

# **UKSim2023**

**UKSim - AMSS 25th International  
Conference on Modelling and Simulation**

**12 – 14 April 2023, Emmanuel College  
Cambridge University  
United Kingdom**

# **Conference Program**

**and Abstracts of Papers**

**Conference Program at a Glance Pages 3 - 5**

**Conference Program in Full Pages 6 – 20**

# UKSim2023

**UKSim - AMSS 25th International Conference on Modelling and Simulation**

**12 - 14 April 2023, Emmanuel College  
Cambridge University  
United Kingdom**

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## UKSim2023 Published Papers

Seq	EDAS ID	Title	First Author	Presenter
P1	<a href="#"><u>1570876428</u></a>	<a href="#"><u>A Semi-Blind Neighbor Discovery Algorithm Based on the Chinese Remainder Theorem</u></a>	<a href="#"><u>Jiahao Wan</u></a>	
P2	<a href="#"><u>1570880111</u></a>	<a href="#"><u>Identifying Safety-Critical Events in Data from Naturalistic Driving Studies</u></a>	<a href="#"><u>Jamal Raiyn</u></a>	
P3	<a href="#"><u>1570887145</u></a>	<a href="#"><u>Associating Colors with Mental States for Computer-Aided Drawing Therapy -- Beyond Color Psychology</u></a>	<a href="#"><u>Tadahiko Kimoto</u></a>	
P4	<a href="#"><u>1570889643</u></a>	<a href="#"><u>Electroencephalography for Enhancing Robotics Learning: CNN Convolutional Neural Network Approach</u></a>	<a href="#"><u>Ebrahim Mattar</u></a>	
P5	<a href="#"><u>1570892467</u></a>	<a href="#"><u>Implementing Text Analytics with Enterprise Resource Planning</u></a>	<a href="#"><u>Surjit Singh Bawa</u></a>	
P6	<a href="#"><u>1570893840</u></a>	<a href="#"><u>A Study on the Effects of U-Net Skip-Connections on Brain Tumor BraTS Dataset</u></a>	<a href="#"><u>Ebrahim Mattar</u></a>	
P7	<a href="#"><u>1570893858</u></a>	<a href="#"><u>Interpolated SOM Neural Networks for Anatomical Joint Constraint Modelling</u></a>	<a href="#"><u>Glenn Jenkins</u></a>	
P8	<a href="#"><u>1570894216</u></a>	<a href="#"><u>Fake Accounts Detection in Online Social Networks Using Hybrid Machine Learning Models</u></a>	<a href="#"><u>Ebrahim Mattar</u></a>	
P9	<a href="#"><u>1570894688</u></a>	<a href="#"><u>Hybrid Common Spatial Pattern with Attention-Based Convolutional Neural Networks for Motor Imagery EEG</u></a>	<a href="#"><u>M. Abdullah Azzam</u></a>	
P10	<a href="#"><u>1570896675</u></a>	<a href="#"><u>Exploratory Research on Global Warming and Weather Data Simulation for Increased Sustainability or Resilience to Hazards Induced by a Changing Climate</u></a>	<a href="#"><u>Gautam Siwach</u></a>	
P11	<a href="#"><u>1570861505</u></a>	<a href="#"><u>Performance Evaluation of Voice over WiFi (VoWiFi) Using IP Multimedia Subsystem (IMS))</u></a>	<a href="#"><u>Wagdy_Anis_Aziz</u></a>	

