IWSDA'2022 Full Program
Keynotes

Keynote 1:
Speaker: **Jonathan Jedwab** (Simon Fraser University, Canada)
Session Chair: Sihem Mesnager
Date & Time: **1st August 2022, 11:20 AM to 12:20 PM**
Title: Constructions and restrictions for balanced splittable Hadamard matrices
Abstract: A Hadamard matrix is balanced splittable if some subset of its rows has the property that the dot product of every two distinct columns takes at most two values. Hadamard matrices with this additional property provide new opportunities for advantageous signal design beyond those already recognized for Hadamard matrices. We use combinatorial analysis to restrict the parameters of a balanced splittable Hadamard matrix to lie in one of several classes. An important consideration is whether the strongly regular graph associated with the balanced splittable Hadamard matrix is primitive or imprimitive. We construct new infinite families of balanced splittable Hadamard matrices in both the primitive and imprimitive cases. A rich source of examples is provided by packings of partial difference sets, from which we construct Hadamard matrices admitting a row decomposition so that the balanced splittable property holds simultaneously with respect to every union of the submatrices of the decomposition.

Keynote 2:
Speaker: **Arne Winterhof** (Austrian Academy of Sciences, Austria)
Session Chair: Chunlei Li
Date & Time: **3rd August 2022, 09:20 AM to 10:20 AM**
Title: Pseudorandom Sequences Derived From Automatic Sequences
Abstract: Many automatic sequences, such as the Thue-Morse sequence or the Rudin-Shapiro sequence, have some desirable features of pseudo-randomness such as a large linear complexity and a small well-distribution measure. However, they also have some undesirable properties in view of certain applications. For example, the majority of possible binary patterns never appear in automatic sequences and their correlation measure of order 2 is extremely large. Certain subsequences, such as automatic sequences along squares, may keep the good properties of the original sequence but avoid the bad ones. In this survey talk we investigate properties of pseudo-randomness and non-randomness of automatic sequences and their subsequences and present results on their behavior under several measures of pseudo-randomness including linear complexity, correlation measure of order k, expansion complexity and normality.

Keynote 3:
Speaker: **Zhiguo Ding** (University of Manchester, UK)
Session Chair: Zilong Liu
Date & Time: **4th August 2022, 09:20 AM to 10:20 AM**
Title: Recent Advances in Non-Orthogonal Multiple Access in 6G Wireless Networks
Abstract: With the current rollout of 5G, the focus of the research community is shifting towards the design of the next generation of mobile systems, e.g., 6G mobile networks. Non-orthogonal multiple access (NOMA) has been recognized as an essential enabling technology for the forthcoming 6G networks to meet the heterogeneous demands on low latency, high reliability, massive connectivity, improved fairness, and high throughput. The principle of NOMA is to encourage users for spectrum sharing, where multiple users are served in the same resource block, such as a time slot, subcarrier, or spreading code. The aim of this talk is to provide an overview of the latest research results and innovations in NOMA technologies as well as their emerging applications, including terahertz (THz) communications, backscatter communications (BackCom), intelligent reflecting surfaces (IRS), mobile edge computing (MEC), etc. Future research challenges regarding NOMA in B5G and 6G are also presented.

Paper Presentation Sessions

Session 1: Complementary Sequences 1 August 2022, 1:50 PM to 3:30 PM	
Session Chair: Avik R. Adhikary (email: avik.adhikary@ieee.org)	

Sl. No.	Paper details
1	*Title:* **Construction of multilevel periodic complementary pairs over integers** *Authors:* Kai Liu, Zebin Chang, Youjia Yang, Yuandong Liu and Yubo Li (Yanshan University, China)
2	*Title:* **New constructions of para-unitary matrices for Golay sequences** *Authors:* Yahong Nan, Jun Zhang (Capital Normal University, China) and Guizhen Zhu (Data Communication Science and Technology Research Institute, China)
3	*Title:* **Golay complementary sequences over QAM based on compatible para-unitary matrices** *Authors:* Erzhong Xue and Zilong Wang (Xidian University, China)
4	*Title:* **Boolean functions of binary Type-II complementary array pair** *Authors:* Erzhong Xue, Zilong Wang (Xidian University, China) and Jinjin Chai (Air Force Engineering University, China)
5	*Title:* **A novel construction of complementary sequences set from complementary sequences pairs** *Authors:* Longye Wang (Southwest Petroleum University, China), Xiaoli Zeng (Tibet University, China) and Gaoyuan Zhang (Henan University of Science and Technology, China)

