

## **Advances and Challenges for Model and Data Engineering**

### **J.UCS Special Issue**

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Following the stimulating discussions in the workshops held during the 9th International Conference on Model and Data Engineering (MEDI 2019), we proposed to edit a special issue compiling the fruitful research resulting from those discussions. This special issue on current research in model and data engineering of the *Journal of Universal Computer Science* is the outcome of that proposal. As such, it contains thoroughly revised and significantly extended versions of key papers discussed at MEDI 2019 workshops.

The main objective of MEDI is to provide a forum for the dissemination of research accomplishments and to promote the interaction and collaboration between the models and data research communities. MEDI provides an international platform for the presentation of research on models and data theory, development of advanced technologies related to models and data and their advanced applications. This international scientific event, initiated by researchers from Euro-Mediterranean countries in 2011, aims also at promoting the creation of north-south scientific networks, projects and faculty/student exchanges.

The following seven accepted papers nicely reflect the wide range of topics covered by MEDI conferences.

In their paper “Enhancing GDPR Compliance Through Data Sensitivity and Data Hiding Tools”, Xabier Larrucea, Micha Moffie and Dan Mor consider the problem of fulfilling the rules set by the General Data Protection Regulation (GDPR) of the EU within the framework of the reference architectural model industry 4.0 for the healthcare sector. This is challenging due to the highly sensitive data managed by this sector and the need to share this data between different national healthcare providers within the EU. The authors propose and implement a series of valuable tools to enhance security and privacy in this context as well as compliance with the GDPR. They also illustrate through a case study the use of the proposed tools for sharing health records and their integration within the reference framework.

In their paper “BSO-MV: An Optimized Multiview Clustering Approach for Items Recommendation in Social Networks”, Lamia Berkani, Lylia Betit and Louiza Belarif present a new approach to improve accuracy and coverage of clustering based recommen-

dations systems for social networks. The approach is based on improving the results of multiview clustering by combining it with a bees swarm optimization algorithm. Through extensive experimentation with two real-world datasets, they are able to demonstrate the effectiveness of the proposed approach to significantly improve accuracy, outperforming others clustering-based approaches.

In their paper “A Formal Model for Configurable Business Process with Optimal Cloud Resource Allocation”, Abderrahim Ait Wakrime, Souha Boubaker, Slim Kallel, Emna Guermazi and Walid Gaaloul propose a formal approach to analyse and verify configurable business process models as well as to optimize the cost of their implementation in the Cloud. The mechanism consists on transforming the problem into an equivalent Boolean satisfiability problem (SAT) which is then feed to a solver. This transformation is done by means of translation rules from configurable business processes to SAT. This model formalizes the different configurable process behaviors including control-flow and cloud resource allocations, enabling the derivation of correct configuration variants. Weighted partial SAT formulae are integrated in the model in order to optimize the global cloud resource allocation cost.

In their paper “Towards a Semantic Graph-based Recommender System: A Case Study of Cultural Heritage”, Sara Qassimi and El Hassan Abdelwahed present a semantic graph-based recommender system of cultural heritage places. Their approach consists on first constructing an emergent description that semantically augments the information about the places of interest and then model through graphs the semantic relationships between similar cultural heritage places and their associated tags. Note that the unsupervised nature of folksonomy’s tags semantically weakens the description of resources, which in turn hinders their indexing and decreases the quality of their classification and clustering. The semantic augmentation produced by the proposed method in the case study of cultural heritage places in Marrakesh city shows to be an effective tool to fight information overload and to produce better recommendations in this context. As such, the paper presents a valuable contribution that can be used to improve the quality of recommender systems in general.

In their paper “Assembling the Web of Things and Microservices for the Management of Cyber-Physical Systems”, Manel Mena, Javier Criado, Luis Iribarne and Antonio Corral face the challenge of facilitating communication between the diverse devices and protocols used by Cyber-Physical Systems (CPS) and the Internet of Things (IoT). They propose an approach based on the concept of digital dice (an abstraction of various objects). The digital dice builds on the web of things standard. It is based on microservices and capable of handling the interaction and virtualization of IoT devices. This work introduces a technique to build, transform and compose digital dices from descriptions of “things”. A full transformation flow is presented and a case study is used to illustrate its implementation. The proposal is shown to be effective and flexible, improving the state of the art.

In their paper “Model-Driven Engineering for End-Users in the Loop in Smart Ambient Systems”, Sylvie Trouilhet, Jean-Paul Arcangeli, Jean-Michel Bruel and Maroun Koussaifi present a Model-Driven Engineering (MDE) approach to involve the user in the process of constructing at run time component based applications, adapted to a situation and user needs, in the context of ambient systems. The proposed solution relies on several domain-specific languages and a transformation process, based on established MDE tools (Gemoc Studio, Eclipse Modeling Framework, EcoreTools, Sirius and Acceleo). In this context, the authors describe an innovative way of reinforcing the place of the user in the engineering loop. The authors propose an editor that allows the end user to be aware of the emerging applications resulting of this process, to understand their function

and use, and to modify them if desired. From these actions, feedback data are extracted to improve the process.

In their paper “An Approach for Testing False Data Injection Attack on Data Dependent Industrial Devices”, Mathieu Briland and Fabrice Bouquet present a domain specific language (DSL) for generating test data for IoT devices/environments. The DSL is proposed for testing and simulating false data injection attacks (FDIA). First, the paper outlines a generic approach for FDIA and presents a list of possible sensor types and a categorization schema for data obtained from sensors. Then, the application of the DSL is illustrated using two examples; a simple one altering the data obtained from a temperature sensor and a more complex one concurrently altering the data obtained from three particle sensors. The authors show that their approach works well in the case study of the Flowbird parking meter system and discuss how it can be adapted to different application domains.

We are grateful to all authors of journal articles in this issue, who contributed to a fine collection of research in model and data engineering. We would like to express our greatest thanks to all reviewers, who put in a lot of time reading the articles and making substantial suggestions for improvement, which at the end led to the high quality. We also would like to thank J.UCS evaluation committee for the opportunity to publish this collection of research articles as a special issue of the Journal of Universal Computer Science and in particular to the publishing managers Dana Kaiser and Johanna Zeisberg for their timeless assistance during the whole process. Last but not least, we would like to acknowledge to our host institutions, the University of Nantes and the Software Competence Center Hagenberg (SCCH) for their support and sponsoring of this special issue. In particular, Prof. Yamine Ait-Ameur and its host institute IRIT/INP-ENSEEIH have significantly collaborated with this special issue in the framework of the COMET scientific partnership agreement with SCCH, and have also supported the MEDI conference from which it originated.

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## **List of Referees**

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