

IDEAL 2021 Programme

22nd International Conference on Intelligent Data Engineering and Automated Learning (IDEAL)

The University of Manchester, UK

25-27 November 2021

(Virtual)

Sponsors:



The University of Manchester



Preface

The International Conference on Intelligent Data Engineering and Automated Learning (IDEAL) is an annual international conference dedicated to emerging and challenging topics in intelligent data analytics and associated machine learning paradigms and systems. The conference provides a unique opportunity and stimulating forum for presenting and discussing the latest theoretical advances and real-world applications in computational intelligence and intelligent data analysis.

After two decades of successful and memorable events, the 22nd edition, IDEAL 2021, was back in Manchester during November 25-27 for the third time. Although the organisers had intended to hold it as a traditional physical event, given the uncertainty of the COVID-19 situation and many travel restrictions and difficulties, it was decided in July that it would not be practical. Like the previous year and many other similar conferences, IDEAL 2021 was held as a virtual conference. It was technically co-sponsored by the IEEE Computational Intelligence Society UK and Ireland Chapter as well as the World Federation on Soft Computing.

For the past two decades, IDEAL has served an important role in the data analytics, machine learning and AI communities. The conference aims to bring together researchers and practitioners to exchange the latest findings, disseminate state-of-the-art results, and share experiences and forge alliances on tackling many real-world challenging problems. Despite the unprecedented turbulence in the last eighteen months around the world, the IDEAL conference has continued to play its role in these communities during challenging times. The core themes of IDEAL 2021, as usual, included big data challenges, machine learning, deep learning, data mining, information retrieval and management, bio-/neuro-informatics, bio-inspired models, agents and hybrid intelligent systems, real-world applications of intelligence techniques and AI.

In total, IDEAL 2021 received 85 quality submissions, which subsequently underwent rigorous peer reviews by the Program Committee members and experts. Only the papers judged to be of the highest quality and novelty were accepted and included in the proceedings. These proceedings contain 52 accepted papers for the main track and 9 accepted papers for special sessions, which were presented at IDEAL 2021. In addition to IDEAL 2021 main track, there had been a few special session proposals. After the submission and peer-review, the following special sessions had sufficient numbers of accepted papers:

Special Session 1: Clustering for Interpretable Machine Learning

Special Session 2: Machine Learning Towards Smarter Multimodal Systems

Special Session 3: Computational Intelligence for Computer Vision and Image Processing

We deeply appreciate the efforts of our distinguished keynote speakers Francisco Herrera of the University of Granada, Spain, Joaquin Vanschoren of Eindhoven University of Technology, The Netherlands, and Deming Chen of the University of Illinois at Urbana-Champaign, USA. We cannot thank them enough for their stimulating lectures.

We would like to thank our sponsors for their technical support. We would also like to thank all the people who devoted so much time and effort to the successful running of the conference, in particular the members of the Program Committee and reviewers, the organisers of the special sessions, and the authors who contributed to the conference. A special thank you to the special sessions and workshop chairs Antonio J. Tallón-Ballesteros and Susana Nascimento, and publicity chairs Bing Li, Guilherme Barreto, Jose A. Costa and Yimin Wen for their fantastic work.

Finally, we are very grateful to the hard work of the local organising team at the University of Manchester and our event management collaborators, Magnifisence, in particular, Lisa Carpenter and Gail Crowe. We also greatly appreciate the continued support, collaboration and sponsorship for the best paper awards from Springer LNCS.

Hujun Yin
David Camacho
Peter Tino
Richard Allmendinger
Antonio J. Tallón-Ballesteros
Ke Tang
Sung-Bae Cho
Paulo Novais
Susana Nascimento

Keynote Speaker



Professor Francisco Herrera

University of Granada
Spain

Federated Learning for Preserving Data Privacy

Abstract: Federated Learning (FL) is a machine learning setting where multiple entities (clients) collaborate in solving a machine learning problem, under the coordination of a central server or service provider. Each client's raw data is stored locally and not exchanged or transferred; instead local learning focused updates intended for immediate aggregation are used to achieve the learning objective. This presentation presents the context of federated learning, discusses its key elements, and gives attention to software libraries, communication attacks and outlines current lines of study.

This presentation presents the context of federated learning and why it is necessary. Its key elements are analyzed, and attention is given to software libraries, communication attacks and current lines of study

Bio-sketch: Francisco Herrera received his M.Sc. in Mathematics in 1988 and Ph.D. in Mathematics in 1991, both from the University of Granada, Spain. He is a Professor in the Department of Computer Science and Artificial Intelligence at the University of Granada and Director of the Andalusian Research Institute in Data Science and Computational Intelligence (DaSCI). He's an academician in the Royal Academy of Engineering (Spain). In the seventh edition of Guide2Research's ranking of the top 1000 scientists in the field of computer science and electronics in 2021 he is ranked 19th in the world and number 1 in Spain (receiving more than 103000 citations in Scholar Google, and H-index 155).