Session 2: Machine Learning and Its Applications 2 August 2022, 9:00 AM to 10:20 AM	
Session Chair: Qu Luo (email: q.u.luo@surrey.ac.uk)	

Sl. No.	Paper details
1	*Title:* **An improved sparsity adaptive matching pursuit algorithm for sparse channel estimation** *Authors:* Chaoyuan Bai, Liu Yang and Pingzhi Fan (Southwest Jiaotong University, China)
2	*Title:* **An effective convolution neural network for automatic recognition of analog and digital signal modulations for cognitive SDR applications** *Authors:* Marte Valerio Falcone, Gaetano Giunta and Luca Pallotta (University of Roma Tre, Italy)
3	*Title:* **A new algorithm for searching sequences with low PAPR via goal attainment method** *Authors:* Yan Yu, Zhi Gu, Avik R. Adhikary, Wei Guo and Rong Luo (Southwest Jiaotong University, China)
4	*Title:* **Dynamic ACB scheme based on neural networks and Markov chain** *Authors:* Shaofu Li, Liu Yang and Pingzhi Fan (Southwest Jiaotong University, China)

Session 3: Sequence Sets with Low/Zero Correlation Properties
2 August 2022, 10:40 AM to 12:20 PM
Session Chair: Tetsuya Kojima (email: kojt@tokyo-ct.ac.jp)

Sl. No.	Paper details
1	*Title:* **Symmetrical Z-complementary code sets for optimal training in generalized spatial modulation** *Authors:* Yajing Zhou, Zhengchun Zhou (Southwest Jiaotong University, China), Zilong Liu (University of Essex, UK), Yang Yang (Southwest Jiaotong University, China), Ping Yang (University of Electronic Science and Technology of China, China) and Pingzhi Fan (Southwest Jiaotong University, China)
2	*Title:* **Multiple Z-complementary code sets with low inter-set cross-correlation** *Authors:* Xinyu Men, Yubo Li, Yihuang Zeng and Linjie Li (Yanshan University, China)
3	*Title:* **A new construction of ZCZ sequence sets with inter-set zero cross-correlation zone** *Authors:* Zheng Wang, Ruibin Ren, Zhifan Ye and Yang Yang (Southwest Jiaotong University, China)
4	*Title:* **Asymptotically optimal quasi-complementary code sets of length $p_1^{m_1}p_2^{m_2}$** *Authors:* Dian Li, Chunlei Li and Palash Sarkar (University of Bergen, Norway)
5	*Title:* **More optimal quasi complementary sequence sets from Florentine rectangles** *Authors:* Avik R. Adhikary, Zhengchun Zhou (Southwest Jiaotong University, China)

Session 4: Coding Theory
2 August 2022, 1:50 PM to 3:30 PM
Session Chair: Peter Kazakov (email: peter.kazakov@gmail.com)

Sl. No.	Paper details
1	*Title:* **Construction of a class of minimal linear codes** *Authors:* Tianxin Wang, Xiaoni Du, Wengang Jin and Yanzhong Sun (Northwest Normal University, China)
2	*Title:* **A gear construction of CRC codes for enhanced polar decoding** *Authors:* Peter Kazakov (Bulgarian Academy of Sciences, Bulgaria), Mengfan Zheng (Imperial College London, UK) and Zilong Liu (University of Essex, UK)
3	*Title:* **Bit-flipping for stack decoding of polarization-adjusted convolutional (PAC) codes** *Authors:* Mohsen Moradi (Bilkent University, Turkey)
4	*Title:* **A new class of AMDS symbol-pair codes** *Authors:* Xiuxin Tang and Rong Luo (Southwest Jiaotong University, China)
5	*Title:* **Some intersections of two binary LRCs with disjoint repair groups**

	Authors: Hyojeong Choi, Zhi Jing, Gangsan Kim, Hong-Yeop Song (Yonsei University, Korea)

