

ibai-publishing  
Prof. Dr. Petra Perner  
PF 30 1138  
04251 Leipzig, Germany  
E-mail: [info@ibai-publishing.org](mailto:info@ibai-publishing.org)

[www.ibai-publishing.org](http://www.ibai-publishing.org)

ISSN 1864-9734  
ISBN 978-3-942952-84-2



Advances in Mass Data Analysis of Images and Signals; Proceedings, MDA 2021

Petra Perner (Ed.)

Petra Perner (Ed.)

# Advances in Mass Data Analysis of Images and Signals

with Applications in Medicine, r/g/b Biotechnology, Food Industries and Dietetics, Biometry and Security, Agriculture, Drug Discover, and System Biology Medicine, Biotechnology, Chemistry and Food Industry



16th International Conference, MDA 2021  
New York, USA, 12-13 July 2021

## Proceedings

**ibai** - publishing

Petra Perner (Ed.)

# **Advances in Mass Data Analysis of Images and Signals**

with Applications in Medicine, r/g/b Biotechnology,  
Food Industries and Dietetics, Biometry and Security,  
Agriculture, Drug Discover, and System Biology

16<sup>th</sup> International Conference, MDA 2021  
New York, USA, July 12-13, 2021

**Proceedings**

**ibai** Publishing  

---

[www.ibai-publishing.org](http://www.ibai-publishing.org)

The German National Library listed this publication in the German National Bibliography.  
Detailed bibliographical data can be downloaded from <http://dnb.ddb.de>.

ibai-publishing  
Prof. Dr. Petra Perner  
PF 30 11 38  
04251 Leipzig, Germany  
E-mail: [info@ibai-publishing.org](mailto:info@ibai-publishing.org)  
<http://www.ibai-publishing.org>

**Copyright** © 2020 ibai-publishing  
P-ISSN 1864-9734  
ISBN ISBN 978-3-942952-74-3

All rights reserved. Printed in Germany, 2021

# **16<sup>th</sup> International Conference on Mass Data Analysis of Images and Signals in Artificial Intelligence and Pattern Recognition**

**with Applications in Medicine, r/g/b Biotechnology, Food  
Industries and Dietetics, Biometry and Security, Agriculture, Drug  
Discover, and System Biology**

## **MDA-AI&PR 2021**

**July 12-13, 2021  
Amsterdam, The Netherlands**

### **Chair**

Petra Perner  
Institute of Computer Vision and Applied Computer Sciences, IBAI  
Leipzig, Germany

### **Program Committee**

Valentin Brimkov	Buffalo State College, USA
Calin Ciufundean	Stefan cel Mare University, Romania
Kamil Dimililer	Near East University, Turkey
Andres Gago-Alonso	Advanced Technologies Application Centre (CENATAV), Cuba
Daniela Georgi	ISTI-CNR, Italy
William Grosky	University of Michigan, USA
Nicolas Jouandeau	University de Vincennes - Paris 8   UP8 , France
Tuan Pham	Linkoping University, Sweden
Jose Ruiz-Shulcloper	Universidad de las Ciencias Informaticas (UCI),Cuba
Rainer Schmidt	University of Rostock, Germany
Bjoern Schuller	University of Augsburg, Germany / Imperial College London, United Kingdom
Dorra Sellami	ENIS, Tunisia
Dong Si	University of Washington Bothell, USA
Paolo Soda	University Campus Bio-Medico di Roma, Italy
Nasseh Tabrizi	East Carolina University, USA
Joe Tekli	Lebanese American University, Lebanon
Massimo Tistarelli	University of Sassari, Italy

Simon Warfield	Harvard University, USA
Richard Wilson	University of York, United Kingdom
Kokou Yetongnon	University of Bourgogne, France
Yasemin Yardim	Middle East Technical University, Turkey

## Preface

The 16<sup>th</sup> International Conference on Mass Data Analysis of Images and Signals in Artificial Intelligence and Pattern Recognition MDA AI&PR 2021 took place in New York in July 12-13, 2021. The acceptance rate for the submitted paper of our conference was 33% percent. Because of many refusals because of missing financial means or other reasons the acceptance rate decreased to few percent. This shows once more the excellent quality of these scientists who contributed to this conference. Their papers are of most excellent quality and expand the state-of-the-art in an excellent way. They follow main topics of MDA and show that MDA is an excellent platform for this kind of research and that MDA has established many important topics.

The proceedings will be freely accessible as an OPEN-ACCESS Proceedings of a wide public so that, the new acquired knowledge on the different subjects is able to spread around quickly worldwide. You can find the proceedings at <http://www.ibai-publishing.org/html/proceeding2021.php>.

The topics range of MDA from work about automatic control methods of pandemic situation, applications in veterinary medicine for the early injury detection by horses to the analysis of pollutant and greenhouse gases with imaging and image analysis procedures.

Selected revised papers of this conference as well as contributed papers will be published in the October issue of the International Journal Transaction on Mass Data Analysis of Signals and Images ([www.ibai-publishing.org](http://www.ibai-publishing.org)).

Two tutorial have been given: one on Intelligent Image Processing and the second one on Case-Based Reasoning.

The 17th conference will be held in 2022 in New York again ([www.mda-signals.de](http://www.mda-signals.de)) under the auspices of the World Congress Frontiers on Intelligent Data Analysis DSA 2021 ([www.worldcongressdsa.com](http://www.worldcongressdsa.com)).

We will give then the tutorials on Data Mining, Case-Based Reasoning, and Intelligent Image Analysis again (<http://www.data-mining-forum.de/tutorials.php>) again. The workshops running in connection with ICDM will also be given (<http://www.data-mining-forum.de/workshops.php>).

We would warmly invite you with pleasure to contribute to this conference. Please come and join us. We are awaiting you.

July, 2021

Prof. Dr. Petra Perner  
Chair of the Conference MDA



## Content

An Automated Equine 3D Scanner, Thermography and Imaging Analysis Platform for Early Injury Detection and Intervention of Racehorses <i>J. C. Sargis, S. P. Muske</i> .....	1
Discrete Event Model of Pandemic Data Processing <i>Calin Ciufudean</i> .....	9
Analysis of Pollutant and Greenhouse Gases using Infrared Hyperspectral Image Processing Techniques <i>Yasemin Yardimci Cetin, Petra Perner</i> .....	19
Author's Index .....	29