(<https://research.com/scientists-rankings/computer-science/2021/>)

He has been the supervisor of 51 Ph.D. students. He has published more than 500 journal papers. He has been nominated as a Highly Cited Researcher (in the fields of Computer Science and Engineering, respectively, 2014 to present, Clarivate Analytics). He currently acts as Editor in Chief of the international journal "Information Fusion" (Elsevier). He acts as editorial member of a dozen of journals.

His current research interests include among others, computational intelligence information fusion and decision making, and data science (including data preprocessing, prediction, non-standard classification problems, and big data).

Keynote Speaker



Professor Joaquin Vanschoren

Eindhoven University of Technology,
Netherlands

Learning How to Learn with OpenML

Abstract: Machine learning aims to perform tasks better based on data and automatically gained experience. Ironically, doing it well often requires a lot of tacit human experience and starting from scratch. What if we could automatically collect experience on how to learn across a wide range of tasks, on a global scale, and spanning many lifetimes? OpenML is an open-source platform for doing exactly this. It allows anyone (and anything) to share machine learning datasets, models, and reproducible experiments. It is integrated into popular machine learning tools to allow easy sharing of models and experiments. It organizes all of this online with rich metadata, and enables anyone to reuse and build on them in novel and unexpected ways. This fosters a budding ecosystem of automated processes that can learn from all shared information on how to build the best machine learning models faster and better over time. We welcome all of you to become a part of it.

Bio-sketch: Joaquin Vanschoren is an assistant professor at the Eindhoven University of Technology (TU/e). His research focuses on the automation of machine learning (AutoML) and Meta-Learning. He co-authored and co-edited the book 'Automatic Machine: Methods, Systems, Challenges', published over 100 articles on these topics, and received an Amazon Research Award, Azure Research Award, and the Dutch Data Prize. He founded and leads OpenML.org, an open science platform for machine learning, and is a founding member of the European AI associations ELLIS and CLAIRE. He has been tutorial speaker at NeurIPS and AACL, and has given more than 20 invited talks. He is datasets and benchmarks chair at NeurIPS 2021 and co-organized the AutoML and Meta-Learning workshop series at NeurIPS and ICML from 2013 to 2021.

Keynote Speaker



Professor Deming Chen

University of Illinois at Urbana-Champaign
USA

Design of Reconfigurable Computing Systems for Accelerating Smart IoT Applications

Abstract: Many new IoT (Internet of Things) applications are driven by the fast creation, adaptation, and enhancement of various types of Deep Neural Networks (DNNs). DNNs are computation intensive. Without efficient hardware implementations of DNNs, these promising IoT applications will not be practically realizable. In this talk, we will analyze several challenges facing the AI and IoT community for mapping DNNs to hardware accelerators. Especially, we will evaluate FPGA's role for accelerating DNNs targeting both cloud and edge computing. We will present a series of effective design techniques for implementing DNNs on FPGAs with high performance, energy efficiency and adaptability. These include automated DNN/FPGA co-design, smart reuse of configurable DNN IPs, smart pipeline scheduling, Winograd techniques, and DNN quantization. The design flows developed based on the proposed techniques, such as DNNBuilder, have been adopted by the industry (e.g., IBM and Xilinx). The new DNN models produced, such as SkyNet, have won championships in the competitive DAC System Design Contest for low-power object detection.

Bio-sketch: Dr. Deming Chen obtained his BS in computer science from University of Pittsburgh, Pennsylvania in 1995, and his MS and PhD in computer science from University of California at Los Angeles in 2001 and 2005 respectively. He joined the ECE department of University of Illinois at Urbana-Champaign in 2005. His current research interests include reconfigurable computing, machine learning and cognitive computing, hybrid cloud, system-level and high-level synthesis, and hardware security. He has given more than 120 invited talks sharing these research results worldwide. He has received 9 Best Paper Awards, a few Best Poster Awards, and numerous other research and service related awards. He is the Donald Willett Faculty Scholar and the Abel Bliss Professor of the Grainger College of Engineering, an IEEE Fellow, an ACM Distinguished Speaker, and the Editor-in-Chief of ACM Transactions on Reconfigurable Technology and Systems (TRETs).

