



Τεχνολογικό  
Πανεπιστήμιο  
Κύπρου

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

Τελετή  
Αποφοίτησης  
Διδακτορικών  
Φοιτητών και  
Φοιτητριών  
2024



**20**  
ΧΡΟΝΙΑ ΤΕΠΑΚ

---

## Πρόγραμμα Τελετής

Δευτέρα, 17 Ιουνίου 2024

Είσοδος πομπής ακαδημαϊκών\*

Ομιλία από Πρύτανη Τεχνολογικού  
Πανεπιστημίου Κύπρου  
Καθηγητή Παναγιώτη Ζαφείρη

Χαιρετισμός από Αντιπρόεδρο Συμβουλίου  
Τεχνολογικού Πανεπιστημίου Κύπρου  
κο Ανδρέα Καρακατσάνη

Χαιρετισμός από Υφυπουργό Έρευνας,  
Καινοτομίας και Ψηφιακής Πολιτικής  
κο Νικόδημο Δαμιανού

Ομιλία από Δρ Δημήτρη Φωτίου,  
*Συνιδρυτής Simlead, Σύμβουλος Στρατηγικής  
Προϊόντων, με θέμα:*  
**"Το Διδακτορικό ως Αφετηρία: Κουλτούρα  
Καινοτομίας και Ανάπτυξης"**

Απονομή διδακτορικών τίτλων

Αποχώρηση πομπής ακαδημαϊκών

Λήξη Τελετής

*Θα ακολουθήσει δεξίωση.*

\* Τη μουσική του ύμνου που συνοδεύει την πομπή των ακαδημαϊκών, συνέθεσε ο Μάριος Τόκας.

## Χαιρετισμός από Πρύτανη Τεχνολογικού Πανεπιστημίου Κύπρου



Αγαπητές Απόφοιτες και Αγαπητοί Απόφοιτοι,

Η απονομή του διδακτορικού σας τίτλου από το Τεχνολογικό Πανεπιστήμιο Κύπρου σηματοδοτεί την ολοκλήρωση των σπουδών σας, μέσω προσπάθειας, μελέτης και προσήλωσης. Είναι ταυτόχρονα και το ξεκίνημα μιας νέας δημιουργικής πορείας για προσωπική και συλλογική καταξίωση και ακαδημαϊκή ή/και ερευνητική ανάπτυξη.

Σύσσωμη η ακαδημαϊκή κοινότητα του Πανεπιστημίου μας, σας δίνει θερμά συγχαρητήρια για την ολοκλήρωση των σπουδών σας, γνωρίζοντας ότι ανοίγονται μπροστά σας νέες ευκαιρίες και δυνατότητες.

Όλα όσα έχετε κατακτήσει κατά τη διάρκεια των σπουδών σας – επιστημονικές γνώσεις, ατομικές δεξιότητες, εμπειρίες και ανθρώπινες σχέσεις – αποτελούν σημαντικά εργαλεία για την περαιτέρω ακαδημαϊκή, επαγγελματική και κοινωνική σας ανάπτυξη. Όμως μην επαναπαυτείτε στις έως σήμερα επιτυχίες σας. Η αποφασιστικότητα και η θετική σας ενέργεια από τώρα και στο εξής θα καθορίσουν το εύρος και το μέγεθος των επικείμενων επιτευγμάτων σας.

Ως Πανεπιστημιακή Ηγεσία, είμαστε πολύ περήφανοι για όλους τους απόφοιτους και όλες τις απόφοιτες μας.

Ανταποκριθήκατε στις απαιτήσεις των σπουδών σας το μέγιστο δυνατό βαθμό, επιδείξατε αξιοθαύμαστη ψυχική αντοχή, πειθαρχία και προσήλωση στην επίτευξη

των στόχων σας και σας αξίζουν πολλά συγχαρητήρια για αυτό. Αξιοποιήστε αυτές τις εμπειρίες σας σε οποιοδήποτε άλλο εγχείρημα θα επιδιώξετε. Αν το κάνετε αυτό, είμαι βέβαιος ότι θα τα καταφέρετε ξανά!

Πλέον ανήκετε στην κοινότητα αποφοίτων του Τεχνολογικού Πανεπιστημίου Κύπρου. Το Πανεπιστήμιο μας, με διάφορους τρόπους θα διατηρήσει επαφή μαζί σας, αφού είστε αναπόσπαστο κομμάτι του μέλλοντος του Πανεπιστημίου μας και όχι απλά μια θετική ανάμνηση του παρελθόντος.

Σας συγχαίρω λοιπόν θερμά για την απόκτηση του διδακτορικού τίτλου σπουδών σας. Ανταποδώστε την αγάπη στην οικογένεια και στους ανθρώπους που στάθηκαν δίπλα σας όλα αυτά τα χρόνια και εύχομαι να έχετε όλοι και όλες μια λαμπρή καριέρα και επιτυχία στο στίβο της ζωής.

**Καθηγητής Παναγιώτης Ζαφείρης**  
Πρύτανης Τεχνολογικού Πανεπιστημίου Κύπρου

## Διδακτορικές Διατριβές Αποφοίτων Τεχνολογικού Πανεπιστημίου Κύπρου

Η Σύγκλητος του Τεχνολογικού Πανεπιστημίου Κύπρου, κατά την ακαδημαϊκή χρονιά 2023–2024, αποφάσισε την απονομή 28 Διδακτορικών Τίτλων σε ειδική Τελετή Αποφοίτησης στις 17 Ιουνίου 2024.

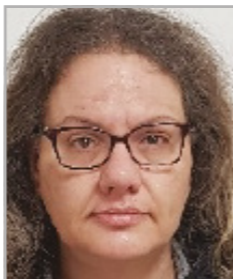
Τα αποτελέσματα της έρευνας των Διδακτορικών Φοιτητών/ Φοιτητριών παρουσιάζονται σε σύντομη περίληψη, όπου αναφέρεται το αντικείμενο της έρευνας και τα αποτελέσματά της. Οι πληροφορίες παρουσιάζονται πιο κάτω με αλφαβητική σειρά κατά Τμήμα.

## ΛΙΑΠΗ ΜΑΡΙΑ

Τμήμα Γεωπονικών Επιστημών, Βιοτεχνολογίας και Επιστήμης Τροφίμων

### Title of Dissertation

Study of Farm Ruminant Mycoplasmas for the Improvement of the Quantity and the Quality of Milk



### Abstract

Among pathogenic Mycoplasmas in ruminants, *Mycoplasma bovis* in cattle and contagious agalactia Mycoplasmas (*Mycoplasma agalactiae*, *Mycoplasma capricolum* subsp. *capricolum*, *Mycoplasma mycoides* subsp. *capri* and *Mycoplasma putrefaciens*) in sheep and goats, are the major ones affecting the milk quantity and quality. No study has attempted to record the presence of *Mycoplasma bovis* in milk from Cypriot cattle, evaluate its spread and further characterize the strains. Contagious agalactia affecting sheep and goats was first reported in 2010; however, no comprehensive study has been performed in Cyprus to address the issue of *Mycoplasma* species in milk and strain deviations. Antibiotics have been used as a choice to confront the disease in small ruminants and no earlier study exists on the genetic profile of Cypriot strains related to antimicrobial resistance. This dissertation elucidates these issues using the latest available laboratory techniques including next generation sequencing, alongside user-friendly bioinformatic tools. The presence and frequency of *Mycoplasma bovis* in cattle was revealed and strains were further characterized with Multilocus Sequencing Typing (MLST). In sheep and goats, the presence and frequency of all contagious agalactia *Mycoplasma* species, except *Mycoplasma mycoides*, as well as *Mycoplasma bovis*, *Mycoplasma ovipneumoniae* and *Acholeplasma*

*oculi* was revealed. Strains were further characterized with MLST, screened for antimicrobial resistance genes and Mobile Genetic Elements related to antimicrobial resistance mechanisms. Furthermore, Single Nucleotide Polymorphism (SNP) analysis was performed for *Mycoplasma agalactiae* strains to assess their population diversity and trace their circulation among sheep and goat herds.

### PhD Advisor

George Botsaris,  
Associate Professor,  
Department of Agricultural Sciences,  
Biotechnology and Food Science,  
Cyprus University of Technology

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

## ΚΥΡΙΑΚΟΥ ΕΥΔΟΞΙΑ

Τμήμα Επικοινωνίας και Μάρκετινγκ

### Title of Dissertation

The Influence of Internal Marketing and Values on Employee Engagement in Higher Education



### Abstract

#### Purpose

This doctoral thesis focused on conceptualizing Internal Marketing (IM) and developing a validated instrument for its measurement. Additionally, the research aimed to reveal the influence of Internal Marketing by identifying what is important to employees to foster their engagement with the organization.