# UKSim2023 Program at a Glance

<b>UKSim2023 Conference Program at a Glance</b> <a href="#">Click here Virtual</a> to join the meeting for a trial run 11 April 3pm to 5pm	
<ol style="list-style-type: none"> <li>1. Presenter must demonstrate deep and detailed knowledge of the paper content by utilizing the full 20 minutes presentation time.</li> <li>2. The session chair must be satisfied the presenter has answered at least one question in full to the approval of both the session chair and the participants.</li> <li>3. The value of conference attendance is to get maximum feedback from participants on the significance of the research being presented.</li> <li>4. Speak clearly and slowly, do not mumble or race through the sentences, moderate your voice without shouting to make sure attendees hear every word you say.</li> </ol>	
<b>Session Code: Wed.am2.A</b> means Wednesday morning after tea break in room A. Other Time periods: am1, am2, pm1, pm2	<b>Paper Nos: from the table below: P1, P2 . . .</b>
<b>Day-0: Tuesday 11 April 2023, 2pm Arrival/booking into college rooms</b> <b>Virtual Presentation Trial run: 11 April 3pm to 5pm</b> <b>5 to 6pm: Early registration desk opens for one hour. 7pm: Dinner at the Eagle, to be confirmed.</b>	
<b>Time</b>	<b>Day-1: Wednesday 12 April 2023</b>
9.15 - 11.25	<b>Wed.am1.A: (Chair: David Al-Dabass/Tim Bashford/Glenn Jenkins): <u>Opening session</u> and Keynote Speaker: Dr Janos Janosy, Virtual-Hungary</b>
10.25 - 11.25	<b>Keynote Speaker: Prof Frank Wang, Virtual</b>
11.25 - 11.40	<b>Refreshments</b>
11.40 - 12.45 3 papers	<b>Wed.am2.A (Chair: Tim Bashford/David Al-Dabass): P1, P2, P3-Physical</b>
12.45 - 1.45	<b>Lunch</b>
1.50 - 3	<b>Wed.pm1.A (Chair: David Al-Dabass/Tim Bashford/Glenn Jenkins): Keynote Speaker-3 Prof Reggie Davidrajuh <u>Virtual-Norway</u></b>
3 - 3.40 2 papers	<b>Wed.pm2.A: (Chair: Taha Osman/Tim Bashford): P4, P5</b>
3.40 - 4	<b>Refreshments</b>
4 - 5 2 papers	<b>Wed.pm3.A (Chair: Tim Bashford/Glenn Jenkins/David Al-Dabass): P6, P7</b>
5.00	<b>Close of day-1 &amp; photo opportunity</b>
7 - 8.30	<b>Dinner at the Eagle, to be confirmed.</b>
<b>Day-2: Thursday 13 April 2023</b>	
9.15 - 10.20	<b>Thu.am1.A: (Chair: David Al-Dabass/Tim Bashford): Day-2 opening session &amp; Keynote Speaker: Prof Ibrahim Zuwairie <u>Virtual-Malaysia</u></b>
10.20 - 11.20 3 papers	<b>Thu.am2.A: (Chair: Glenn Jenkins/David Al-Dabass): P8, P9</b>
11.20 - 11.35	<b>Refreshments</b>
11.35 - 12.40	<b>Thu.am3.A (Chair: Tim Bashford/Glenn Jenkins): Keynote Speaker: Dr Simon Thorne <u>Virtual-UK</u></b>
12.40	<b>Close of day-2 &amp; photo opportunity</b>
12.45 - 1.45	<b>Lunch</b>
2.00pm >	<b>Cambridge Tour/Glenn Jenkins. Committee Meeting. Conference Dinner 7pm, restaurant to be confirmed, meet at the Eagle after.</b>
<b>Day-3: Friday 14 April 2023</b>	
9.20 - 10.20	<b>Fri.am1.A: (Chair: David Al-Dabass/Tim Bashford): Day-3 opening session &amp; Keynote Speaker: Prof Lela Mirtskhulava, <u>Virtual- Georgia</u></b>
10.20 - 11.20 2 papers	<b>Fri.am2.A: (Chair: Glenn Jenkins/ David Al-Dabass/): P10, P11</b>
11.20 - 11.35	<b>Refreshments</b>
11.35 - 12.40	<b>Fri.am3.A (Chair Tim Bashford/ David Al-Dabass): Keynote Speaker: Prof Qiang Shen <u>Virtual-UK</u></b>
12.40	<b>Close of Conference &amp; photo opportunity</b>
12.45	<b>Lunch and depart</b>

## UKSim2023, 12 to 14 April 2023, Sessions

### Wednesday, April 12

09:15am -10:25am	Wed.am1.A: <i>Keynote Speaker-1: Dr Janos Janosy, <b>Virtual-Hungary</b></i>
10:25am -11:25am	Wed.am2.A: <i>Keynote Speaker-2: Prof Frank Wang, <b>Virtual-UK</b></i>
11:40am -12:45pm	Wed.am3.A: <i>Papers: P1-China, P2-Isreal-<b>Virtual</b>, P3-<b>Physical</b></i>
01:50pm-03:00pm	Wed.pm1.A: <i>Keynote Speaker-3: Prof Reggie Davidrajuh <b>Virtual-Norway</b></i>
03:00pm - 03:40pm	Wed.pm2.A: <i>Papers: P4-Bahrain, P5-USA, <b>Virtual</b></i>
04:00pm - 05:00pm	Wed.pm3.A: <i>Papers: P6-<b>Virtual-Bahrain</b>, P7-<b>Physical</b></i>

### Thursday April 13

09:10am - 10:20am	Thu.am1.A: <i>Keynote Speaker-4 Prof Zuwaairie Ibrahim <b>Virtual-Malaysia</b></i>
10:20am - 11:20am	Thu am2A: <i>Papers: P8-Bahrain, P9-Malaysia, <b>Virtual</b></i>
11:35am -12:40pm	Thu am3A: <i>Keynote Speaker-5: Dr Simon Thorne <b>Virtual-UK</b></i>

### Friday April 14

09:20am -10:20am	Fri.am1.A: <i>Keynote Speaker-6 Dr. Lela Mirtskhulava, <b>Virtual-Georgia</b></i>
10:20am -11:20am	Fri.am2.A: <i>Papers: P10-<b>USA</b>, P11-<b>Egypt</b>, <b>Virtual</b></i>
11:35am -12:40pm	Fri.am3.A: <i>Keynote Speaker-7: Prof Qiang Shen <b>Virtual-UK</b></i>

