986]

<sup>1</sup> Open University of Catalonia, Spain. {lburguenoc,rclariso}@uoc.edu

<sup>2</sup> ITIS Software, Universidad de Málaga, Spain. {lolaburgueno,paulam,av}@uma.es

<sup>3</sup> ICREA, Spain. jordi.cabot@icrea.cat

<sup>4</sup> CEA List, France. sebastien.gerard@cea.fr

**Keywords:** Information systems, software, domain models, uncertainty, belief, belief fusion, consensus, subjective logic, vagueness, decision-making

**Published in:** ACM Transactions on Software Engineering and Methodology, Vol. 32, No. 2, pp. 31:1–31:34, 2023.

**Impact Factor:** JCR 3.685 - Q1 - Position: 25/110 - Area: Software Engineering.

**DOI:** <https://doi.org/10.1145/3542947>

**Abstract.** There are numerous domains in which information systems need to deal with uncertain information. These uncertainties may originate from different reasons such as vagueness, imprecision, incompleteness or inconsistencies; and, in many cases, they cannot be neglected. In this paper, we are interested in representing and processing uncertain information in domain models, considering the stakeholders' beliefs (opinions). We show how to associate beliefs to model elements, and how to propagate and operate with their associated uncertainty so that domain experts can individually reason about their models enriched with their personal opinions. In addition, we address the challenge of combining the opinions of different domain experts on the same model elements, with the goal to come up with informed collective decisions. We provide different strategies and a methodology to optimally merge individual opinions.

---

<sup>\*</sup> This work is partially supported by Universidad de Málaga. Campus de Excelencia Internacional Andalucía Tech, the Spanish Government under projects LO-COSS (PID2020-114615RB-I00), CoSCA (PGC2018-094905-B-I00) and MBTI4A (P20-00067-FR); and TRANSACT, which has received funding from the ECSEL Joint Undertaking (JU) under grant agreement No 101007260. The JU receives support from the European Union's Horizon 2020 research and innovation programme and Netherlands, Finland, Germany, Poland, Austria, Spain, Belgium, Denmark, and Norway.