#### Design/ Methodology/ Approach

A mixed methods approach, specifically the sequential exploratory research design, was employed in this study. Semi-structured interviews were purposefully selected as the method for qualitative data collection and conducted with 15 individuals holding diverse administrative roles within a University setting. These interviews provided insights that informed the development of a questionnaire for the quantitative phase. The target population for the survey included employees (both academic and administrative) from Higher Education Institutions (HEIs) in Cyprus. The self-administered questionnaire was distributed via email to the entire population, resulting in a response rate of 22,4% (509 respondents, 415 were usable for data analysis). Reliability analysis, normality assessment, inferential statistics, and hypotheses testing were conducted, supplemented by exploratory and confirmatory factor analyses. These analyses served to validate theoretical constructs and determined the acceptance or rejection of research hypotheses.

#### Key Findings

A conceptual model was developed, encompassing four key variables.

The construct of Perceived Internal Marketing was assessed through a reliable 12-item scale (Cronbach's  $\alpha$  of .93), affirming its substantial direct and indirect influence on Employee Engagement (EE), as gauged by a reliable 21-item scale (with Cronbach's  $\alpha$  of .95). The intricate mediating role of Organizational Values (evaluated via an 8-item scale with a Cronbach's  $\alpha$  of .79) in this relationship was also recognized. The model identifies also the moderating influence of Personal Basic Values (assessed through a 9-item scale with Cronbach's  $\alpha$  of .89) on the relationship between Perceived Internal Marketing and Organizational Values.

#### Research Limitations

The focus of this study on HEIs in Cyprus may limit generalizability. Conducting comparative analyses across countries could provide broader insights into the effectiveness of IM in diverse cultural and institutional contexts. Furthermore, the role of culture in shaping experiences and outcomes was not included in the scope of this doctoral thesis.

#### Implications

Managerially, leaders and administrators can use the validated IM scale to enhance communication, coordination, vision, initiatives, career paths, training, and safety of the employees, thereby creating a positive work environment and improving organizational performance. Industrially, although the study underscores the importance of IM in HEIs, it might be applied to other industries, with the potential to foster a strong organizational culture. Policymakers can leverage these findings to shape policies aimed at

enhancing EE. In this way, organizations can operate more effectively and efficiently, which in turn can have positive effects on the broader community and society.

#### **Originality/Value**

This thesis contributes to a deeper understanding of Internal Marketing by gathering primary data from employees' perspective within HEIs through semi-structured interviews – a context in which IM has not received much attention so far. By integrating these findings with literature in Marketing and Management, a refined and validated measurement tool was formulated. This tool elucidates four significant constructs highlighting the pivotal role of IM in impacting EE. It considers the influence of Organizational Values and Personal Basic Values on this relationship. The validated and reliable questionnaire of this study can serve as an instrument for further research in diverse industries, facilitating broader investigations into IM across various sectors.

#### **Keywords**

Internal Marketing (IM); Employee Engagement (EE); Higher Education Institutions (HEIs); Organizational Behavior; Personal Values; Organizational Values.

#### **PhD Advisor**

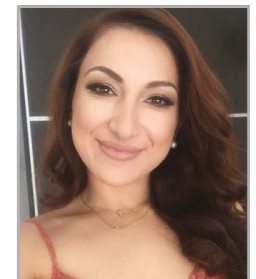
Anna Zarkada,  
Associate Professor,  
Department of Communication  
and Marketing,  
Cyprus University of Technology

## **ΑΓΗΣΙΛΑΟΥ ΑΝΤΡΙΑ**

*Τμήμα Επικοινωνίας και Σπουδών Διαδικτύου*

### **Title of Dissertation**

A Personal Data Literacy Framework for Students: Identifying and Supporting Students' Competencies About Their Personal Data



### **Abstract**

To increase children's agency in the data economy, efforts should be made to empower them by helping them become personal data literate. Personal data literacy involves a spectrum of technical, conceptual, and critical competencies necessary for children to recognize, reflect, and respond to socio-economic practices of Big Data. Research has shown that children and adolescents have difficulties in recognizing and understanding how, when, by whom, and why their personal data are being collected, processed, and reused, while many reports confirm violation of children's data rights. Existing frameworks on the matter have focused either on adults, or do not explicitly discuss how such kind of literacy can be conceptualized for children, what kind of competencies children, as a special population, might need to develop, and what kind of literacy interventions might work best. This doctoral thesis, reporting on research efforts to develop a competency framework for identifying and supporting students' competencies about their personal digital data, investigated the following overarching research question: How can the design of educational interventions, aiming to foster students' personal data literacy, be supported? Following a design-based research approach, and employing qualitative methods, this doctoral research collected data from three elementary schools, six classrooms, and a total of 103 students. This doctoral thesis first reports on the design of a learning

module to enable upper elementary school students to produce their own personal data using activity trackers, and reflect on them. Then, data are presented from the implementation of this learning module in three elementary school classes in Cyprus, with 63 students. The results informed the development of the PeDaL framework, a pedagogical tool demonstrating a taxonomy of competences to support the development of students' personal data literacy. Finally, I discuss how these findings informed the redesign of the learning module, based on the PeDaL framework. The findings of this doctoral research can contribute to advancing understanding on how personal data literacy can be defined and framed for students, by demonstrating the spectrum of competencies students should have. The design and implementation of the learning module resulted in a better understanding of upper elementary school students' data disclosure practices, supporting the identification of conceptual gaps, and of the types of pedagogical activities that students might need to develop personal data literacy competencies. This doctoral thesis concludes by discussing the main limitations of this work and avenues for further research.

### **PhD Advisor**

Eleni A. Kyza,  
Professor,  
Department of Communication  
and Internet Studies,  
Cyprus University of Technology

**ΣΕΡΓΙΔΟΥ ΝΕΛΛΗ-ΜΑΡΙΑ***Τμήμα Επικοινωνίας και Σπουδών Διαδικτύου***Title of Dissertation**

The Dynamic Relationship Between News and Social Media Agendas in the Context of Information Society

**Abstract**

Greece has been in economic and sociopolitical turmoil since 2009. On June 27, 2015, the Greek coalition government led by SYRIZA announced a July 5th referendum for citizens to decide whether to adopt the EU-proposed economic plan. Referendums in Greece are uncommon, and this decision triggered competing narratives about the motives behind it. SYRIZA supported a "No" vote, believing it would provide leverage for better negotiations with creditors. Conversely, elite political forces advocated for a "Yes" vote, warning that rejecting the deal could lead to Greece's default, EU exit, and international isolation. The thesis examines media coverage in online media during the referendum campaign. More specifically, it explores the salient issues in public debate using press and Twitter data to identify dominant topics and patterns in political discussions about the referendum and vote choices. Based on agenda-setting and priming theories, the main research question is: Which issues were most salient in the online press and on Twitter during the Greek bailout referendum campaign? A dataset of news media articles and tweets was analyzed using content and sentiment analysis. Findings highlight the complex interaction between different media types, news content, media agendas, and public opinion formation in the digital age. The rise of social media has compelled traditional news media to adapt and develop

new agenda-setting strategies. The study reveals the unpredictability of media agendas, influenced by timeliness, fake accounts, and platform characteristics. It underscores the need for ongoing exploration of media dynamics and emphasizes the importance of education in fostering critical media evaluation skills.

**PhD Advisor**

Vasiliki Triga,  
*Associate Professor,  
Department of Communication  
and Internet Studies,  
Cyprus University of Technology*

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

**ΣΟΥΡΟΠΕΤΣΗΣ ΜΑΡΚΟΣ***Τμήμα Επικοινωνίας και Σπουδών Διαδικτύου***Title of Dissertation**

Investigating the Impact of Gamified Learning at Cultural Heritage Sites Through the Use of Extended Reality Environments

**Abstract**

It is increasingly considered important to examine the learning processes in terms of technologically mediated learning during educational field trips, whether physical or virtual, to cultural heritage sites. This PhD thesis examined whether the integration of extended reality technologies (XR) and gamification affects the psychological and behavioral changes of the students, and by extension their cognitive processes. The research adopted a design-based research approach to investigate learning processes in non-formal learning conditions, when using extended reality gamified learning environments. Through the design-based research approach, two studies were conducted to address the research questions. The first study examined the extent to which the use of a gamified Augmented Reality (AR) environment during an educational visit to a cultural heritage site affected the learning performance and learning motivation of 6th grade elementary school students. Fifty-nine students participated in this study. The data corpus consisted of pre-and post-test questionnaires to evaluate students' motivation and learning gains. The results show that the use of a gamified AR learning environment during educational visits to cultural heritage sites enhanced students' motivation and learning. The second study investigated how the use of a gamified versus a non-gamified Virtual Reality (VR) learning environment impacted student motivation and learning outcomes in the context of a virtual visit at a cultural heritage site.