## Day-1, Wednesday, 12 April 2023, 3 Keynote Speakers & 7 Papers

9:15-10:25, Wed.am1.A: Keynote Speaker-1: Dr Janos Sebestyen Janosy, Virtual

Session Chairs: David Al-Dabass, Tim Bashford, Glenn Jenkins

### Load-Tracking Control Strategies for Nuclear Power Plants to Compensate for Unpredictable Renewables

**Dr Janos Sebestyen Janosy,**

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**Abstract:** The actual events in Europe changed a lot the opinions about nuclear power. In the European Union it is regarded already as green provided the storage problem of nuclear waste is solved (technically it is done already). Nuclear Power Plants (NPPs) in Europe and USA are mainly equipped with pressurized water reactors (PWRs) having primary circuits between the reactor vessel and steam generators in order to achieve better isolation from the environment. The water circulating in the primary circuit has high pressure to avoid boiling even around or above 300 degrees C - typical temperature in the PWR reactor. Stabilizing the steam pressure means that temperatures inside the reactor vessel grow proportionally with the power level. The lifetime of the irreplaceable huge (well above 200 metric tons) reactor vessels depends upon the number of cooling-downs and heating-ups: temperature changes. This happens mainly for refueling with periods usually longer than one year.

Nowadays it is easier to obtain the license from the authorities to prolong operations from 30 to 50-60 years than to build a new NPP - provided that the vessel is in good shape. That is why NPPs with PWRs like to operate permanently on full power, without temperature changes. Moreover, this practice helps to get a quicker return of the investments. On the other hand, the growing green power - renewable with solar panels and wind turbines - is definitely unpredictable due the weather conditions. Gradually stopping the fossil power plants (because missing Russian supplies and resulting in less emission of CO<sub>2</sub>), the regulation of the electrical network partly should be taken over by NPPs.

It will be shown that it is possible without dangerous to the vessel temperature changes in the primary circuit. With one degree of freedom - regulating only nuclear power and steam turbine pressure - we are able to stabilize one of the primary circuit temperatures - inlet, mean or outlet. Introducing another controller - rotating speed of the circulating pumps - we can stabilize all of the 3 primary circuit temperatures in a wide range of power. High-power frequency converters are nowadays widely available. Accurate and thoroughly tested full-scope training simulators are essential to work out n-w stress-free control strategies for the NPPs. As an example, the possibilities for the Hungarian PWR plant will be shown.

The talk will include a summary concerning the French electrical energy network control system. They have well above 70% share of nuclear power and more than 20% renewable water energy. The latter is the best to regulate the network because its power can be changed very quickly - just opening or closing a valve - without change the temperatures and pressures significantly, and none of these powers emit CO<sub>2</sub>. The rest few percent of conventional fossil power has an insignificant role. Even so - to change sometimes the nuclear power is indispensable, too.

**Biography:** Janos Sebestyen Janosy has been working for the AEMI Nuclear Energy Engineering Office Company Limited since 2014 after retiring as a Senior Advisor of the Centre for Energy Research of the Hungarian Academy of Sciences (HAS). He has been a Senior Researcher since 1974 and served as Head of the Simulator Development Department from 1994 - 2011, and a Senior Consultant to the Technical and Scientific Support Organization since 2012. He is Honorary Life Fellow of the UK Simulation Society. He was awarded the Eugene Wigner prize (founded by HAS) in 2016. J.S. Janosy has published over 70 scientific papers in international journals and conferences. His main scientific interests include: modelling and simulation, real-time simulation and simulators, nuclear, fossil and renewable energy production, energy distribution, smart electrical grids and energy storage.

**Wednesday, April 12 10:25 - 11:25**

**Wed.am2.A: Keynote Speaker-2: Prof Frank Wang, Virtual**

Session Chairs: David Al-Dabass, Tim Bashford, Glenn Jenkins

**Building A New Quantum Computer Not Limited by Landauers Bound**

**Professor Frank Wang**

Chairman, IEEE Computer Society, UK&I Chapter  
Head of School of Computing (2010-2016), School of Computing  
University of Kent, United Kingdom  
Email: frankwang@ieee.org

**Abstract:** Most recently, Professor Frank Wang published an article on Quantum Information Processing in Springer Nature:

<https://link.springer.com/article/10.1007/s11128-022-03707-2>

to report on a new quantum computer that can break Landauers Bound:

[https://en.m.wikipedia.org/wiki/Landauer%27s\\_principle](https://en.m.wikipedia.org/wiki/Landauer%27s_principle)

Among a number of physical limits to computation, Landauers bound limits the minimum amount of energy for a computer to process a bit of information. In the light of this study, we may have to presume the demise of this bound despite the many mysteries uncovered with it over the past 60 years.