Overview

Thursday 25th November (Zoom: TBA)	
09:00-09:10	Opening (General Chairs)
09:10-10:10	Keynote: Learning How to Learn with OpenML, Speaker: Joaquin Vanschoren (chaired by Richard Allmendinger)
10:10-10:55	T1: Explainable AI (XAI) (#50, #58, #74)
10:55-11:10	Coffee/Tea Break
11:10-13:10	T2: Text Mining and NLP (#7, #9, #16, #19, #21, #23, #28, #46)
12:10-14:00	Lunch Break
14:00-15:45	T3: Classification and Event Detection (#14, #22, #39, #66, #67, #68, #70)
15:45-16:00	Coffee/Tea Break
16:00-16:45	T4 - <i>Special Session on Clustering for Interpretable Machine Learning</i> (#3, #34, #47)
16:45-17:45	T5 - <i>Special Session on Machine Learning towards Smarter Multimodal Systems</i> (#13*, #31, #52, #79)

Friday 26th November (Zoom: TBA)	
09:00-11:00	F1: KDD & Text Mining (#12, #26, #49, #53, #54, #60, #62, #65)
11:00-11:15	Coffee/Tea Break
11:15-12:45	F2: Time Series and Temporal Processing (#27, #42, #44, #77, #80)
12:45-14:00	Lunch Break
14:00-15:00	Keynote: Design of Reconfigurable Computing Systems for Accelerating Smart IoT Applications, Speaker: Deming Chen (chaired by Antonio Tallón-Ballesteros, Hujun Yin)
15:00-16:00	F3: Optimisation and Evolutionary Methods (#56, #33, #83, #84)
16:00-16:15	Coffee/Tea Break
16:15-18:00	F3: ML for Industrial & Real-World Applications (#2, #41, #45, #63, #71, #73, #76)

Saturday 27th November (Zoom: TBA)	
09:00-10:00	Keynote: Federated Learning for Preserving Data Privacy, Speaker: Francisco Herrera (chaired by David Camacho)
10:00-10:45	S1: ML Applications Medical and Healthcare (#35, #59, #64)
10:45-11:00	Coffee/Tea Break
11:00-12:15	S2: General ML Methodologies (#4*, #6, #10, #15, #81)
12:15-13:15	S3 – <i>Special Session on Computational Intelligence for Computer Vision and Image Processing</i> (#8, #55, #20, #43)
13:15-13:30	Awards & Closing (General Chairs, PC Chairs)

* Note: paper #13 and paper #4 will be swapped due to certain constraint.

Detailed

Thursday 25th November	
T.1 Explainable AI (XAI)	
Chair: David Camacho	
From classification to visualization: a two way trip	Marina Cuesta, Isaac Martín de Diego, Carmen Lancho, Víctor Aceña and Javier M. Moguerza
Explainable AI (XAI) in Healthcare – Opportunities, Gaps and Challenges and a New Way to Look the Problem Space	Petra Korica, Neamat El Gayar and Wei Pang
Finding Local Explanations through Masking Models	Fabrizio Angiulli, Fabio Fassetti and Simona Nisticò
T.2 Text Mining and NLP	
Chairs: Paulo Novais, Susana Nascimento	
A Neural Architecture for Detecting Identifier Renaming from Diff	Qiqi Gu and Wei Ke
Spell Checker Application Based on Levenshtein Automaton	Alexandru Buse-Dragomir, Paul Stefan Popescu and Marian Cristian Mihaescu
Plagiarism Detection by Usage of Encoplot and Transformers	Ciprian Amzuloiu, Marian Cristian Mihaescu and Traian Rebedea
Drift Detection in Text Data with Document Embeddings	Robert Feldhans, Adrian Wilke, Stefan Heindorf, Mohammad Hossein Shaker, Barbara Hammer, Axel-Cyrille Ngonga Ngomo and Eyke Hüllermeier
Multi Language Application of Previously Developed Transcripts Classifier	Theodora Danciulescu, Stella Heras, Javier Palanca, Vicente Julian and Marian Cristian Mihaescu
Linear Concept Approximation for Multilingual Document Recommendation	Tsegaye Misikir Tashu, Vilmos Salamon and Tomas Horvath
An Empirical Study of the Impact of Field Features in Learning-to-rank Method	Hua Yang and Teresa Goncalves
Learning Inter-Lingual Document Representations via Concept Compression	Marc Lenz, Tsegaye Misikir Tashu and Tomáš Horváth
T.3 Classification and Event Detection	
Chairs: Sung-Bae Cho, Antonio J. Tallón-Ballesteros	
A Hierarchical Multi-Label Classification of Multi-Resident Activities	Hiba Mehri, Tayeb Lemlouma and Nicolas Montavont
A complexity measure for binary classification problems based on lost points	Carmen Lancho, Isaac Martín de Diego, Marina Cuesta, Víctor Aceña and Javier M. Moguerza
Improving Maximum Likelihood Estimation using Marginalization and Black-Box Variational Inference	Soroosh Shalileh
Meta-Feature Extraction Strategies for Active Anomaly Detection	Fabrizio Angiulli, Fabio Fassetti, Luca Ferragina and Prospero Papaleo