Session 5: Sequences and Their Applications
3 August 2022, 10:40 AM to 12:20 PM

Session Chair: Palash Sarkar (email: Palash.Sarkar@uib.no)

Sl. No.	Paper details
1	*Title:* **Generalized construction of Z-complementary pairs with fixed zero correlation zone ratios** *Authors:* Xiuping Peng, Mingshuo Shen and Shicheng Liu (Yanshan University, China)
2	*Title:* **A new class of Z-complementary pairs and their application in channel estimation for mountainous terrain** *Authors:* Yangjie Xiang, Zhi Gu, Avik R. Adhikary and Ruibin Ren (Southwest Jiaotong University, China)
3	*Title:* **Generalized symmetric Zadoff-Chu sequences for enhanced timing advanced estimation** *Authors:* Tingting Feng, Ruibin Ren and Yang Yang (Southwest Jiaotong University, China)
4	*Title:* **A novel design of flag sequences for low-complexity delay-Doppler estimation** *Authors:* Lingsheng Meng, Yong Liang Guan, Yao Ge (Nanyang Technological University, Singapore) and Zilong Liu (University of Essex, UK)
5	*Title:* **A novel scheme for peak-to-average power ratio reduction using polar codes** *Authors:* Chin-Chieh Huang, Tzu-Chieh Kao, Cheng-Yu Pai and Chao-Yu Chen (National Cheng Kung University, Taiwan, R.O.C)

Session 6: Finite Fields and Their Applications
4 August 2022, 10:40 AM to 12:20 PM

Session Chair: Sihem Mesnager (email: sihem.mesnager@telecom-paris.fr)

Sl. No.	Paper details
1	*Title:* **New correlations of m-sequences over the finite field F_4 compatible with a new bijection to Z_4** *Authors:* Serdar Boztas (Maryland Advanced Development Laboratory University Research Foundation, USA), Ferruh Ozbudak (Middle East Technical University, Turkey) and Eda Tekin (Karabuk University, Turkey)
2	*Title:* **A new kind of hybrid character sums and their applications** *Authors:* Xiwang Cao, Xinyi Gu and Jinlong Wan (Nanjing University of Aeronautics and Astronautics, China)
3	*Title:* **A new transformation for Costas arrays** *Authors:* Ali Ardalani and Alexander Pott (Otto von Guericke University, Germany)
4	*Title:* **A note on the differential spectrum of a class of power functions** *Authors:* Nian Li, Yanan Wu, Xiangyong Zeng (Hubei University, China) and Xiaohu Tang

	(Southwest Jiaotong University, China)
5	*Title:* **Quantum synchronizable codes from generalized cyclotomy** *Authors:* Xueting Wang, Tongjiang Yan, Tao Wang and Shiwen Sun (China University of Petroleum, China)

Session 7: Modulation and Detection
4 August 2022, 1:50 PM to 3:30 PM

Session Chair: Zilong Liu (email: zilong.liu@essex.ac.uk)

Sl. No.	Paper details
1	*Title:* **Solving the data imbalance problem in network intrusion detection: a MP-CVAE based method** *Authors:* Hongyi Li, Zicheng Wang, Hua Meng and Zhengchun Zhou (Southwest Jiaotong University, China)
2	*Title:* **Clock offset and skew estimation based on correlation detection with one-way dissemination in wireless sensor networks** *Authors:* Ruijie Fan, Wei Liu, Mao Li and Zichao Chai (National University of Defense Technology, China)
3	*Title:* **OAMP for low complexity detection in large-Scale LDS systems** *Authors:* Wen Haifeng (University of Electronic Science and Technology of China, China), Luo Qu (University of Surrey, UK), Yuan Weijie (Southern University of Science and Technology, China), Liu Zilong (University of Essex, UK) and Xiao Pei (University of Surrey, UK)
4	*Title:* **A look at OTFS from a hybrid carrier perspective** *Authors:* Yuliang Dong, Jing Lei, Ying Li and Ke Lai (National University of Defense Technology, China)
5	*Title:* **Jamming modulation: make enemies become friends** *Authors:* Jianhui Ma (University of Electronic Science and Technology of China (UESTC), China), Linsong Du (Southwest Jiaotong University, China), Chenxing Li (Huawei Technologies Co., Ltd., China) and Qiang Li (University of Electronic Science and Technology of China (UESTC), China)