**Biography:** Frank Z. Wang is the Professor in Future Computing and Head of School of Computing (2010-2016), University of Kent, the UK. The School of Computing was formally opened by Her Majesty the Queen. His led school achieved an amazing result in the 2014 UK government REF (Research Excellence Framework): the research intensity was ranked 12th out of over 150 computing departments in the UK. Professor Wang's research interests include brain-like computer, memristor theory and applications, deep learning, cloud computing, big data, and green computing, etc. He has been invited to deliver keynote speeches and invited talks to report his research worldwide, for example at Princeton University, Carnegie Mellon University, CERN, Hong Kong University of Sci. & Tech., Tsinghua University (Taiwan), Jawaharlal Nehru University, Sydney University of Technology, and University of Johannesburg. In 2004, he was appointed as Chair & Professor, Director of Centre for Grid Computing at CCHPCF (Cambridge-Cranfield High Performance Computing Facility). CCHPCF is a collaborative research facility in the Universities of Cambridge and Cranfield (with an investment size of 40 million Pound Sterling). Prof Wang and his team have won an ACM/IEEE Super Computing finalist award. He is a panel member for the UK government EPSRC **e-Science** programme and **Hardware for Efficient Computing** programmes. Prof Wang is Chairman, UK & Ireland Computer Chapter of the IEEE Computer Society and Fellow of British Computer Society.

## 11.25 – 11.40: Refreshments

### 11.40 - 12.45: Wed.am2.A, 3 papers: P1, P2, P3

Session Chairs: Tim Bashford/Glenn Jenkins/David Al-Dabass

#### Paper P1

##### A Semi-Blind Neighbor Discovery Algorithm Based on the Chinese Remainder Theorem

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**Abstract** - The process of obtaining the positions of neighbors in narrow beam width directional MANET is important in both blind and semi-blind situations, and the process of which is called neighbor discovery. In this article, a semi-blind neighbor discovery algorithm based the Chinese Remainder Theorem was proposed and designed. Firstly, the node model of directional antennas for sector distributions was constructed and evaluated. Then, the corresponding receiving and sending ID sequence was designed. Finally, the performance of the CRT semi-blind algorithm was evaluated and compared with the scan based algorithm-deterministic and the semi-blind completed randomized algorithm using MATLAB. The simulation results shows that the proposed algorithm has better overall performance than that of the other two algorithms.

**Keywords** – MANET, directional antenna, neighbor discovery, semi-blind, the Chinese Remainder Theorem



## Paper P2

### Identifying Safety-Critical Events in Data from Naturalistic Driving Studies

Jamal Raiyn<sup>†</sup> and Adam Rayan<sup>‡</sup>

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**Abstract** - Within the next decade, the world will witness a radical change in the field of transportation as technology engineers work to integrate. Autonomous vehicles (AVs) into transportation networks with conventional vehicles. However, this project faces many challenges, and chief among them are safety-critical events. Safety-critical events are difficult to control, but they can be managed through the analysis of naturalistic driving data. Naturalistic driving studies (NDSs) collect data continuously from real traffic activity, so as not to miss any safety-critical event. In NDSs of AVs, the vehicles are equipped with cameras, radar, and other sensors and Internet of Things (IoT) devices to capture as much driving data as possible. This paper describes how this data can be used to identify chain of events that leads to an accident.

**Keywords** - *autonomous vehicle, NDS, driving behavior, heterogeneity.*

## Paper P3

### Associating Colors with Mental States for Computer-Aided Drawing Therapy: Beyond Color Psychology

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**Abstract** - The aim of a computer-aided drawing therapy system in this study is to associate drawings which a client makes with the client's mental state in quantitative terms for psychological diagnosis. To perform such association through colors, we translate a drawing to a color feature by measuring its representative colors as primary color rates which are defined from psychological primary colors. To estimate how closely a color feature is associated with a concurrent mental state, we propose a method of utilizing machine-learning classification. A practical way of making a classification model through training and validation on a very small dataset is presented. The classification accuracy reached by the model is considered as the degree of association of the color feature with the mental state data. Experiments were carried out on given clinical data. Several kinds of color feature were compared in terms of the association with the same mental state. As a result, we found out a good color feature with the highest degree of association in the range of experiments. Also, primary color rates proved more effective in representing colors in psychological terms than RGB components. The results provide evidence that colors can be related quantitatively with states of human mind.

**Keywords** - *drawing therapy, psychological primary colors, color analysis, machine-learning classification*

**12.45 – 1.45: Lunch**

**Wednesday, April 12 1:50 - 3:00**

**Wed.am3.A: Keynote Speaker-3: Prof Reggie Davidrajuh, Virtual**

Session Chairs: David Al-Dabass, Tim Bashford, Glenn Jenkins

**Activity-Oriented Petri Nets for Reducing the Complexities of Discrete Models**

**Professor Dr Reggie Davidrajuh**

Department of Electrical Engineering and Computer Science  
University of Stavanger, Norway.  
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**Abstract** - Petri Net was popular in the 1980s and 1990s as an effective tool for the modelling and analysis of discrete systems. However, researchers soon discovered that Petri nets-based models become huge even for small real-life scenarios. Researchers then proposed methodologies for the compression of models; compression methodologies work for some cases, demanding some skills from the model developers as only some specific types of Petri nets (e.g., event graphs) can be compressed. Also, in most cases, the preservation of properties of the original model in the compressed model is not guaranteed. Researchers also proposed modular Petri Net models, partitioning the monolithic model into multiple modules. Though modular models offer many advantages (such as reuse and independent development and testing of modules), the overall size would still be huge, causing extensive simulation time. Also, some Petri nets cannot be modularized due to their crisscrossing connections.

