## Center For Applied Neuroscience 13th ANNUAL SCIENTIFIC CONFERENCE

# Contributions of Predictive Modelling & Artificial Intelligence to Applied Neuroscience

Aithousa Teleton, University of Cyprus November 29<sup>th</sup>, 2023 0830 - 1700 #CAN2023











#### "Contributions of Predictive Modelling & Artificial Intelligence to Applied Neuroscience"

		ROGRAN	M
0900 - 0930	Opening Remarks	PROF. TASOS CHRISTOFIDES	
		Rector, University of Cyprus	
		PROF. ANTONIS ELLINAS	
		Dean, Faculty of Social Sciences & Education, University of Cyprus	
		PROF. FOFI CONSTANTINIDOU	
		Professor of Psychology & Director Center for Applied Neuroscience, University of Cyprus	
0930 - 1030	Keynote	PROF. GEORGE SPYROU	Торіс:
		Bioinformatics ERA Chair, Professor & Head of the Bioinformatics Department, The Cyprus Institute of Neurology & Genetics (CING), Nicosia, Cyprus	"Bioinformatics in the fight against neuro- degenerative diseases in the context of Network Medicine."
1030 - 1045	COMFORT	BREAK	
1045 - 1130	Invited Speaker	DR. CHISTOFOROS CHRISTOFOROU	Topic:
		Associate Professor, Division of Computer Science, Mathematics & Science, St. John's University, New York	"At the intersection of Machine Learning (ML), AI, & Neuroscience. ML models in the study of the neural underpinnings of reading disorders and beyond."
1130 - 1215	Invited Speaker	DR. MIHALIS NICOLAOU	Topic:
		Assistant Professor, Computation-based Science & Technology Research Center, The Cyprus Institute	"Artificial Intelligence: Recent Developments, Limitations, and Opportunities."
1215 - 1230	Acknowledgment Award	DR. ANTHI LOUTSIOU	
		Licensed Clinical Psychologist and EuroPsy Certified Psychologist , Function over form/ Contextual Behavioral Scientist & Psychotherapist , Director of Clinical Training Master's Program in School Psychology Department of Psychology/ UCY	
1230 - 1330	LIGHT RECI	EPTION & POSTER VIE	WINGS



	F	ROGRAM	N
1330 - 1430	Symposium by CAN Researchers Predictive modeling in AI in clinical population	<b>IOULIA SOLOMOU, MSC</b> Research Associate at Center for Applied Neuroscience (CAN) - University of Cyprus Clinical Psychology (PhD Candidate) Neuroscience (MSc)	Topic: "Hamessing the Power of AI: Revolutionizing TBI Care from Acute Diagnosis to Advanced Therapies"
		<b>DR. EVA PETTEMERIDOU</b> PhD, Clinical Psychology #551 Postdoctoral Fellow, Center for Applied Neuroscience, Univer- sity of Cyprus. KIOS Innovation & Research Center of Excellence, University of Cyprus	Topic: "PAMS: An Intelligent Patient Assessment and Monitoring System."
		KALIA LOFITOU, MSC Special Scientist at Center for Applied Neuroscience, University of Cyprus PhD Student in Clinical Psychology, University of Cyprus. MSc Neuropsychology & Cognitive Development, Université Libre de Bruxelles, Belgium Registered Psychologist (#861)	
		<b>TONIA-FLERY ARTEMI, MA</b> PhD Candidate in Clinical Psychology Lab, Special Scientist & Early Stage Researcher Clinical Psychology and Psychophysiology Lab Center of Applied Neuroscience, UCY	Topic: "The Desire to Play: Motivational and Emotional Mechanisms Associated with Gambling Behavior"
1430 - 1530	Panel Discussion	<b>DR. JAHNA OTTERBACHER</b> Associate Professor, Faculty of Pure and Applied Sciences, Open University of Cyprus. Co-Leader, Fairness and Ethics in Human-Al Interaction (fAIre), CYENS CoE	Topic: Ask the Experts
		<b>PROF. GEORGE SPYROU</b> Bioinformatics ERA Chair, Professor and Head of the Bioinformatics Department, The Cyprus Institute of Neurology & Genetics (CING), Nicosia, Cyprus	
		<b>DR. CHRISTOFOROS CHRISTOFOROU</b> Associate Professor, Division of Computer Science, Mathematics and Science, St. John's University, New York	
		<b>DR. MIHALIS NICOLAOU</b> Assistant Professor, Computation-based Science and Technology Research Center, The Cyprus Institute	
1530 - 1545	COMFORT BREAK & POSTER VIEWINGS		
1545 - 1645	ABSTRACT SHORT PRESENTATIONS		
1645 - 1700	CLOSING		