For this purpose, an experimental research design was adopted to analyse the experience of 46 undergraduate university students; 23 of them used a gamified version of the VR learning environment, while 23 of them used the same VR environment without the gamification elements. Data were collected using pre and post learning assessments, motivation questionnaires, as well as individual semi-structured interviews. The results showed that the integration of gamification in virtual reality environments can contribute to the increase of certain learning aspects and can impact the factors that lead to higher motivation levels. The results of the research contribute to the debate on the use of gamification in virtual reality environments as a possible variable that can contribute to enhancing students' motivation, thus making learning more effective. The results of both studies led to the identification of open empirical issues concerning the application of gamification and extended reality environments for learning at cultural heritage sites. The PhD thesis concludes with the discussion of the limitations of the studies and future research directions.

**PhD Advisor**

Eleni A. Kyza,  
*Professor,  
Department of Communication  
and Internet Studies,  
Cyprus University of Technology*

**ΑΝΤΩΝΙΟΥ ΑΝΑΣΤΑΣΙΑ**

Τμήμα Ηλεκτρολόγων Μηχανικών και Μηχανικών  
Ηλεκτρονικών Υπολογιστών και Πληροφορικής

**Title of Dissertation**

Magnetic Resonance Imaging Guided  
Focused Ultrasound in the Treatment  
of Neurological Disorders

**Abstract**

Magnetic Resonance guided Focused Ultrasound (MRgFUS) has emerged in the field of neurosurgery as a non-invasive modality for the treatment of various brain diseases. Numerous studies involving the use of mouse models have shown that extracorporeal FUS administered with an US contrast agent can transiently disrupt the Blood Brain Barrier (BBB) so that molecules of pharmacologically relevant size can enter the brain parenchyma to impart therapeutic effects. This doctoral study aimed to provide insights on the topic of transcranial FUS (tFUS) through a series of ex-vivo and in-vivo preclinical experiments. Realistic phantom models were developed to mimic all the critical properties of live tissue and assessed for their feasibility as quality assurance tools for tFUS procedures. The developed tissue mimicking phantoms served as the main tool for evaluating the practicality of using single-element ultrasonic transducers in trans-skull thermal applications. Critical topics of the preclinical assessment of newly developed systems and emerging applications in the context of MRgFUS were also covered. The study further presents the development of a compact single-stage positioning device dedicated to tFUS applications in small animal models, which was evaluated for its ability to cause safe and efficient BBB disruption (BBBD) in Wild Type mice. The next key objective was to examine the capability of specific anti-A $\beta$  antibodies to penetrate the brain tissue following FUS-mediated BBBD and

impart therapeutic effects in the 5XFAD mouse model of the Alzheimer's disease (AD), thus potentially holding promise for the development of disease-modifying therapeutics for AD patients. Some preliminary outcomes on the potential feasibility of this technology in the treatment of neurodevelopmental disorders are reported as well.

**PhD Advisor**

Christakis Damianou,  
Professor,  
Department of Electrical Engineering,  
Computer Engineering and Informatics,  
Cyprus University of Technology

2024

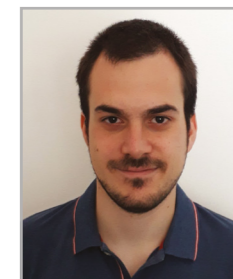
Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

**ΒΟΣΚΟΥ ΑΝΔΡΕΑΣ**

Τμήμα Ηλεκτρολόγων Μηχανικών και Μηχανικών  
Ηλεκτρονικών Υπολογιστών και Πληροφορικής

**Title of Dissertation**

Deep Transformer Neural Networks  
with Stochastic Competition

**Abstract**

Transformers have become one of the most successful architectures in deep learning, experiencing a steady rise in popularity. These advanced networks have revolutionized the field of Natural Language Processing (NLP) and are extending their influence into new domains within artificial intelligence and beyond. The recent rise of large language models, fundamentally reliant on Transformer architectures, highlights their effectiveness and underscores their transformative impact.

This thesis delves into exploring further capabilities of this deep learning framework by incorporating stochastic methodologies as an essential component of Transformer networks. Our primary focus is on leveraging stochastic competition techniques, proven to be highly advantageous in various contexts, as the cornerstone for developing high-performing models. Instead of focusing on the extensively researched application areas such as NLP, our research pivots to exploring two distinct and significantly different fields: i) Sign Language Translation and ii) Tabular Data Modeling.

We begin with a short introduction to the concept of Deep Learning and its basic techniques. We outline the foundational concepts of neural networks, the core principles of training procedures, and some simple and widely-used modules. Furthermore, we address common

challenges, such as overfitting, and the typical strategies for dealing with them. In the second chapter, we progress to Bayesian Neural Networks. Here, we introduce Bayesian statistics and its application in re-approximating classical neural networks (NNs). We elaborate on the most significant methods of this approach and the robust properties they inject into neural networks, thereby essentially defining and introducing Stochastic Neural Networks, as they are approached in this thesis. Following this, we explore modern methods in deep learning for processing sequential structures and Natural Language, aiming to establish the necessary background leading to the introduction of Transformer networks. We then delve into the detailed formulation of this influential paradigm, including its original format and subsequent variants.

Advancing towards the main areas of contribution, the fourth chapter is dedicated to Sign Language and, more specifically, automatic Sign Language Translation. We aim to build the required background on the applications of neural networks in the recognition and translation of Sign Language. Beyond its scientific intrigue, the task of SLT is of considerable social importance, bridging communication gaps between the deaf and the hearing.

Herein, we propose a novel SLT methodology that employs a specialized Transformer architecture equipped with stochastic modalities, including: (i) local winner-takes-all (LWTA) layers with stochastic winner sampling, as opposed to conventional ReLU layers, (ii) stochastic weights with posterior distributions estimated via variational inference, and (iii) a weight compression technique at inference time leveraging estimated posterior variance for substantial, nearly lossless compression. The proposed model demonstrates state-of-the-art results on the Phoenix14T dataset, the standard benchmark for such models. Moving beyond this innovation, we aim for real-world applicability. Existing SLT methods either lack translation capability or are trained and evaluated on datasets with limited vocabulary and real-world applicability. An example is the aforementioned Phoenix2014T benchmark dataset, restricted to weather forecasts in German Sign Language. Addressing this gap, we introduce a new collection of 29,653 Greek Sign Language video translation pairs based on the official Greek Elementary School syllabus and covering a broad range of subjects. Utilizing this novel dataset, we develop a new variant of our model. Our findings highlight our method's potential, striking a favorable balance between predictive power, usability and real-world applicability.

In the fifth chapter, we expand our research to include modeling of tabular data. This task is of significant interest, as such data forms frequently appear across numerous scientific and technical fields. Interestingly, despite their popularity, importance, and seeming simplicity, these data formats have been historically underexplored from a deep learning perspective, though they have started garnering increasing attention in recent years. By employing a Stochastic Competition Hybrid Transformer, we achieved exceptional results across multiple well-known tabular datasets, surpassing previous deep learning networks and the state-of-the-art Gradient Boosting methods that have dominated this area. These findings underscore the effectiveness of Stochastic Competition Transformers in a broad and diverse range of domains.

