

# Communications in Computer and Information Science


1091

*Commenced Publication in 2007*

Founding and Former Series Editors:

Phoebe Chen, Alfredo Cuzzocrea, Xiaoyong Du, Orhun Kara, Ting Liu,  
Krishna M. Sivalingam, Dominik Ślęzak, Takashi Washio, and Xiaokang Yang

## Editorial Board Members

Simone Diniz Junqueira Barbosa 

*Pontifical Catholic University of Rio de Janeiro (PUC-Rio),  
Rio de Janeiro, Brazil*

Joaquim Filipe 

*Polytechnic Institute of Setúbal, Setúbal, Portugal*

Ashish Ghosh

*Indian Statistical Institute, Kolkata, India*

Igor Kotenko 

*St. Petersburg Institute for Informatics and Automation of the Russian  
Academy of Sciences, St. Petersburg, Russia*

Junsong Yuan

*University at Buffalo, The State University of New York, Buffalo, NY, USA*

Lizhu Zhou

*Tsinghua University, Beijing, China*

More information about this series at <http://www.springer.com/series/7899>


Daniel Burgos · Marta Cimitile ·  
Pietro Ducange · Riccardo Pecori ·  
Pietro Picerno · Paolo Raviolo ·  
Christian M. Stracke (Eds.)


# Higher Education Learning Methodologies and Technologies Online


First International Workshop, HELMeTO 2019  
Novedrate, CO, Italy, June 6–7, 2019  
Revised Selected Papers


### *Editors*

Daniel Burgos   
Universidad Internacional de La Rioja  
Logroño, La Rioja, Spain

Pietro Ducange   
Department of Information Engineering  
University of Pisa  
Pisa, Italy

Pietro Picerno   
SMARTTEST Research Centre  
Università degli Studi eCampus  
Novedrate, Como, Italy

Christian M. Stracke   
Open University in the Netherlands  
Heerlen, The Netherlands

Marta Cimitile   
Unitelma Sapienza University  
Rome, Italy

Riccardo Pecori   
Università degli Studi eCampus  
Novedrate, Como, Italy

Paolo Raviolo   
Università degli Studi eCampus  
Novedrate, Italy

ISSN 1865-0929                      ISSN 1865-0937 (electronic)  
Communications in Computer and Information Science  
ISBN 978-3-030-31283-1              ISBN 978-3-030-31284-8 (eBook)  
<https://doi.org/10.1007/978-3-030-31284-8>

© Springer Nature Switzerland AG 2019

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG  
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

## Preface

This volume of *Communication in Computer and Information Science* (CCIS) contains the post-proceedings of HELMeTO 2019, the First International Workshop on Higher Education Methodologies and Technologies Online. The event was successfully held at the headquarters of the eCampus University, Novedrate (CO), Italy, during June 6–7, 2019. HELMeTO 2019 aimed to bring together researchers and practitioners working in *Higher Distance Education Institutions* or studying *Online Learning Methodologies* to present and share their research in a multidisciplinary context. The workshop provided a forum for the discussion of new research directions and applications in these fields, where different disciplines effectively met, divided into two main tracks: Online Pedagogy and Learning Methodologies, and Learning Technologies, Data Analytics and Educational Big Data Mining, together with their applications.

Some examples of the discussed interdisciplinary topics are: pedagogical framework studies, learning models, learning outcomes, online learning communities, blended learning, online peer assessment, social learning, evaluation for online education, assessment methods in online and blended learning environments, assessment and accreditation of courses and institutions, computer-aided assessment, community building, context dependent learning, course design and e-learning curricula, digital libraries for e-learning, distance and e-learning in a global context, e-learning platforms and portals, e-testing and new test theories, distance education, immersive learning, learning organization, mobile learning (m-learning), simulated communities and online mentoring, supervising and managing student projects, teacher evaluation, security aspects, standards and interoperability, ontologies and metadata standards, theoretical bases of e-learning environments, Web-based learning, wikis and blogs, educational Big Data mining, learning analytics, prediction of the students' performance, design of proper retain strategies exploiting learning analytics, and educational Big Data.