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#### "Contributions of Predictive Modelling & Artificial Intelligence to Applied Neuroscience" MEET OUR PRESENTERS

#### **Professor George Spyrou**

Professor George M. Spyrou is the Bioinformatics European Research Area Chair Holder and the Head of the Bioinformatics Department (C-BIG) at the Cyprus Institute of Neurology and Genetics (CING). He is the Bioinformatics Course Coordinator at the Postgraduate School of CING where he has been elected as full Professor. He is a Senior IEEE Member and he serves as member of the Editorial Board in well-known bioinformatic cs-related journals. His work is focusing on the design and development of computational methods for the discovery of complex patterns of biomarkers, the understanding of underlying molecular mechanisms and drug repurposing though network-based analytics and systems bioinformatics.



## "Bioinformatics in the fight against neurodegenerative diseases in the context of Network Medicine."

Network science, together with machine learning and computational modeling, lays out a roadmap for the further development of bioinformatics towards a more efficient exploitation of single-level as well as multi-omics. Network-based inference and integration provide great opportunities to develop innovative methodologies that lead to new insights into candidate biomarkers, repurposed drugs, and disease-related mechanisms, supporting and enhancing the vision of Network Medicine. Network-based methods and tools for mechanism understanding, drug repurposing and biomarker discovery, developed by the Bioinformatics Department at CING will be presented.

#### Learning Objectives:

- The attendees to understand the Network Medicine context.
- The attendees to get familiar with the capabilities of Bioinformatics in the fight against neurodegeneration.
- The attendees to be aware of the network-based methods and tools for mechanism understanding, drug repurposing and biomarker discovery, developed by the Bioinformatics Department at CING.

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## MEET OUR PRESENTERS

#### Dr. Christoforos Chirstoforou

Dr. Christoforou is an Associate Professor at the Division of Computer Science, Mathematics, and Sciences of St. John's University in New York, USA. He also serves as the Program Director of the Master's in Computer Science program at St. John's University and leads the Neuro-Intelligence and Innovation Lab.

His research explores questions and problems at the intersection of computer science and neuroscience. His approach focuses on developing machine learning and AI algorithms to decode and extract information from electroencephalographic (EEG) and other neurophysiological signals and use those to design novel neurotechnology solutions and gain insights into the neurocognitive processes of the human brain during complex and dynamic tasks.

His research contributions include applications in a wide range of domain areas such as brain-computer interfaces, human-robot interaction, neuro-cinematics, and neuro-marketing, as well as the study of the neural underpinnings of reading disorders and other neurocognitive processes (i.e., spatial cognition, emotions) during complex paradigm design (i.e., dynamic video viewing). He also maintains a close collaboration with the Learning Disabilities group of the Center for Applied Neuroscience of the University of Cyprus, led by Dr. Timothy Papadopoulos.

Dr. Christoforou holds a Ph.D. and M.Phil. in Computer Science from the Graduate Center of the City University of New York and a Master of Science from the City College of the City University of New York.

> "At the intersection of Machine Learning (ML), AI, underpinnings of reading disorders and beyond."