#### PhD Advisor

Sotirios Chatzis,  
Associate Professor,  
Department of Electrical Engineering,  
Computer Engineering and Informatics,  
Cyprus University of Technology

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

#### ΚΑΛΑΗΣ ΚΩΝΣΤΑΝΤΙΝΟΣ

Τμήμα Ηλεκτρολόγων Μηχανικών και Μηχανικών  
Ηλεκτρονικών Υπολογιστών και Πληροφορικής

#### Title of Dissertation

Stochastic Deep Networks with Linear  
Competing Units for Transfer Learning



#### Abstract

Deep Learning (DL) has become the preferred approach to addressing various challenging machine learning (ML) tasks, like computer vision, natural language processing, and speech recognition. Deep Neural Networks (DNN's) have achieved superior performance in those tasks compared to traditional ML methods. However, they entail a huge number of weights causing them to make over-confident predictions, that may reduce their generalization capacity in hard problems, e.g. a Meta-Learning (ML) scenario. To mitigate this issue, researchers have applied Bayesian modeling to DNN's, where they employ Bayesian Neural Networks (BNN's) with more robust and tractable estimates of uncertainty in a model's predictions. That way, we can build safer ML systems in safety-critical applications, such as healthcare, video recognition, and autonomous vehicle control. DL models trained to solve a single task suffer from a common drawback: they cannot combine data from diverse tasks in order to learn new tasks in a future training round. Such models often require extensive training and data collection for each task individually, which can be time-consuming and data-intensive. This limitation has given rise to the importance of research in ML. This field aims to address these shortcomings by developing methods that allow existing models to efficiently learn from and adapt quickly to new tasks, by leveraging knowledge gained from previous tasks.

Therefore, ML methods aim to make models more capable of generalizing well to unseen tasks with just a small amount of examples; this is the so-called problem of few-shot learning. In this thesis, we aim to study how some existing DL methods for ML are used to tackle this phenomenon, and suggest a novel ML method regarding improving generalization capacity, predictive performance, and computational efficiency. Specifically, our proposed approach relies on the concepts of stochastic and sparse learned representations. In that way, we aim to define a sparse and stochastic network paradigm for ML, with novel network design principles compared to currently used ML models; we use stochastic deep networks with linear competing units in the context of model-agnostic ML. As we empirically show, our approach produces state-of-the-art predictive accuracy on few-shot image classification and regression experiments, as well as reduced predictive error on an active learning setting; these improvements come with an immensely reduced computational cost. These encouraging results, further motivate us to also examine the case where we do not have all tasks available beforehand, but they come in sequentially. In such a case, a DNN should learn to adapt to this continuous stream of data, effectively handling a major problem that affects DNN's in such settings, namely catastrophic forgetting. Continual Learning (CL) methods are designed to mitigate or



reduce this issue. Specifically, such a method learns the DNN to accumulate new knowledge after a few training iterations on a new data distribution, and avoid drastically forgetting previously learned information from older tasks. Recently, researchers have developed various approaches in order to counteract this problem. To address this challenge, this thesis proposes a radically different regard toward addressing catastrophic forgetting in CL tasks, and especially in a famous variant of CL called class-incremental learning (CIL). Our approach is founded upon the framework of stochastic local competition which is implemented in a task-wise manner. We have shown that it produces state-of-the-art predictive accuracy on few-shot image classification experiments, and imposes a considerably lower computational overhead compared to the current state-of-the-art.

#### PhD Advisor

Sotirios Chatzis,  
Associate Professor,  
Department of Electrical Engineering,  
Computer Engineering and Informatics,  
Cyprus University of Technology

#### ΠΑΦΙΤΗΣ ΑΡΙΣΤΟΔΗΜΟΣ

Τμήμα Ηλεκτρολόγων Μηχανικών και Μηχανικών  
Ηλεκτρονικών Υπολογιστών και Πληροφορικής

#### Title of Dissertation

A Unified Approach to Assessing the  
Structural Resilience of Blockchain  
Overlay Networks



#### Abstract

Blockchains have gained significant attention due to their unique attributes: immutability, public verifiability, and decentralization. Immutability ensures data integrity, making it impossible to alter recorded information. Public verifiability allows any external entity to validate the correctness of operations, thereby maintaining and enhancing trust and transparency. Decentralization eliminates central points of failure, increasing the system's resilience and reliability. This technology has sparked enthusiasm because it operates without the need to trust any single individual or entity, positioning itself to disrupt various industries and aspects of everyday life.

Beyond financial applications, blockchain technology holds immense potential for diverse sectors, promising to significantly impact multiple facets of daily activities. The decentralized trust and immutable nature of blockchain systems offer innovative solutions to longstanding issues such as secure and transparent transactions, efficient supply chain management, and decentralized finance. Many other applications have been identified across a wide range of fields, including healthcare, advertising, insurance, copyright protection, energy, cybersecurity, financial technologies, and government services.

Blockchains rely on decentralized peer-to-peer (P2P) networks for their operation. These networks are easily constructed and

allow rapid information dissemination. Each peer in a blockchain network must maintain a local copy of all transactions and blocks, and the swift diffusion of this information is crucial for the system's correct and fair operation. The P2P overlay serves as the backbone of a blockchain system, facilitating the propagation of transactions and blocks to all participating peers.

The availability and integrity of the P2P overlay are essential for the propagation of blockchain data. Flaws and vulnerabilities in this network layer can compromise the guarantees offered by blockchain applications and their consensus protocols. Network-level attacks can lead to double-spending or other exploits, despite the security provided by the consensus protocol. Such attacks can weaken consensus in specific parts of the network. Therefore, the P2P infrastructure is a critical architectural component of a blockchain system, defining its security, resilience, and scalability.

It is therefore essential to understand the structural properties, topological characteristics, and vulnerabilities of these networks to realize their full potential and protect against emerging threats, as previous research has primarily focused on the cryptographic and consensus aspects, neglecting the underlying P2P networks.

The research community recognizes this knowledge gap, noting that the

design, connectivity properties, and interdependencies of blockchain networks remain largely unexplored. This gap stems partly from an implicit assumption about the reliability and safety of Internet communications. Additionally, the distributed nature of blockchain systems often leads to the mistaken belief in their inherent safety and resilience.

Accurate analysis of blockchain P2P networks is challenging due to the absence of formal specifications and the use of topology-hiding techniques designed to prevent adversarial actions like deanonymization, node eclipsing, and transaction censorship. This thesis addresses the gap by examining the structural properties of seven distinct blockchain networks, focusing on their resilience.

The study uses a unified modelling approach, treating all network components equally and providing broad applicability across different blockchain systems. This model allows for the simultaneous study of various blockchain networks while maintaining a consistent framework for analysis. To further enhance the analysis, a novel approach is introduced to overcome the limitations of previous methods for inferring network topology. This ensures a comprehensive examination, with results indicating that the current structure of blockchain P2P networks may not be resilient enough to be fully trusted.

This thesis uncovers significant vulnerabilities in blockchain networks, challenging the perceived decentralization and resilience of these systems. The study reveals a troubling trend of high centralization within blockchain networks, making them susceptible to targeted attacks where the removal of a few nodes can disrupt stability. This centralization issue dictates the need for a re-evaluation of network structures and mitigation strategies.

Furthermore, the research identifies "overlapping nodes," which participate in multiple blockchains simultaneously, representing a significant portion of each network. These overlapping nodes create vulnerabilities that malicious actors could exploit, potentially leading to widespread disruptions across various networks.

Through longitudinal analysis, the study establishes a correlation between node uptime and degree, enabling attackers to identify crucial nodes in networks that use topology-hiding techniques. This analysis provides insights into the evolution of blockchain networks and suggests ways to enhance their resilience against various challenges.

Additionally, the research examines the spatial concentration of nodes within Autonomous Systems, highlighting latent risks that could compromise the broader blockchain ecosystem's stability and security.

In summary, this thesis makes substantial contributions by exposing vulnerabilities within blockchain overlay networks and the broader ecosystem. By highlighting these deficiencies, the research provides a deeper understanding of blockchain network overlays, paving the way for the development of more resilient and robust network structures.

**PhD Advisor**

Michael Sirivianos,  
*Associate Professor,  
Department of Electrical Engineering,  
Computer Engineering and Informatics,  
Cyprus University of Technology*

**ΓΡΗΓΟΡΙΟΥ ΙΩΑΝΝΑ***Τμήμα Νοσηλευτικής***Title of Dissertation**

Leadership Style, Organizational Commitment, and Job Satisfaction Among Physicians in the Public Health Sector of Cyprus

**Abstract**

Leadership, organizational commitment, and employee satisfaction impact the work environment, playing a significant role in the physician turnover intention. The recent global economic crisis led to 70% of the population seeking medical care from Public Hospitals and Health Centers. At the same time, salary cuts for medical staff were taken place due to financial constraints. The positions of physicians which have retired were not immediately filled because of a decrease in budget, and a shortage of staff was recorded. The perception for leadership style, organizational commitment, job satisfaction, and physician turnover in Cyprus's Public Hospitals and Health Centers had to be explored.

The study aims to investigate physicians' perceptions of leadership, organizational commitment, and job satisfaction, along with determining the factors influencing them in Cyprus's Public Hospitals and Health Centers. Secondly, the study explores the trend of medical staff turnover.