HELMeTO 2019 received 39 total submissions, 29 of which were selected for presentation at the workshop as either long or short talks. We accepted 17 high-quality papers (43% of the original submissions) for publication in an extended version in this post-proceedings volume (15 long papers of more than 12 pages and 2 short papers of more than 8 pages), after a single-blind review round performed by at least three Program Committee members.

Submissions and participants in HELMeTO 2019 came from seven different countries, including Greece, India, Spain, Italy, the UK, Colombia, and Pakistan, immediately making HELMeTO an international event. Following this ever-increasing international spirit, future HELMeTO editions are also expected to be held outside Italy.

Many people contributed to this successful edition. We express our gratitude to the authors for submitting their works, to the members of the Program Committee, coming from eight different countries (Italy, Spain, the Netherlands, the UK, China, the USA, Germany, and New Zealand), for devoting so much effort to reviewing papers despite a

tight schedule, and finally to the invited speakers of the two HELMeTO main tracks and the special track on “The Challenge of Online Sport and Exercise Sciences University Programs.”

Our gratitude also goes to the eCampus University for offering the venue for the event, which allowed the workshop to be held in a technological and green atmosphere, and to SIREM, Società Italiana di Ricerca sull’Educazione Mediale. We would also like to mention Rosanna Di Nuzzo for being a constant source of fruitful inspiration, help and ideas for HELMeTO itself.

June 2019

Daniel Burgos  
Marta Cimitile  
Pietro Ducange  
Riccardo Pecori  
Pietro Picerno  
Paolo Raviolo  
Christian M. Stracke

# Organization

## General Chairs

Daniel Burgos	Universidad Internacional de La Rioja, Spain
Pietro Ducange	University of Pisa, Italy
Paolo Raviolo	eCampus University, Italy

## Program Committee Chairs

Marta Cimitile	Unitelma Sapienza University, Italy
Riccardo Pecori	eCampus University, Italy
Christian M. Stracke	Open University, The Netherlands

## Chair of the Special Session on “Online Sport and Exercise Sciences University Programs”

Pietro Picerno	eCampus University, Italy
----------------	---------------------------

## Program Committee

Pasquale Ardimento	University of Bari “Aldo Moro”, Italy
Mario Luca Bernardi	“Giustino Fortunato” University, Italy
Bruno Boniolo	SIeL - Italian Society of e-Learning, Italy
Riccardo Botteri	eCampus University, Italy
Gabriella Casalino	University of Bari, Italy
Nicola Convertini	University of Bari, Italy
Yannis Dimitriadis	University of Valladolid, Spain
Xu Du	Central China Normal University, China
Claudia Eckert	Open University, UK
Stefano Faralli	Unitelma Sapienza University, Italy
Andrea Garavaglia	Milano-Bicocca University, Italy
Nasser Giacaman	Auckland University, New Zealand
Stephan Krusche	Technical University of Munich, Germany
Patrizia Magnoler	Pegaso University, Italy
Rossella Mana	eCampus University, Italy
Riccardo Mancini	eCampus University, Italy
Gianmauro Manzoni	eCampus University, Italy
Umberto Nanni	Roma La Sapienza University, Italy
Elvira Padua	San Raffaele University, Italy
Fabrizio Patanè	“Niccolò Cusano” University, Italy
Giuseppe Pirlo	University of Bari, Italy

Luigi Sarti	Institute for Educational Technologies - Italian National Research Council, Italy
Sanja Štajner	Symanto, Germany
Hawamdeh Suliman	University of North Texas, USA
Gaetano Tieri	Unitelma Sapienza University, Italy
Chih-Hsiung Tu	Northern Arizona University, USA

## Additional Reviewers

José M. Alonso	Irene Mauro
Marco Arnesano	Salvatore Messina
Manuel Jesus Cobo Martin	Matteo Moglie
Alberto Fernández	Roberto Raffaeli
Simona Ferrari	Alessia Rosa
Andrea Garavaglia	Jose Manuel Soto-Hidalgo
Itziar García-Honrado	Vincenzo Suraci
Enzo Iuliano	Elliot Varoy
Damian Keil	Gennaro Vessio