General-purpose Petri Net Simulator (GPenSIM) offers a variety of solutions to solve the huge size of Petri Net models. GPenSIM allows not only modularisation but also allows modules to be run on different computers so that the simulation time can be drastically reduced, making the modules suitable for real-time applications. In addition to modular model development, it also provides Activity-Oriented Petri Nets (AOPN). AOPN is a two-phased model development. In the first phase (static phase), only the activities are considered resulting in a simpler static Petri Net model; the resources are not considered in the first phase. Then, in the second phase (run-time phase), the resources are added during the simulation. AOPN, in addition to modular models, provides a solution to reduce the size of Petri net models and remove some complexities.

**Biography** - Professor Reggie Davidrajuh received a Masters Degree in Control Systems Engineering and a PhD in Industrial Engineering, both from the Norwegian University of Science and Technology (NTNU). He also received a DSc (habilitation degree) from the AGH University of Science and Technology, Poland. He is now a professor of Informatics at the department of Electrical Engineering and Computer Science, the University of Stavanger, Norway. His current research interests are discrete-event dynamic systems, modelling, simulation and performance analysis, algorithms, and graph theory. He is a senior member of IEEE and a Fellow of British Computer Society. He is also a member of the Norwegian Academy of Technological Sciences (NTVA).

## **Wed.pm2.A, 3pm - 3.40pm: 2 papers P4 and P5**

Session Chairs: Tim Bashford, Glenn Jenkins, David Al-Dabass

### **Paper P4**

#### **Electroencephalography for Enhancing Robotics Learning: CNN Convolutional Neural Network Approach**

Ebrahim Mattar

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*Abstract* - In context of EEG based robotics systems, this is an active area of research. This paper is presenting developing a learning system for robotics hand grasping and manipulation of objects while relying on human Electroencephalography – EEG cognition. Nowadays, EEG is playing major roles in current robotics applications. EEG brainwaves are also being employed to learn how human is performing daily complex tasks, while emulating human acts to robotics devices. There are tremendous efforts to employ EEG brainwaves signals and patterns for robotic applications. However, due to complexity of EEG patterns, making use of these patterns for robotics is not a trivial task. Therefore, the paper is focusing on introducing EEG decoding and using learned patterns to achieve defined tasks. The paper will present how Convolutional Neural Network Techniques (CNN) classification algorithms have been used to classify human behaviors and how to assemble these behaviors for building much expert and fuzzy based learned robotics systems.

*Keywords* – *Electroencephalography, CNN, Fuzzy Systems, Feature Extraction, Classification, Multi-fingers Robotics Hand control, Hand Manipulation.*

### **Paper P5**

#### **Implementing Text Analytics with Enterprise Resource Planning**

Surjit Singh Bawa

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*Abstract* - The increasing volume of unstructured data in organizations has led to the adoption of text analytics to extract valuable insights. In this article, we discuss the implementation of text analytics with Enterprise Resource Planning (ERP) systems to improve decision-making processes. We provide recommendations for overcoming these challenges and offer a roadmap for organizations to follow when implementing text analytics in their ERP systems.

*Keywords* - *Intelligent Enterprise, ERP, Text Analytics, Machine Learning.*

## **3.40 - 4: Refreshments**

## Wed.pm3.A : 4pm to 5pm, 2 Papers P6 and P7

Session Chairs: Tim Bashford/Glenn Jenkins/David Al-Dabass

### Paper P6

#### A Study on the Effects of U-Net Skip-Connections on Brain Tumor BraTS Dataset

Jawaher Albanki and Ebrahim Mattar

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**Abstract** - Skip-connections play an important role in the gradient flow and convergence of U-Net model. They bridge the semantic gap between the encoder and decoder, allowing the recovery of lost information. Previous research has explored various approaches to altering these connections to improve the overall performance of U-Net. In this study, we propose an efficient skip-connections configuration by analyzing their effect on the BraTS dataset. We varied the architecture of the skip-connection by omitting specific layers and testing different combinations of configurations to assess performance. Our findings suggest that eliminating the first skip-connection in U-Net results in the most efficient and optimal performance. We suggest that future research build upon this finding as a base model upon which further improvements can be made.