The research design was descriptive-correlational (cross-sectional). The study sample was census and consisted of all physicians working in Public Hospitals and Health Centers of the Republic of Cyprus (N= 690). More specifically, it included physicians from the General Hospitals of Nicosia, Limassol, Larnaca,

Paphos, and Famagusta, physicians from the Archbishop Makarios III Hospital, and physicians from the two Rural Health Centers in Polis Chrysohou and Kyperounda. Additionally, 36 Health Centers (urban and rural) across the island were selected, central offices of Medical and Public Health Services, as well as the central offices of the Ministry of Health.

Three questionnaires were used for the study: the Multifactor Leadership Questionnaire (MLQ) by Avolio and Bass (1997), for leadership style, the Organizational Commitment Questionnaire (OCQ) by Meyer and Allen (1991), for organizational commitment, and the Job Satisfaction Survey by Paul Spector (1994) for job satisfaction.

The prevailing leadership style is passive leadership, followed by a large margin, though in similar digits, transformational and transactional leadership (2.29 vs 1.68 vs 1.70). Regarding leadership categories, physicians reported more frequently observing "passive management with exclusion/exception" (M= 2.40) and "Laissez-Faire" (M= 2.11).

Regarding organizational commitment, physicians reported higher continuous commitment (M= 4.41) and lower affective and normative commitment (M= 4.18-3.78 respectively).

The physician's satisfaction was moderate (M= 3.03). Higher satisfaction was expressed for the work itself (M= 4.81), the supervisor (M= 4.33), and relationships with colleagues (M= 4.17). Lower satisfaction was expressed for benefits (M= 1.97), salary (M= 2.09), promotion opportunities (M= 2.12), and procedures/protocols (M= 2.22). Differences in satisfaction were also observed regarding administrative regions.

Regarding turnover intentions, almost half (43.9%) stated they would leave their position in the next year due to dissatisfaction, with only a small percentage stating they wouldn't (18.8%). Regarding the leadership style of physicians in Public Hospitals and Health Centers, it seems that clinic/department directors, despite being in a challenging environment and expected to be supportive, did not provide the necessary assistance, due to passive leadership among physicians.

Regarding organizational commitment, a higher percentage of employees remain committed out of necessity rather than desire or ethical considerations. General satisfaction is mediocre, being higher for the nature of work (the physician chooses their occupation due to liking), relationships with colleagues and supervisors and lower for benefits, salaries, procedures and promotions.

This depiction reflects the environment in Public Hospitals at the time of the study being held. Physicians are dissatisfied with passive leadership. It makes sense when the manager doesn't spend time with the employee or doesn't make decisions, for the employee not to be satisfied. While a transformational or/and transactional leadership fosters, there is affective commitment, satisfaction, and have a lower tendency to leave. Leadership, organizational commitment, and job satisfaction play significant roles in physicians' work environment and retention trends. Health sector management (state, Ministry of Health, SHSO) should consider these variables for an improved work environment, which gets more demanding every year, addressing the specific needs of physicians and preventing intention to leave. Analyzing and processing the study's results can guide the Ministry of Health and State Health Services Organization (SHSO) in adopting effective practices for better service planning and an important tool in the hands of today's leaders for a better design under a new composition.

Implementing an evaluation process for administrative positions, similar to the qualitative criteria introduced in the HIS, could enhance leadership quality. Moreover, a more sustainable approach involves starting physicians' management education at the undergraduate level, extending into continuous training.

Considering the study predates the implementation of the General Health System (GHS), a repetition with current measurements would provide insights into the current situation, leadership perception, satisfaction, and attrition rates among physicians.

In conclusion, the SHSO should undergo significant modifications, introducing structural changes to develop successful health policies and encourage physician participation, leading to alignment, with work modifications which could enhance physician retention.

#### PhD Advisor

Anastasios Merkouris,  
Associate Professor,  
Department of Nursing,  
Cyprus University of Technology

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

#### ΚΟΛΙΑΝΤΡΗ ΙΩΑΝΝΑ

Τμήμα Νοσηλευτικής



#### Title of Dissertation

Informational Support Needs of Pregnant Women and New Mothers in Cyprus and Information-Seeking Practices on the Internet during the Transition to Parenthood: A Mixed-Methods Exploratory Study

#### Abstract

##### Background

The transition to parenthood (TtP) is a significant and challenging period characterized by rewards but also numerous stressors. In addition to good quality medical care, women need relevant and timely information to support their decision-making process. However, traditional approaches to antenatal education have been questioned as to their effectiveness to the extent to which they address the real informational needs of pregnant women. This has led many women to turn to the internet in search of guidance, despite the varying quality and accuracy of online information.

##### Methods

A mixed-methods descriptive sequential exploratory study was conducted. A series of 12 focus groups provided an in-depth understanding of the informational support needs and information-seeking practices of women during TtP, focusing on the role of the internet in informed decision-making. This was followed by a survey to quantify the characteristics and important aspects of internet use during TtP as well as to explore further some important constructs that emerged from the qualitative study related to user-provider interactions including the perceived self-efficacy in communication (PEPPI scale) and autonomy in decision making (MADM scale).

##### Results

Qualitative findings revealed seven themes: in an "unsupportive system", 'void' of

informational support, pregnant women strive to have a "confident voice". They find themselves "self-navigating in parallel worlds" of formal and informal information, where the internet holds a prominent place. "Supplementing and filtering", most commonly instinctively and selectively, results in a state of "doubt and faith" towards the trustworthiness of the information but also towards healthcare providers. Effective communication with providers is needed to break the cycle, but this seems dependent on the self-efficacy of the women themselves ("art of communication"). While women "de-construct and re-imagine" their experiences, they often assign responsibility on themselves for not having been better prepared. Among 387 participants in the survey (32.6% pregnant, 67.4% new mums, 42.6% C/S, 79.6% private sector), searching online for information about pregnancy, childbirth and parenting seems very frequent, even though 65.1% report coming across wrong or misleading information often. Cross-checking for consistency across sites and/or with information by healthcare providers (92.8%) is the most common technique for assessing trustworthiness. As many as 87.9% of survey participants believe that healthcare professionals should recommend trustworthy internet sites, but only 6.5% report that their HP made recommendations. Even though women report discussing information retrieved from the internet with their healthcare

providers, as many as 38.7% of the women characterize the healthcare provider's reception as negative. The role of the internet in assisting decision-making is rated by women as moderate ( $M= 2.29$ ,  $SD= 0.57$ ); yet 57.6% of participants reported searching online in order to have control over their decisions. In terms of autonomy in decision-making, this was classified as high for 54.3% of the women in the survey, based on the MADM scale, while 21% of the women were classified as having low or very low levels of autonomy. Higher scores of autonomy were linked to multiparous women ( $p= 0.02$ ) and women giving birth in the private sector ( $p<0.001$ ). Strong positive correlations were observed with the perceived efficacy in patient-physician interaction ( $r= 0.60$ ,  $p<0.001$ ) and perceived alliance with healthcare providers ( $r= 0.71$ ,  $p<0.001$ ).

#### Conclusions

Women want to have control over decisions affecting their pregnancy but their informational needs do not seem to be supported by current healthcare practices. While the internet is a prevalent information source, the flow of information is problematic as it appears that women are more likely to search online to verify information rather than discuss this information with their providers, who do not always welcome or encourage it. There are major gaps in user-provider communication and the experience seems to be dependent on the women's self-efficacy and the responsiveness from healthcare providers. The findings highlight the urgent need for healthcare professionals

to recognize and address women's informational support needs during TtP. Embracing the digital era, providers should actively encourage open communication regarding online information, guiding women towards reliable resources while respecting their autonomy in decision-making. By fostering a supportive environment that values women's voices and preferences, healthcare professionals can empower women to make informed choices.

#### PhD Advisor

Nicos Middleton,  
Associate Professor,  
Department of Nursing,  
Cyprus University of Technology

## MENOIKOY IOANNA

Τμήμα Νοσηλευτικής

### Title of Dissertation

Perceived and Functional Health Literacy Among Cypriot Parents, Antibiotic Use in Children, and Childhood Vaccinations



#### Abstract

##### Introduction

Health literacy (HL) refers to people's competencies in accessing, understanding, appraising, and applying health information to meet demands in healthcare, preventing illness, and promoting health. In the case of children, parental HL is important in establishing health-promoting behaviors and better health outcomes. Several factors have been associated with vaccination hesitancy (VH) and antibiotic misuse, two increasing public health problems. HL may influence parental knowledge, attitudes, and practices (KAP) towards antibiotic use and vaccination in their children.