An implementation of the "Guess who?" game using CLIP	Arnau Martí Sarri and Victor Rodriguez-Fernandez
Directional Graph Transformer-based Control Flow Embedding for Malware Classification	Hyung-Jun Moon, Seok-Jun Bu and Sung-Bae Cho
Violence Detection with Audio inside the Car	Flavio Santos, Dalila Durães, Francisco Marcondes, Niklas Hammerschmidt, Sascha Lange, José Machado and Paulo Novais
T.4 Special Session on Clustering for Interpretable Machine Learning	
Chairs: Susana Nascimento, José Valente de Oliveira, Victor Sousa Lobo, Boris Mirkin	
Detecting Communities in Feature-Rich Networks with a K-Means Method	Soroosh Shalileh and Boris Mirkin
Meta-learning based feature selection for clustering	Oleg Taratukhin and Sergey Muravyov
AChC: Associative Classifier based on Hierarchical Clustering	Jamolbek Mattiev and Branko Kavšek
T.5 Special Session on Machine Learning Towards Smarter Multimodal Systems	
Chairs: Nuno Correia, Rui Neves Madeira, Susana Nascimento	
Multimodal Semi-supervised Bipolar Disorder Classification *	Niloufar Abaeikoupaei and Hussein Al Osman
Developments on support vector machines for multiple-expert learning	Ana C. Umaquina-Criollo, Juan D. Tamayo-Quintero, María N. Moreno García, Yahya Aalaila and Diego H. Peluffo-Ordóñez
WalkingStreet: understanding human mobility phenomena through a mobile application	Luís Rosa, Cesar Analide and Fábio Silva
Indoor Positioning System for Ubiquitous Computing Environments	Pedro Albuquerque Santos, Rui Porfírio, Rui Neves Madeira and Nuno Correia

* to be moved to Session S2 - see outline

Friday 26th November	
F.1 KDD & Text Mining	
Chair: Richard Allmendinger, David Camacho	
AutoML technologies for the identification of sparse models	Aleksei Liuliakov and Barbara Hammer
Unsupervised Detection of Solving Strategies for Competitive Programming	Alexandru Stefan Stoica, Daniel Babiceanu, Marian Cristian Mihaescu and Traian Rebedea
Mixture-based probabilistic graphical models for the partial label ranking problem	Juan C. Alfaro, Juan A. Aledo and José A. Gámez
Neural Complexity Assessment: A Deep Learning Approach to Readability Classification for European Portuguese Corpora	João Correia and Rui Mende
Countering misinformation through semantic-aware multilingual models	Álvaro Huertas-García, Javier Huertas-Tato, Alejandro Martín and David Camacho
SFU-CE: Skyline Frequent-Utility Itemset Discovery Using the Cross-Entropy Method	Wei Song and Chuanlong Zheng