**Keywords** - U-Net, Glioblastoma, Segmentation, Skip-connections.

### Paper P7

#### Interpolated SOM Neural Networks for Anatomical Joint Constraint Modelling

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Carolyne Skye, Larry Boltovskoi

UCLL University of Applied Sciences  
Leuven  
Belgium

**Abstract** – Recent years have witnessed an increase in demand for individual and general kinematic joint models. The need for their accuracy is stronger than ever, with a number of applications in fields as varied as animation, biomechanics, motion capture, ergonomics and robot human interaction modelling. Many approaches to date have exploited unit quaternions to eliminate singularities when modelling orientations between limbs at a joint, leading to the development of a number of novel joint constraint validation and correction methods. Recent work has demonstrated the use of a modified Rigid Map Network with a continuous output to model regular conical constraints on the orientation of the limb. In this paper we extend this work deploying a modified Self Organizing Map (SOM) with a continuous output.

**Keywords** – Self Organizing Map, Continuous, Unit Quaternion, Joint Constraint

**Day-2, Thursday, 13 April 2023, 2 Keynote Speakers & 2 papers**

**9.15 - 10.20, Thu.am1.A, Keynote Speaker-4 Assoc Prof Zuwairie Ibrahim**

Session Chairs: David Al-Dabass, Tim Bashford, Glenn Jenkins

**Opening Session & Keynote Speaker-4:**

**Prof Ibrahim Zuwairie Virtual-Malaysia**

**Progress in Simulated Kalman Filter MetaHeiristics**

**Assoc. Prof Dr. Zuwairie Ibrahim**

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Kuantan, Malaysia  
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### **Abstract**

The Simulated Kalman Filter (SKF) solves optimization problems by finding the estimate of the optimum solution. As a population-based algorithm, every agent in the population acts as a Kalman filter by using a standard Kalman filter framework. This talk presents an overview of the research progress in SKF, discussing the progress, improvements, modifications, and applications of SKF in drill path optimization, airport gate allocation problem (AGAP), assembly sequence planning (ASP), system identification, feature selection, image template matching, controller tuning, wireless sensor network, and engineering design problems.

### **Biography**

Associate Professor Dr Zuwairie Ibrahim graduated from Universiti Teknologi Malaysia with B.Eng in Electrical Engineering in 2000 and MSc by research in Image Processing in 2002. He received his PhD in DNA Computing from Meiji University, Japan, in 2006. He is currently with the Faculty of Manufacturing and Mechatronic Engineering Technology, Universiti Malaysia Pahang. He is one of the innovators who developed new estimation-based optimisation algorithms namely Simulated Kalman Filter Algorithm and Finite Impulse Response Optimiser. To date he has published over 130 conference papers and over 100 journal papers.

## **10.20 - 11.20, Thu.am2.A: Papers P8 and P9**

Session Chairs: Glenn Jenkins, Tim Bashford, David Al-Dabass

### **Paper P8**

#### **Fake Accounts Detection in Online Social Networks using Hybrid Machine Learning Models**

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**Abstract** - Online social networks (OSNs) have become popular worldwide and are excellent spaces for exchanging ideas, keeping up with the news, and promoting goods. However, because of their increasing popularity, social networks have become a target for suspicious exploitation, such as the disseminating of false or harmful information, which makes them less dependable and trustworthy. Unwanted content may circulate on the social network by way of the creation of fake and malicious accounts. Therefore, predicting fake accounts is a significant issue. In this research, we applied various machine learning methods to this issue and assessed and compared their results.

**Keywords** - Fake Accounts, SVM, ANN, RF, KNN, Machine Learning, Hybrid.

## 10.20 - 11.20, Thu.am2.A: Papers P8 and P9

Session Chairs: Glenn Jenkins, Tim Bashford, David Al-Dabass

### Paper P9

## A Hybrid Common Spatial Pattern with Attention-Based Convolutional Neural Networks for Motor Imagery EEG

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*Abstract* - Motor imagery on electroencephalogram (EEG) signals is widely used in brain-computer interface (BCI) systems with many exciting applications. Recently, many deep learning classifiers have been adopted, especially Convolutional Neural Networks (CNNs) in BCI application. However, CNNs suffer from the loss of salient features during training, causing the spatial invariant problem that affects the performance. This study develops a framework using CSP and Short-Time Fourier Transform (STFT) with Attention Convolutional Neural Network (CSP-STFT CNN) for EEG BCI classification. The features from CSP are translated into the spatial domain using STFT as input to attention-based CNN as the classifier. This framework uses attention-based CNNs to classify the collected spatial images across different test subjects. Finally, the performance of the CSP-STFT CNN is validated on BCI benchmark datasets, Competition III dataset Iva. The proposed CSP-STFT offers a promising result; the classifier achieved better performance in terms of classification accuracy, averaging 80% across all five subjects for Competition III dataset IVa. The precision and recall are excellent too, ranging around 0.8-0.9. In general, the proposed CSP-STFT CNN can offer richer joint spatiotemporal features as inputs to classifiers, whereas using an Attention-CNN classifier improves upon the earlier problems suffered by CNNs.