##### Aim

To assess parental perceived health literacy (PHL) and functional health literacy (FHL) and explore the association with parental KAP towards antibiotic use in children and parental VH and beliefs and attitudes towards childhood vaccinations.

##### Methodology

A cross-sectional study was conducted among parents of children, aged 6 months to 15 years, in the Republic of Cyprus. A convenience sample of parents was recruited from the pediatric outpatient departments in three cities (Nicosia, Limassol, and Paphos) assessed their HL using the HLS-EU-Q47 and the NVS (Newest Vital Sign), a self-rated and a performance-based measure of HL, respectively. Participants were classified according to the overall and domain-specific scores. Participants also, completed either a KAP tool on antibiotic use or a tool tapping on beliefs and attitudes regarding their children vaccination and VH.

Associations of parental HL with KAP towards antibiotic use in children, and beliefs and attitudes towards childhood vaccinations and VH were explored. Associations with socio-demographic characteristics were also examined.

##### Results

HLS-EU-Q47 mean score among 416 parents (83.2% female, 83.8% tertiary education) was 35.30 ( $SD=7.45$ ). Based on suggested ranges, almost half (42.6%) were classified as having inadequate or problematic PHL. Consistently, 62.8% showed high likelihood or significant possibility of limited FHL, based on the NVS with a mean score of 2.73 ( $SD=2.02$ ). Furthermore, a significant proportion of Cypriot parents demonstrated limited knowledge (44.0%), negative attitudes (55.1%), and problematic practices (31.7%) towards antibiotic use in their children. Regarding vaccinations, 58.6% of parents were classified as 'non-hesitant acceptors', 9.9% as 'hesitant acceptors', 20.7% as 'delayers' and 8.9% as 'refusers'.

Increased parental PHL was statistically significantly associated with higher educational attainment ( $p= 0.01$ ), having two children ( $p= 0.01$ ), and absence of financial difficulties ( $p=0.01$ ). Increased FHL was statistically significantly associated with male gender ( $p=0.04$ ), older age ( $p= 0.04$ ), higher educational attainment ( $p<0.01$ ), not receiving financial aid ( $p= 0.03$ ), and higher monthly family income ( $p<0.01$ ). Increased parental knowledge and proper practices towards antibiotic use in children was observed in older parents ( $p= 0.01$  and  $p= 0.02$ , respectively) and parents with higher

educational attainment ( $p= 0.01$  and  $p= 0.05$ , respectively). Absence of financial difficulties was significantly associated with increased knowledge ( $p= 0.03$ ) and more positive attitudes ( $p<0.01$ ) towards antibiotic use, while increased perceived social status was significantly associated with positive attitudes towards antibiotic use in children ( $p= 0.02$ ). VH among Cypriot parents was significantly associated with several sociodemographic characteristics, such as residence in an urban area ( $p= 0.01$ ), being divorced or not married ( $p<0.01$ ), higher educational attainment ( $p<0.01$ ), increased number of children in the family ( $p<0.01$ ), and higher child's order in the family ( $p<0.01$ ).

Regarding the association of parental HL with KAP towards antibiotic use in their children, an increase in the FHL score was associated with an increase in the knowledge ( $p= 0.01$ ), attitudes ( $p= 0.01$ ), and practices ( $p<0.005$ ) towards antibiotics. In contrast, no significant associations were observed between PHL and practices towards antibiotic use. In terms of childhood vaccinations, higher PHL was associated with certain positive attitudes and practices related to childhood vaccination, whereas higher FHL appeared to be associated with certain negative attitudes and practices. No significant associations between PHL and VH were observed. In contrast, higher FHL was associated with VH ( $p= 0.01$ ) with parents categorized as 'refusers' ( $M= 3.67$ ,  $SD= 2.64$ ) or 'hesitant acceptors' ( $M= 3.15$ ,  $SD= 2.74$ ) having higher FHL than parents categorized as 'delayers' ( $M= 2.95$ ,  $SD= 2.63$ ) or 'non-hesitant acceptors' ( $M= 2.99$ ,  $SD= 2.42$ ).

#### Discussion

As a high proportion of parents in Cyprus has inadequate or problematic HL, to improve outcomes for their children, healthcare services should be oriented towards identifying problematic HL, assessing both perceived and functional HL, while Public Health interventions are needed to enhance parental HL, currently not standard practice. Assessing both PHL and FHL led to a more comprehensive understanding of parental HL which can guide the design and implementation of targeted interventions to address limited HL among parents. Furthermore, better performance in a FHL measure among parents was associated with an increase in KAP towards antibiotic use in their children. Although this association did not appear consistent with PHL, a high number of parents with limited HL, either PHL or FHL, faced challenges in KAP towards antibiotic use in children. While health education at clinical and population level are needed to counteract parental VH, the association of parental HL with childhood vaccination attitudes and practices is not straightforward, since a mixed pattern emerged depending on whether HL was operationalized using a perceived or functional measure.

#### PhD Advisor

Christiana Nicolaou,  
Assistant Professor,  
Department of Nursing,  
Cyprus University of Technology

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

#### ΦΙΛΙΠΠΟΥ ΚΑΤΕΡΙΝΑ

Τμήμα Νοσηλευτικής

#### Title of Dissertation

Supportive Care in the Management of Patients with Heart Failure and Diabetes Mellitus



#### Abstract

Heart failure (HF) and diabetes mellitus (DM) most of the times occur together, aggravating patients' outcomes and each disease of HF and DM independently increases the risk for the other.

#### Aim

The aim of the current study was to evaluate the effectiveness of an individualized supportive care management program in patients with HF and DM, in order to improve patients' health related quality of life (HR-QoL) compared to the 'usual' care. The secondary outcomes were to investigate the difference between HF-DM patients receiving the supportive care interventions and 'usual' care, in terms of self-management, knowledge, perceived social support, exercise tolerance, anxiety and depression, acute events and mortality.

#### Study design

The current study, is a sub-analysis of the randomized clinical trial (RCT) named 'SupportHeart' (Trial ID: NCT04415723) using pragmatic methodology. It was consisted by two groups: 1. The control group (CG) and 2. The intervention group (IG). The study investigated the patients for a period of one year at 5 time points (in baseline, 1 month, 3 months, 6 months, 1 year). The study development of the RCT 'SupportHeart' followed the steps below: the first step was the conduction of a qualitative research (Metasynthesis) in order to determine what HF (and DM) patients describe as major needs and which intervention was effective for them. The support needs extracted, served as a 'guide' to develop a plan to be used in the intervention. Focus groups exploring patients with HF views on their support needs were also conducted, to find out,

if the literature reflects their needs or if specific aspects for their support needs are missing. Results of the focus groups were used to create the educational program for the IG. The quantitative phase of data collection followed, using the following tools: the Greek versions of the 'Minnesota Living with Heart Failure questionnaire' (MLHFQ), the 'Self-care of Heart Failure Index' (SCHFI), the 'Multidimensional scale of perceived social support'(MSPSS), the 'European Heart Failure Self-Care Behavior Scale' (Gr9EHFScB), the 'Hospital and Anxiety depression scale' (HADS), the 'International Physical Activity Questionnaire' (IPAQ), the 'Audit of Diabetes Dependency Quality of Life Version 19' (ADDQoL-19), socio-demographic and clinical variables of the participants.