Advances in Machine Learning and AI models can enable us to extract latent information from neural signals (i.e., EEG) during complex, un-constrained, and Neuroscience. ML models and dynamic tasks. These models open new opportunities for studying the neural underpinnings of in the study of the neural cognitive processes during novel and existing experimental paradigms in ways not previously possible using conventional analysis techniques. In this talk, I will introduce the neural-congruency

framework, a novel machine learning-based approach I developed for analyzing neurophysiological (i.e., EEG) and eye-tracking signals. Moreover, I will discuss recent collaborative work where we demonstrate the efficacy of the neural-congruency framework in the study of the neural underpinnings of reading disorders during complex reading tasks, namely, serial Rapid-automatized Naming (RAN), Phoneme Elision, and Spoonerism. Finally, I will discuss opportunities and applications of the neural-congruency framework in more general neuroscience research studies and neurotechnology development.

#### Learning Objectives:

- Recognize how Machine Learning algorithms can you use to analyze EEG.
- Introduce the neural-congruency framework for analyzing EEG signals. •
- Identify the applications of the neural-congruency frame for studying the neural underpinnings of cognitive processes during complex tasks.





#### "Contributions of Predictive Modelling & Artificial Intelligence to Applied Neuroscience" MEET OUR PRESENTERS

#### Dr. Mihalis Nicolaou

Mihalis Nicolaou is assistant professor at the Computation-based Science and Technology Research Center at The Cyprus Institute. He received the B.Sc. degree from the University of Athens, Greece (2008), and the M.Sc. (2009) and Ph.D. (2014) degrees from the Department of Computing, Imperial College London. He is interested in developing machine learning U.K. algorithms that are robust, efficient, generalizable, and interpretable, with a particular focus on generative models. He works in a wide range of applications, often related to computer vision and natural language processing, while he is particularly interested in critical inter-disciplinary applications of machine learning, as in the domains of health and climate monitoring. His earlier work on human sensing received best paper awards (IEEE Face and Gesture '11, ICASSP '16), while he has been guest editor at IEEE Transactions on Affective He has published more than 70 research Computing. papers in venues including NeurIPS, ICLR, CVPR, TPAMI.



## "Artificial Intelligence: Recent Developments, Limitations, and Opportunities."

The past decade was marked by rapid progress in the area of AI, primarily in machine and deep learning. Scalability, vast amounts of training data, and suitable learning algorithms have produced unprecedented results across many applications (e.g., computer vision and imaging, natural language processing). While the early success of deep learning was mostly in the realms of discriminative learning (e.g., classification), large generative (foundation) models with up to trillions of parameters have emerged as the most recent breakthrough in the area – for example, Large Language Models (LLMs). In this light, I will discuss some opportunities that arise given these developments, while highlighting existing limitations and challenges (e.g., interpretability, bias, alignment). I will also talk about my work in addressing some of these challenges in the context of generative models and multimodal learning, while focusing on applications related to applied neuroscience and health.

#### Learning Objectives:

- Intuitive understanding of recent AI architectures and their properties.
- Leveraging AI in applications related to neuroscience and health.
- Awareness of limitations and capabilities.

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#### MEET OUR PANEL

#### Dr. Jahna Otterbacker

Jahna Otterbacher (Ph.D., University of Michigan at Ann Arbor, USA) is Associate Professor and Vice Dean of the School of Pure and Applied Sciences at the Open University of Cyprus (OUC). At OUC, she leads the Cyprus Center for Algorithmic Transparency (CyCAT), which conducts interdisciplinary research focused on promoting technical and educational solutions for promoting AI transparency and literacy. Concurrent to this, Jahna co-leads the Fairness and Ethics in Al-Human Interaction (fAlre) group at CYENS, a new center of excellence and innovation in Nicosia, Cyprus. Her research has been funded by the EU's Horizon 2020 Research and Innovation Program (under Grant Agreements No. 739578 (RISE) & No. 810105 (CyCAT)), as well as the Cyprus Research and Innovation Foundation (under grants EXCELLENCE/0918/0086 (DESCANT) and EXCELLENCE/0421/0360 (KeepA(I)n)). Since 2022, she is included on the Stanford-Elsevier list of the world's most-cited scholars (in the area of artificial intelligence image analysis).