*Keywords* - Common Spatial Pattern, Short Time Fourier Transform, CNN, Attention Mechanism

## 11.20 - 11.35: Refreshments

**11.35 - 12.40, Thu.am3.A**

Session Chairs: Glenn Jenkins, Tim Bashford, David Al-Dabass

**Keynote Speaker-5: Dr Simon Thorne, Virtual-UK**

**Spreadsheet Modelling: Shadow Computing and Human Decision Making**

**Dr Simon Thorne**

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**Abstract:** Spreadsheet applications make up the vast majority of data processing activities of organizations but are totally unknown, hidden and lurking in the shadows of IT infrastructure. Spreadsheets are utterly ubiquitous and indispensable but they also contain serious data integrity issues that mean decision making based on spreadsheet models is risky and can result in serious material losses for organizations. Spreadsheet use is common in practically every industry there is and the serious decisions are made every day with spreadsheets, from business critical decision making to life and death in medical settings. The major types of issues that arise in spreadsheets are, data integrity resulting from bugs and errors, fraud perpetrated through falsification of data in spreadsheets, bias and misinterpretation of data and the trust placed in such artefacts. This talk will examine several cases of unintended losses from spreadsheets, what the underlying causes of these mistakes are and what can be done to minimize the risks.

**Biography:** Dr Simon Thorne is a Senior Lecturer in Computer Science at Cardiff School of Technologies. Simon teaches and researches in the fields of Artificial Intelligence, Machine Learning, Neural Networks, End User Computing, Spreadsheet Error and Human Factors. Simon has personally published 30 papers since 2004 and has held the position as chair of the European Spreadsheets Risks Interest Group (EuSpRIG) since 2008. In that time he has published 13 proceedings containing 150 papers with about 1500 citations on spreadsheet error, risk, software engineering, computers in society and human factors. Simon is a subject specialist in Artificial Intelligence, Data Science, Machine Learning and visualization for the Engineering and Physical Science Research Council (EPSRC) college. Simon also reviews for top tier computer science journals such as IEEE Access.

**1.45pm Lunch**

**2.30pm: Cambridge Tour, Committee Meeting**



## **Day-3, Friday, 14 April 2023, 2 Keynote Speakers & 2 Papers**

**9:20 - 10:20, Fri.am1.A: Keynote Speaker-6 Assoc Prof Dr Lela Mirtskhulava, Virtual**

Session Chairs: David Al-Dabass, Tim Bashford, Glenn Jenkins

### **Brain Disorders Monitoring Caused By Covid-19 Using EEGLAB**

**Assoc Prof Dr Lela Mirtskhulava**

**Ivane Javakhishvili Tbilisi State University and San Diego State University Georgia.**

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**Abstract:** COVID-19, caused by the SARS-CoV-2 virus, has not only affected the respiratory system but also has the potential to affect the central nervous system, leading to various brain disorders. The neurological symptoms of COVID-19 can range from mild headaches and dizziness to severe encephalitis, stroke, and even death. The pandemic has posed a significant challenge to the healthcare system worldwide, as the detection and management of COVID-19-related brain disorders require specialized resources and expertise.

Various studies have highlighted the prevalence of neurological symptoms in COVID-19 patients, with the incidence of severe complications such as encephalopathy and stroke being higher in critically ill patients. Monitoring of brain function through imaging techniques such as magnetic resonance imaging (MRI) and electroencephalography (EEG) have shown abnormalities in the brain structure and function of COVID-19 patients, which are associated with cognitive and behavioral deficits.

Early detection and management of COVID-19-related brain disorders are crucial to mitigate their long-term impact on patient health and well-being. Therefore, a multidisciplinary approach is needed to identify and manage these complications, involving neurologists, intensivists, infectious disease specialists, and rehabilitation professionals. Long-term studies are required to understand the full extent of COVID-19's impact on the brain and to develop effective interventions to prevent and treat these complications.

EEGLAB is a widely used open-source MATLAB toolbox that provides a user-friendly platform for EEG data analysis. It includes various tools for data preprocessing, artifact rejection, and signal processing, which can be used to extract relevant features from EEG signals.

Several studies have utilized EEG and EEGLAB to investigate the impact of COVID-19 on brain function. These studies have demonstrated that COVID-19 patients with neurological symptoms exhibit abnormal EEG patterns, including slowing of the background rhythm, increased delta and theta activity, and decreased alpha activity. These abnormalities were associated with cognitive impairment, delirium, and other neurological symptoms.

EEGLAB is a valuable tool for monitoring COVID-19-related brain disorders, providing a non-invasive method to detect changes in brain function and track the progression of the disease. The use of EEGLAB in combination with other imaging modalities, such as magnetic resonance imaging (MRI) and computed tomography (CT), may provide a more comprehensive understanding of the neurological consequences of COVID-19. Further research is needed to validate the use of EEGLAB in clinical settings and to develop standardized protocols for EEG data analysis in COVID-19 patients.