#### Results

The sample consisted of 121 patients (N=56 in the IG and N=65 in the CG), with HF and DM, 80 (66%) male and 41 (34%) female patients. In the current study, the multilevel model for the effect of the intervention on HR-QoL has shown a statistically significant effect of the IG at all time points after the intervention ( $p<0.001$ ) on the overall HR- QoL. The Linear Mixed Model results have shown that there is a statistically significant effect in the IG at all time points after the intervention ( $p<0.001$ ) in all the dimension of MLHFQ; physical, emotional and social HR-QoL. The IG had higher perceived social support compared to the CG ( $p<0.001$ ) at all dimensions of the MSPSS at first month, three months, six months and in one year after the intervention. At three months after the intervention, six months, and in one year the IG had lower emotional

distress compared to the CG. At one year after the intervention  $p < 0.001$  in all the dimensions of the HADS. The multilevel model for the effect of the intervention on the HADS in the overall emotional distress and the Linear Mixed Model results, did not show any statistically significant effect of the intervention, at any of the time points after the intervention ( $p > 0.05$ ) at the dimension of anxiety and at the dimension of depression ( $p = 0.004$ ), but clinically there was a declining trend in almost at all time points after the intervention. The Linear Mixed Model results have shown that there was a statistically significant effect of the intervention at all the time points after the intervention ( $p < 0.001$ ) in all the dimensions of the SCHFI; the maintenance, management and self-confidence dimension. The multilevel model analysis for the effect of the intervention on the total self-care score for the GR9EHFScBS showed a statistically significant effect of the intervention at all the time points after the intervention ( $p < 0.001$ ) in the overall self-care. At three months, six months and one year after the intervention, the IG showed more overall physical activity compared to the CG ( $p < 0.001$ ), and specifically higher walking ( $p < 0.001$ ) and moderate exercise ( $p < 0.001$ ). The multilevel model for the effect of the intervention on physical activity did not show a statistically significant effect of the intervention at any time point ( $p > 0.05$ ) for the overall physical activity. Patients in the IG experienced better HR-QoL related to DM, in the dimensions of ADDQoL ( $p < 0.001$ ) and DM was not found to affect their HR-QoL. The level of glycosylated haemoglobin (HbA1c) showed that the patients in the IG

had significantly lower values across time, compared to CG ( $p < 0.001$ ) where the levels of HbA1c from 7.1 % (0.5) at baseline falls to 6.9% (0.4) in one year, and in the CG was 7.5% (0.7) at baseline and falls to 7.4% (0.6) in a year. In survival analysis both acute events (readmissions / emergency room visits) and mortality, after three months and until six-month time point, in the CG [9/58 (15.5 %)] were observed more acute events and deaths compared to the IG [1/49 (2%)] ( $p = 0.02$ ).

#### **Discussion/ Conclusion**

Supportive care seems to be a promising concept for HF-DM management programs. The pragmatic methodology that used in the current sub-analysis research study has an intensive intervention which started rapidly and in early stages, based on patient – centred guidelines, focused on the 'real world' and on the 'real needs' of HF-DM patients and was rapidly accepted by the patients in the IG since it improved their HR-QoL symptoms and acute events. Future studies should be focused on the specific population of HF-DM patients and access and apply supportive care management programs in a long-term duration for this population, with the scope to increase their HR-QoL, reduce acute events and make patients actively participants in the management of their own chronic conditions in a continues and long-term support.

#### **PhD Advisor**

Ekaterini Lambrinou,  
Professor,  
Department of Nursing,  
Cyprus University of Technology

## **XATZHIQANNOY ANNA**

Τμήμα Νοσηλευτικής

### **Title of Dissertation**

Investigating the Effectiveness of the Combined Use of Technology and Education in Empowering Individuals with Bipolar Disorder



### **Abstract**

#### **Introduction**

People with Bipolar Disorder (BD) are increasingly being recognized as partners by Mental Health Professionals, endowed with rights and responsibilities regarding the therapeutic process, and actively participating in decisions related to their health. One of the key parameters in achieving these objectives is the provision of structured educational interventions that enhance the cognitive foundation regarding BD, thus empowering individuals to better understand and subsequently self-manage their symptoms. Educational interventions are also expected to involve first-degree relatives, as the issue of BD requires a systemic approach. The content of these educational interventions is anticipated to be tailored to the personal needs of individuals with BD and their first-degree relatives. Indeed, the best outcomes from the participation in structured educational interventions for individuals with BD and their first-degree relatives have been extensively documented in international literature. Specifically, improvements in the quality of life for individuals with BD, reductions in the frequency of hospitalizations, and proper use of pharmacotherapy are some of the significantly enhanced parameters. Furthermore, improvements in communication, reduction of negative emotions, and enhancements in the quality of life are some of the benefits observed in first-degree relatives participating in structured educational interventions.

### **Purpose**

The purpose of this study was:

- To investigate the educational needs of people with Bipolar Disorder (BD);
- To investigate the educational needs of first-degree relatives of people with BD;
- To develop the online platform [www.mob.com.cy](http://www.mob.com.cy) based on the educational needs of the participants;
- To provide a face-to-face structured educational intervention to individuals with BD based on the educational manual by Colom & Vieta (2006) and Cognitive Behavioral Therapy, enriched with technology, specifically the online platform [www.mob.com.cy](http://www.mob.com.cy), as well as the educational needs of individuals with BD;
- to evaluate the effectiveness of the educational intervention for individuals with BD.

This study is named with the acronym MoB (Management Of My Bipolarity).

#### **Target Population**

The target population consisted of all adult individuals with Bipolar Disorder (BD) who provided written consent for their participation in this study. It is noted that the study has received all necessary approvals for its conduct from the Cyprus National Bioethics Committee (CNBC) and the Ministry of Health (MH) - Study Committee.

#### **Methodology**

The design adopted was the mixed method multiphase design, providing a deeper and more comprehensive understanding of

the parameters studied. Participants were identified through criterion sampling and snowball sampling methods. The qualitative data collection was conducted using in-depth interviews based on a semi-structured guide developed by the scientific team of this intervention. A deductive approach to the topic was employed. Data accuracy was ensured through data saturation and thematic saturation. To further ensure the study's reliability, Munhall's (1994) criteria were applied. Data verification was conducted using triangulation with multiple researchers, and the main themes were confirmed by the participants.

The quantitative part of the study was a clinical trial where individual and group structured educational sessions were conducted. Participants were identified through purposive and snowball sampling methods and then randomly assigned to either the intervention group or the control group. The intervention group participated in the educational intervention (12 group sessions and 8 individual sessions), while the control group received no intervention, to clarify the effectiveness of the educational intervention.

The effectiveness of the educational intervention was evaluated using the following psychometric tools: Young Mania Scale, HAM-D, Drug Attitude Inventory (DAI-30), Alcohol Use Disorders Identification Test (AUDIT), Drug Use Disorders Identification Test (DUDIT), Quality of Life Scale of the World Health Organization

Quality of Life Assessment (WHOQOL), Multidimensional Health Locus of Control (MHLC), Education Assessment (EA), and frequency and days of hospitalizations from each participant's record. Descriptive statistics and the statistical tool SPSS 19.0 (SPSS, Inc, Chicago, IL version 20.00) were used for data analysis. The mean (M) and standard deviation (SD) of continuous variables, as well as the frequency of categorical variables, were recorded. Differences between groups were tested using parametric (t-test, ANOVA) and non-parametric ( $\chi^2$ ) tests. For all statistical tests, statistically significant associations were defined based on  $p$ -values  $\leq 0.05$ .

#### **Study Results**

**Qualitative Part** – The main theme that emerged from all interviews with individuals with Bipolar Disorder (BD) was that their journey with the condition was like "a dark and lonely passage across the sea." This journey was characterized by the unknown and the unpredictable. Specifically, acquiring knowledge and understanding the symptoms as a result of BD was a solitary path for the participants, with a marked absence of mental health professionals. In this journey, participants' experiences with their illness served as support in this dark path, with experiential learning acting as a "beacon" in the lonely dark journey. Emotions such as uncertainty, tension, and fear accompanied the path of the unknown evolution of BD. In this unknown journey, the internet functioned as a companion "in the darkness of knowledge," while health professionals acted more as a "rein" in providing

knowledge. This dark path was illuminated by "knowledge" about the symptomatology and progression of the disease.

Similarly, first-degree relatives of individuals with BD described their journey of living with a family member with BD. Specifically, all participants described the course of the disease as a lonely "bombed uphill path resembling a minefield." The traversal of this path was intensely lonely, without tools for detecting the "mines." This minefield was unmarked, so when a "mine" exploded, it was sudden and unexpected. There were warning signs that the path led to a "minefield," but participants were unable to understand these signs due to the lack of an essential parameter that would help them—"education." Characteristics of the path to the minefield included obstacles, difficulties, impacts (both collective and individual), and negative emotions. The absence of mental health professionals in providing educational interventions and psychosocial support was strongly noted.

**Quantitative Part** – A total of 42 participants were randomized into 2 groups. The educational intervention was found to be effective in several parameters evaluated. Statistically significant differences between the intervention and control groups were recorded in the HAM-D scale ( $p=0.00$ ), the DAI scale ( $p<0.005$ ), the "Physical Condition" subscale of the WHOQOL-BREF ( $p<0.005$ ), the environment subscale ( $p<0.05$ ), the psychology subscale ( $p<0.05$ ), and the "Bipolarity Knowledge (BK)" scale ( $p<0.05$ ). The mean scores of the scales decreased

in the YOUNG scale from 6.33 to 1.05, the HAMD scale from 11.62 to 4.63, the DUDIT scale from 9.05 to 3.81, the AUDIT scale from 5.57 to 2.33, the MHLCa scale from 73.38 to 70.10, and the MHLCb scale from 71.24 to 68.81.