Evaluating Football Player Actions during Counterattacks	Laurynas Raudonius and Richard Allmendinger
A Profile on Twitter Shadowban: an AI Ethics position paper on Free-Speech	Francisco Marcondes, Adelino Gala, Dalila Durães, Fernando Moreira, José João Almeida, Vania Baldi and Paulo Novais
F.2 Time Series and Temporal Processing	
Chair: Peter Tino	
Application of long short-term memory neural networks for electric arc furnace modelling	Maciej Klimas and Dariusz Grabowski
A Hybrid Approach for Predicting Bitcoin Price using Bi-LSTM and Bi-RNN Based Neural Network	Sunanda Das, Md. Masum Billah and Suraiya Akter Mumu
Time-series in Hyper-parameter Initialization of Machine Learning Techniques	Tomas Horvath, Rafael G. Mantovani and André C. P. L. F. de Carvalho
Multi-Attribute Forecast of the Price in the Iberian Electricity Market	Gonçalo Peres, Antonio J. Tallón-Ballesteros and Luís Cavique
Tracking the temporal-evolution of supernova bubbles in numerical simulations	Marco Canducci, Abolfazl Taghribi, Michele Mastropietro, Sven de Rijcke, Kerstin Bunte, Peter Tino and Reynier Peletier
F.3 Optimisation and Evolutionary Methods	
Chair: Ke Tang	
Genetic and Ant Colony algorithms to solve the multi-TSP	Sílvia Pereira, Eduardo Pires and Paulo Oliveira
An Optimized Evidential Artificial Immune Recognition System based on Genetic Algorithm	Rihab Abdelkhalek and Zied Elouedi
Fair Regret Minimization Queries	Yuan Ma and Jiping Zheng
Chimera: A Hybrid Machine Learning-Driven Multi-Objective Design Space Exploration Tool for FPGA High-Level Synthesis	Mang Yu, Sitao Huang and Deming Chen
F.4 ML for Industrial & Real-World Applications	
Chairs: Paulo Novais, Hujun Yin	
A Comparison of Machine Learning Approaches for Predicting In-Car Display Production Quality	Luís Miguel Matos, André Domingues, Guilherme Moreira, Paulo Cortez and André Pilastrri
A Deep Learning-Based Approach for Train Arrival Time Prediction	Bas Jacob Buijse, Vahideh Reshadat and Oscar Enzing
Prediction of Maintenance Equipment Failures Using Automated Machine Learning	Luís Ferreira, André Pilastrri, Vítor Sousa, Filipe Romano and Paulo Cortez
An Intelligent Decision Support System for Production Planning in Garments Industry	Rui Ribeiro, André Pilastrri, Hugo Carvalho, Arthur Matta, Pedro Rocha, Marcelo Alves and Paulo Cortez
Evaluating Uni-dimensional Convolutional Neural Networks to Forecast the Influent pH of Wastewater Treatment Plants	Pedro Oliveira, Bruno Fernandes, Francisco Aguiar, Maria Alcina Pereira and Paulo Novais
LSTM neural network modeling of wind speed and correlation analysis of wind and waves	Carlos Serrano, Cristina Leonard and Matilde Santos
Wind Turbine Modelling based on Neural Networks: a First Approach	Jesus Enrique Sierra Garcia and Matilde Santos

Saturday 27th November

S.1 ML Applications Medical and Healthcare

Chair: Hujun Yin

New Arabic Medical Dataset for Diseases Classification	Aleksandra Vatian, Jaafar Hammoud, Natalia Dobrenko, Nikolay Vedernikov, Natalia Gusarova and Anatoly Shalyto
End-to-End Deep Learning for Detecting Metastatic Breast Cancer in Axillary Lymph Node from Digital Pathology Images	Turki Turki, Anmar Al-Sharif and Y-H. Taguchi
Learning Dynamic Connectivity with Residual-Attention Network for Autism Classification in 4D fMRI Brain Images	Kyoung-Won Park, Seok-Jun Bu and Sung-Bae Cho

S.2 General ML Methodologies

Chair: Sung-Bae Cho

A Parallel Variable Neighborhood Search for Solving Real-World Production-Scheduling Problems*	Eneko Osaba, Erlantz Loizaga, Xabier Goenaga and Valentin Sanchez
Inheritances of Orthogonality in the Bio-inspired Layered Networks	Naohiro Ishii, Toshinori Deguchi, Masashi Kawaguchi and Tokuro Matsuo
Ensemble Synthetic Oversampling with Manhattan Distance for Unbalanced Hyperspectral Data	Tajul Miftahushudur, Bruce Grieve and Hujun Yin
Fast and Optimal Planner for the Discrete Grid-Based Coverage Path-Planning Problem	Jaël Champagne Gareau, Eric Beaudry and Vladimir Makarenkov
SOMiMS - Topographic Mapping in the Model Space	Xinyue Chen, Yuan Shen, Peter Tino, Eder Zavala, Krasimira Tsaneva-Atanasova, Thomas Upton and Georgina Russell

S.3 *Special Session on Computational Intelligence for Computer Vision and Image Processing*

Chairs: Ying Bi, Bing Xue, Antonio J. Tallón-Ballesteros

T Line and C Line Detection and Ratio Reading of the Ovulation Test Strip Based on Deep Learning	Libing Wang, Junyu Li, Li He, Deane Zeng and Yimin Wen
Radar echo image prediction algorithm based on multi-scale encoding-decoding network	Xingang Mou, Chang Liu and Xiao Zhou
Validation of Video Retrieval by Kappa Measure for Inter-Judge Agreement	Diana Bleoanca, Stella Heras, Javier Palanca, Vicente Julian and Marian Cristian Mihaescu
DC-Deblur: A Dilated Convolutional Network for Single Image Deblurring	Boyan Xu and Hujun Yin

* to be moved to Session T5 - see outline.