Session 8: Sequences with Low Correlation Properties
5 August 2022, 9:20 AM to 10:20 AM

Session Chair: Avik Ranjan Adhikary (email: avik.adhikary@ieee.org)

Sl. No.	Paper details
1	*Title:* **Equivalence classes and balance properties of interleaved sequences** *Authors:* Kirsten Nelson, Daniel Panario and Brett Stevens (Carleton University, Canada)
2	*Title:* **3-adic complexity of ternary sequences with period pq** *Authors:* Vladimir Edemskiy (Yaroslav-the-wise Novgorod State University, Russia), Chenhuang Wu (Putian University, China), Sofia Koltsova (Yaroslav-the-wise Novgorod State University,

	Russia) and Meixiang Chen (Putian University, China)
3	*Title:* **A large family of sequences with low correlation** *Authors:* Zhangti Yan (Southwest Jiaotong University, China), Qi Gao (Lanzhou Technology and Business College, China), Wei Guo and Rong Luo (Southwest Jiaotong University, China)

Session 9: Coding Theory and Cryptography
5 August 2022, 10:40 AM to 12:20 PM

Session Chair: Peter Boyvalenkov (email: peter@math.bas.bg)

Sl. No.	Paper details
1	*Title:* **Boolean functions with few Walsh transform values** *Authors:* Pinhui Ke (Fujian Normal University, China) and Zhixiong Chen (Putian University, China)
2	*Title:* **Bounds for the minimum distance and covering radius of orthogonal arrays via their distance distributions** *Authors:* Silvia Boumova (Sofia University, Bulgaria), Peter Boyvalenkov (Bulgarian Academy of Sciences, Bulgaria) and Maya Stoyanova (Sofia University, Bulgaria)
3	*Title:* **Boomerang spectrum of a class of power functions** *Authors:* Haode Yan, Ziying Zhang and Zhen Li (Southwest Jiaotong University, China)
4	*Title:* **BCH-SPC based cubic turbo product coding** *Authors:* Li Deng (University of Electronic Science and Technology of China, China), Yong Liang Guan (Nanyang Technological University, Singapore), Zilong Liu (University of Essex, UK), Zhiping Shi and Zhongpei Zhang (University of Electronic Science and Technology of China, China)
5	*Title:* **Cryptographic pseudorandom noise generators for FHE and differential privacy** *Authors:* Kalikinkar Mandal (University of New Brunswick, Canada)

Session 10: Receiver Design and Application of Frequency Hopping Sequences
5 August 2022, 1:50 PM to 3:30 PM

Session Chair: Zilong Liu (email: zilong.liu@essex.ac.uk)

Sl. No.	Paper details
1	*Title:* **Demonstration of flexible transceiver scheme for optical access networks** *Authors:* Xing Ouyang, Giuseppe Talli and Paul Townsend (Tyndall National Institute, Ireland)
2	*Title:* **Minimizing age of information for mobile edge computing empowered industrial internet of things** *Authors:* Jiaping Li, Jianhua Tang (South China University of Technology, China) and Zilong Liu (University of Essex, UK)
3	*Title:* **A new class of optimal wide-gap one-coincidence frequency-hopping sequence** *Authors:* Ting Wang, Xianhua Niu (Xihua University, China), Jianan Wang (Chengdu Aerospace

	Communication Device Company Limited, China) and Minfeng Shao (Xihua University, China)
4	*Title:* **A construction of control sequences set for access control in data link** *Authors:* Xin Tan, Xianhua Niu, Jiabei Ma (Xihua University, China), Jianan Wang (Chengdu Aerospace Communication Device Company Limited, China), Xing Liu (Sichuan University, China) and Jianhong Zhou (Xihua University, China)
5	*Title:* **A Distance Measurement Algorithm Based on Auto-correlation Detection with IEEE 802.11ad Preamble** *Authors:* Sudun Zhao, Wei Liu, Jing Lei and Mao Li (National University of Defense Technology, China)