### SHORT PRESENTATIONS

#	Title	Authors
1	Exploring the Genetic Underpinnings of Internalizing and Externalizing Psychopathology in Children Aged 8-12 years old	Georgia Soursou, & Kostas Fanti
2	Exploring lexical semantic violations in poor reading: An Eye-Tracking Study	Evgenia-Peristera Kouki, Anna Panayiotou, Evangelos Paraskevopoulos, George Spanoudis, & Timothy C. Papadopoulos
3	Semantic content effect on the perception of movieclips	Anastasia Maria Kesoglou, Kyriaki Mikellidou
4	The P300 as a candidate marker of emotion regulation difficulties	Markos Apostolakis, Georgia Panayiotou
5	<sup>(</sup> Predictive Factors of Acquired Brain Injury (ABI) in Cases of Intimate Partner Violence: An Examination of Violence Characteristics and Risk Assessment	Flora Nikolaou, Iro Michael , Andri Andronikou, Fofi Constantinidou

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#### "Contributions of Predictive Modelling & Artificial Intelligence to Applied Neuroscience"

## **Abstracts for Scientific Posters**

#	Title	Authors
1	Assessing the psychometric properties of the South Oaks Gambling Screen-A Systematic Review	Revekka Christodoulou, & Georgia Panayiotou
2	AUTISM AND DOMESTIC SPACE : Location choices of au- tistic people when in different moods.	Marios Avramides, Pelagia Kavvalou, Christakis Chatzixristos, and Nadia Charalambous
3	Bullying and Victimization: Relational and Psychopathic Factors.	Apostolou, S., Zacharaki, G., & Charalampous, K., Stavrinides, P.
4	Implementing the Categorization Program (CP) as a Single Treatment Modality in Chronic Brain Injury-Implications for Neurorehabilitation	Fofi Constantinidou, Ioulia Solomou, Constantinos Christodoulides, Flora Nicolaou, Melina Ioannou & Nina Michael
5	'Like going into a chocolate shop, blindfolded': What do people with primary progressive aphasia want from speech and language therapy?	Maria Loizidoua, Emilie Brotherhooda, Emma Hardinga, Sebastian Crutcha, Jason D. Warrena, Chris J. D. Hardya, & Anna Volkmerb
6	Multimodal Prediction of Alexithymia from Physiological and Audio Signals	Valeria Fillipou, Nikolas Theodosiou, Mihalis A. Nicolaou, Georgia Panayiotou, Elena Constantinou, Marios Theodorou & Maria Panteli
7	Novel Insights on the Association of Psychological Risk Factors with Heart Rate Variability in Breast Cancer Patients and Survivors: A Systematic Review	Ioanna Kazalaki & Georgia Panayiotou
8	Parenting Style and Children's Cognitive and Emotional Development: Preliminary Data	Antriani Tsagkaraki, Evgenia-Peristera Kouki MSc, George Spanoudis , & Timothy C. Papadopoulos