**Biography:** Lela Mirtskhulava received her Ph.D. in Computer Science and currently holds an associate professor position in the department of Computer Science at Ivane Javakhishvili Tbilisi State University/San

Diego State University Georgia. She was part-time faculty in the department of Computer engineering at San Jose State University, CA. She worked as an ICT Senior Engineer at Ericsson and Geocell LLC. Her research interests include cybersecurity, AI, blockchains, AI modeling in Medicine, brainwaves monitoring, wireless technologies, and mathematical modeling. She has published over 80 scientific papers. Dr. Mirtskhulava was invited as a visiting professor at the University of Cambridge, UK. She is the recipient of the Fulbright and DAAD Scholarships. She serves as a keynote speaker and the technical Committee and advisory board member at several international conferences. She served as a Pillar II coordinator and Health NCP at Horizon Europe Program Georgia. She is a Management Committee member of COST CA 19136 action.

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## **10:20 - 11:20, Fri.am2.A, 2 Papers P10 and P11**

Session Chairs: Glenn Jenkins, Tim Bashford, David Al-Dabass

### **Paper P10**

#### **Exploratory Research on Global Warming and Weather Data Simulation for Increased Sustainability or Resilience to Hazards Induced by a Changing Climate**

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*Abstract* - This research explores the rise in global surface temperature of planet earth. This analysis combines the granular details contributing to the impact of climate change by observing the simulations for rising temperature and includes the details on other possible contributing factors like temperature against date and time, etc. To find the main cause leading to recent climate changes, it is vital to account the effects of global warming through analysis of weather data by region and season. In the planet geography, there are places where the impact is severe and rapid. this study discusses the overall implications of the climate changes on ecosystem, wildlife, and people. This study outlines the impact of natural calamities like drought, ice storms, etc. in terms of moisture loss and the anticipated impact of these continued tragedies in near future to understand complexities to build support systems, prepare and respond.

*Keywords* - *Climate Change, Sustainability, Weather, Machine Learning, Global Warming*

### **Paper P11**

#### **Performance Evaluation of Voice over WiFi (VoWiFi) Using IP Multimedia Subsystem (IMS)**

**Wagdy Anis Aziz**

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Cairo-Egypt

*Abstract* - Poor coverage is a leading cause of to use VoWiFi calling to enhance coverage . With Wi-Fi Calling, Mobile network operators has a significant reduction in churn. So that we are keen to invest greatly in VoWiFi. VoWiFi means that we use radio waves in wireless networks to exchange voice instead of using wired networks, it Enables VoLTE subscribers to access EPC network using WiFi register with IMS network so that they can use IMS services such as voice call, SMS and other supplementary services and Subscribers can use WiFi to access EPC network when LTE is unavailable.

*Keywords* - *Performance Evaluation, VoWiFi, Voice over WiFi, IMS, IP Multimedia Subsystem*

## **11.20 – 11.35: Refreshments**

**11:35 - 12:40, Fri.am3.A**

Session Chairs: David Al-Dabass, Tim Bashford, Glenn Jenkins

### **Keynote Speaker-7: Prof Qiang Shen, Virtual-UK**

#### **Approximate Reasoning with Knowledge Interpolation and its Applications**

##### **Professor Qiang Shen**

**Pro Vice-Chancellor for Business and Physical Sciences**

**Aberystwyth University, Wales, UK.**

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**Abstract:** The Application of approximate reasoning has led to the development of practical intelligent systems for successfully tackling a wide range of real-world problems. Particularly, knowledge extraction implemented with fuzzy rule interpolation (FRI) facilitates approximate reasoning for situations where only an incomplete or sparse rule base is available and certain observations may not match any existing rules. Traditional fuzzy systems require (at least partial) direct pattern matching between observations and the given rules; however, FRI reasons through manipulation of rules that bear certain similarity with an unmatched observation.

Fuzzy Rule Interpolation (FRI) techniques have been extensively investigated for decades, resulting in many different approaches. This talk will focus on a popular group of the techniques known as Transformation-based FRI (T-FRI), which work by exploiting linear transformations of automatically selected rules nearest to an unmatched observation. It will first provide a review of the underlying, seminal T-FRI approach, followed by a brief introduction to its extended family, including: adaptive T-FRI, backward T-FRI, higher-order T-FRI, dynamic T-FRI and weighted T-FRI, each of which addresses some of the critical limitations of the original. Then, the talk will present successful applications that help resolve challenging problems such as network security and medical diagnosis. Finally, the talk will conclude with initial sketches for further development in this important area.

**Biography:** Qiang Shen received a PhD in Knowledge-Based Systems (1990) and a DSc in Computational Intelligence (2013). He holds the Established Chair of Computer Science and is Pro Vice-Chancellor: Faculty of Business and Physical Sciences at Aberystwyth University. He is a Fellow of the Royal Academy of Engineering and a Fellow and Council Member of the Learned Society of Wales (the national academy of Wales). Professor Shen was a panel member for the past two UK Research Excellence Framework (REF) exercises: 2014 and 2021, both on Computer Science and Informatics. He has authored 2 research monographs and over 450 peer-reviewed papers, including an award-winning IEEE Outstanding Transactions paper. Professor Shen was a London 2012 Olympic Torch Relay torchbearer, nominated to carry the Olympic torch in celebration of the centenary of Alan Turing.

**12.45 Close of Conference, Photo Opportunity  
Lunch and Depart**