## Sponsors

eCampus University



SIREM, Società Italiana di Ricerca sull'Educazione Mediale





# Contents

## Online Pedagogy and Learning Methodologies

The ‘Sophisticated’ Knowledge of <i>e-Teacher</i> . Re-shape Digital Resources for Online Courses . . . . .	3
<i>Loredana Perla, Laura Sara Agrati, and Viviana Vinci</i>	
Higher Education and Students with Disabilities: e-Learning for Inclusion at eCampus University. . . . .	18
<i>Venusia Covelli, Rossella Mana, Laura Panizza, Luigi Sarti, and Elisa Zugno</i>	
Predicting Learning Outcomes in Distance Learning Universities: Perspectives from an Integrated Model. . . . .	30
<i>Massimiliano Barattucci</i>	
Online Problem Based Learning for the Professional Development of Educators. . . . .	41
<i>Mario Giampaolo and Loretta Fabbri</i>	
Empowering Positive Behaviors: A Gamification-Based Approach . . . . .	54
<i>Iñigo Garbayo-Ágreda, Natalia Padilla-Zea, and Daniel Burgos</i>	
Assessing Attitudes Towards Collaboration of Students in Self-directed Online Groups in Higher Education. . . . .	69
<i>Consuelo Garcia and Jesús Privado</i>	
Read, Watch, Do: Developing Digital Competence for University Educators . . . . .	80
<i>Fabio Nascimbeni, Joaquín Alonso, Olga Sanz, and Daniel Burgos</i>	

## Learning Technologies, Data Analytics and Educational Big Data Mining as well as Their Applications

On the Students’ Misconceptions in Object-Oriented Language Constructs . . .	97
<i>Pasquale Ardimento, Mario Luca Bernardi, and Marta Cimitile</i>	
CiDAEN: An Online Data Science Course . . . . .	113
<i>Luis de la Ossa, Pablo Bermejo, Juan A. Aledo, José A. Gámez, José M. Puerta, Cristina Romero, Jacinto Arias, Javier Cózar, Enrique González, Juan Ignacio Alonso, and Jesús Martínez</i>	

Explainable Artificial Intelligence for Human-Centric Data Analysis in Virtual Learning Environments . . . . .	125
<i>José M. Alonso and Gabriella Casalino</i>	
eLearning Course Design in Higher Education to Maximize Students' Performance . . . . .	139
<i>Matteo Moglie, Michela Simoncini, Edoardo Mancini, Vincenzo Suraci, and Marco Arnesano</i>	
A Comparative Assessment of Learning Outcomes in Online vs Traditional Teaching of Engineering Drawing . . . . .	149
<i>Roberto Raffaelli, Paolo Cicconi, and Ferruccio Mandorli</i>	
Fostering the Family-School Relationship with a Web-Based Application. . . .	163
<i>Jesús Pérez-Navarro, Natalia Padilla-Zea, Juan Antonio Sicilia, and Lara Orcos</i>	
A Novel Keyword Ontology Generator Method Tested on "Digital Transformation in Higher Education" Topic . . . . .	179
<i>Laura Duque Cano, Daniel Burgos, Carlos Fernández, John William Branch, and Martín Darío Arango</i>	
The 4Ts Game to Develop Teachers' Competences for the Design of Collaborative Learning. . . . .	192
<i>Andrea Ceregini, Donatella Persico, Francesca Pozzi, and Luigi Sarti</i>	
<b>The Challenge of Online Sport and Exercise Sciences University Programs</b>	
Sport and Exercise Sciences Degrees in Italy: Comparison Between Online and Traditional Teaching Models . . . . .	209
<i>Francesca D'Elia and Gaetano Raiola</i>	
Smartphones and Exergame Controllers as BYOD Solutions for the e-tivities of an Online Sport and Exercise Sciences University Program . . . .	217
<i>Pietro Picerno, Riccardo Pecori, Paolo Raviolo, and Pietro Ducange</i>	
<b>Author Index . . . . .</b>	<b>229</b>