## **Abstracts for Scientific Posters**

Title	Authors
Patient and Caregiver Perceptions of Unmet Needs following Traumatic Brain Injury	Ioannou Melina, Pettemeridou Eva, Christodoulides Constantinos, Christofi Mairi, Kokkinou Mikaella, Nicolaou Flora, Solomou Ioulia, Kadianaki Irini, & Constantinidou Fofi
Predicting Reading Outcomes in School Age	Savvina Banti, Evgenia-Peristera Kouki, George C. Spanoudis, & Timothy C. Papadopoulos
Predicting violence risk: Clinical Judgment Vs Structural Professional Judgment Vs Actuarial Assessment.	Metaxas, G.M., Antoniou, A., & Christodoulou S.C.
Predictive Modeling and Epidemiological Trends of Pediatric TBI in Cyprus Pre- and Post-COVID-19	Lofitou, K., Agathocleous, M. & Constantinidou, F
Psychometric properties of GMQ-F.	Arapoglou Leonidas, & Panayiotou Georgia
"Public attitudes toward Solar Energy" a Systematic Review	Despina Melanthiou & Georgia Panayiotou
Simultaneous cognitive processing in developing readers: Evidence from eye movement	Argyro Fella, Maria Loizou, Christoforos Christoforou, & Timothy C. Papadopoulos
Teleporting impairs scene recognition in virtual environments	Christodoula Gavriel , Adamantini Chatzipanagioti, Alexia Galati, Savvas Avraam & Marios N. Avraamides
Visually-Filled Vs. Empty Reproductions: Effects on the Reproduced Durations of Auditory Stimuli	Miria N. Plastira & Marios N. Avraamides
	Title   Patient and Caregiver Perceptions of Unmet Needs following Traumatic Brain Injury   Predicting Reading Outcomes in School Age   Predicting violence risk: Clinical Judgment Vs Structural Professional Judgment Vs Actuarial Assessment.   Predictive Modeling and Epidemiological Trends of Pediatric TBI in Cyprus Pre- and Post-COVID-19   Psychometric properties of GMQ-F.   "Public attitudes toward Solar Energy" a Systematic Review   Simultaneous cognitive processing in developing readers: Evidence from eye movement   Teleporting impairs scene recognition in virtual environments   Visually-Filled Vs. Empty Reproductions: Effects on the Reproduced



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"Contributions of Predictive Modelling & Artificial Intelligence to Applied Neuroscience"

## CAN at a Glance

Email : can@ucy.ac.cy Phone: +357 22895190

#### **General Information:**

Center for Applied Neuroscience (CAN) was founded in 2011 through competitive funding for an infrastructure grant by the Cyprus Research & Innovation Foundation. In 2013, the House of Representatives, Republic of Cyprus, approved CAN as an Independent Research Center in the School of Social Sciences & Education at the University of Cyprus.

CAN is the only established Research Center of its kind in Cyprus. Researchers at CAN apply integrative and contemporary neuroscience methodologies to investigate healthy and clinical populations, with a focus on high incidence neurological and psychiatric disorders. The founding of CAN brings to the forefront the importance of research, development, and delivery of evidence-based procedures and clinical services in Cyprus.

#### Vision:

As the leading Research Center for the study of brain, mind, and human behavior in Cyprus, the Center for Applied Neuroscience (CAN) aspires to be the flagship Center for neuroscience research and collaboration in the greater geographical region.

#### **Mission**:

The mission of the CAN is to conduct basic and applied research and contribute to the development of new knowledge, methods, and technologies that advance science and benefit health, quality of life and the society.

#### **Scope & Objectives:**

Through their research program and their established collaborations with other reputable research institutions and the industry, CAN researchers contribute significant research outcomes to science and society at large. The scope and objectives of CAN are:

- $\Rightarrow$  Build capacities through training and development of new researchers and clinicians;
- ⇒ Develop and adapt assessment and intervention modalities for language, cognition, behavior and affect;
- $\Rightarrow$  Promote multidisciplinary and interdisciplinary research;
- $\Rightarrow$  Implement multimodal and integrative research methodologies;
- $\Rightarrow$  Expand the national and international network of partners; and
- ⇒ Apply scientific knowledge and support entrepreneurship to address societal and economic challenges.



Center for Applied Neuroscience & the Department of Psychology, UCY, thank you for attending the...

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Email: can@ucy.ac.cy

Website: cancyprus.org

Address:Center for Applied Neuroscience<br/>University of Cyprus, Central Campus<br/>Building E<br/>Kallipoleos 75<br/>Nicosia 1678

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