The individual structured education was found to be an acceptable method for the participants, potentially useful for a wide range of issues, such as improving the quality of life of individuals with BD, improving depressive symptoms, enhancing knowledge about BD, improving beliefs about pharmacotherapy and consequently proper use, and reducing alcohol use frequency. This study presents an inherent challenge for creating a structured support mechanism for individuals with BD. Barriers such as the lack of a unified policy for structured educational interventions should not be seen as insurmountable obstacles but rather as factors that can improve cooperation between the state and university institutions that produce relevant scientific data.

#### **PhD Advisor**

Maria Karanikola,  
Associate Professor,  
Department of Nursing,  
Cyprus University of Technology



## ΕΥΑΓΟΡΟΥ ΕΥΑΓΟΡΑΣ

Τμήμα Πολιτικών Μηχανικών και  
Μηχανικών Γεωπληροφορικής

### Title of Dissertation

Application of Geographic Information Systems and use of Satellite Bathymetry to detect spatial conflicts in the context of Maritime Spatial Planning (MSP)



### Abstract

The study of resolving the conflicts that arise between maritime activities is considered a key component in Maritime Spatial Planning (MSP). The successful implementation of the MSP as well as the monitoring can be achieved with the availability of tools to support the competent authorities in making the right decisions.

This thesis proposes a useful tool based on national and international legal frameworks designed to facilitate the monitoring and improvement of the Maritime Spatial Plans (MSPs) of Cyprus. The basic stages of creating the tool were the collection of updated data, the study of the institutional framework leading to the creation of the Table of Conflicts and Compatibility in the marine environment. Furthermore, recognizing that bathymetry is considered an important parameter in marine applications of activities and infrastructures, this thesis delves into Satellite Bathymetry through passive sensors, using empirical methods.

This standard tool can identify and present maritime and coastal spatial conflicts as well as areas where multiple conflicts coexist, taking into account the third dimension. The results include both the spatial conflicts of the existing situation and the results of a scenario of moving an activity and creating a new infrastructure

in the maritime space, thus identifying the activities and infrastructures affected and the variations of the spatial conflicts. The tool can be considered a useful tool to competent authorities seeking the harmonious coexistence of activities and uses, applying a sustainability-focused approach.

### PhD Advisor

Diofantos Hadjimitsis,  
*Professor,*  
*Department of Civil Engineering*  
*and Geomatics,*  
*Cyprus University of Technology*

## ΚΑΚΟΥΛΛΗΣ ΔΗΜΗΤΡΗΣ

Τμήμα Πολιτικών Μηχανικών και  
Μηχανικών Γεωπληροφορικής

### Title of Dissertation

A Novel Methodology for the Determination of Optimal Locations for the Establishment and Performance Assessment of Integrated GNSS CORS and SAR Corner Reflector Networks in the Advent of GGOS



### Abstract

This doctoral thesis is intrinsically linked to the Cyprus Continuously Operating Natural Hazards Monitoring and Prevention System, abbreviated CyCLOPS, a national strategic research infrastructure devoted to systematically studying geohazards in Cyprus and the EMMENA region. To date, the permanent segment of CyCLOPS is comprised by six permanent sites, each housing a Tier-1 GNSS continuously operating reference stations (CORS) co-located with two calibration-grade corner reflectors (CRs). The latter are strategically positioned to account for both the ascending and descending tracks of SAR satellite missions, including ESA's Sentinel-1.

The goal of CyCLOPS is to establish a reliable permanent station network across Cyprus, featuring co-located GNSS and SAR CR configurations that continuous monitoring geohazards. To fulfil this goal, it is essential to determine the most suitable sites for the permanent installation of equipment, which guarantees the best performance of each device that utilizes associated space-based technologies. Thus, a comprehensive literature review was conducted to analyze such infrastructures, the required instruments according to international standards, installation procedures, and the optimal spatial distribution of stations to create an integrated nationwide network capable of providing combined data of the

two advanced space-based technologies, with maximum performance and minimal error. Nonetheless, the review identified fragmented guidelines regarding the co-location of SAR and GNSS permanent infrastructures. Furthermore, no guidelines exist for the determination of the most suitable locations using a holistic approach, in terms of criteria and required data.

Therefore, to address this gap in literature, the objective of this PhD thesis is twofold. First, to propose a semi-automatic suitability analysis for selecting sites for the permanent installation and co-location of GNSS CORS and a pair of SAR triangular trihedral CRs, considering crucial factors that influence both their individual localization and their interspatial interrelation. Second, to propose a standardized comprehensive workflow for the assessment of the performance of integrated GNSS-SAR permanent stations, which also serves as an evaluation tool for the proposed suitability analysis.

All necessary parameters and criteria were collected, and a semi-automated suitability analysis of determining the optimal positions was created for the installation of the abovementioned permanent co-located sensors.

The signal response and the position of CRs were evaluated in terms of radiometric characteristics and geolocation accuracy,

through Point Target Analysis derived from Sentinel-1A SAR data. Moreover, the position stability of the GNSS CORS was evaluated through the analysis of signals received from GNSS receivers.

The results indicate a consistent performance with the expectations for an adequately installed high-quality integrated GNSS and CR network. After 2.5 years of operational experience and excellence, these findings advance SAR product quality understanding, and CyCLOPS infrastructure effectiveness and reliability.

#### PhD Advisor

Chris Danezis,  
Associate Professor,  
Department of Civil Engineering  
and Geomatics,  
Cyprus University of Technology

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

#### ΠΑΠΑΝΤΩΝΙΟΥ ΑΝΤΩΝΗΣ

Τμήμα Πολιτικών Μηχανικών και  
Μηχανικών Γεωπληροφορικής

#### Title of Dissertation

Development of a Smart City Geospatial  
Integrated Framework



#### Abstract

The Smart City Geospatial Framework can be defined as an organized structure that incorporates geographic information systems, spatial data infrastructure, and various geospatial technologies to enable data-driven insights and facilitate the seamless integration of spatial data into the broader smart city ecosystem. Implementing a Smart City Geospatial Framework involves the deployment of geospatial technologies in urban planning, infrastructure management, emergency response, and citizen engagement. This includes the establishment of spatial data infrastructure, integration with IoT devices, and the development of citizen-centric applications. Successful implementations result in optimized resource allocation, improved public services, and enhanced overall urban resilience. The Smart City Geospatial Framework is imperative for several reasons. Firstly, it enables data-driven decision-making, allowing city officials to make informed choices about urban planning and resource allocation. Secondly, it enhances the efficiency of public services, such as transportation and emergency response, by leveraging real-time spatial data. Moreover, the framework promotes sustainability by providing insights into environmental factors, contributing to eco-friendly urban development. Lastly, the integration of geospatial technologies fosters citizen

engagement, transparency, and overall improvement in the quality of life for urban residents. This thesis presents a well-defined questionnaire in five thematic sections based on the needs of the Municipality of Limassol in Cyprus, the development of a novel 'Smart City Geospatial Integrated Framework', and the development of a Web-GIS Dashboard Application to support Smart Cities.

Cities ought to contemplate the adoption of a Smart City Geospatial Integrated Framework as a strategic measure to tackle challenges associated with well-informed decision-making, refined urban planning, upgraded transportation systems, improved emergency response capabilities, reinforced environmental sustainability, increased citizen engagement, efficient allocation of resources, adept management of smart infrastructure, implementation of data-driven public services, and strengthening against the impacts of climate change.

Adopting a Smart City Geospatial Integrated Framework can transform cities by overcoming challenges, promoting sustainability, enhancing citizen engagement, and creating resilient urban environments. This framework empowers cities to make informed decisions, optimize resource management, and improve overall governance.

**Smart City Framework includes**

**Stakeholder Analysis and Requirements Gathering:** Identify and engage key stakeholders, including city officials, urban planners, technology experts, community representatives, and businesses. Gather requirements by understanding the unique needs, challenges, and goals of the city.

**Comprehensive Urban Analysis**

Conduct a thorough analysis of the city's current urban landscape, including land use, infrastructure, transportation, and environmental factors. Identify critical areas for improvement and assess existing geospatial capabilities and data.

**Technology Assessment and Integration**

Evaluate existing geospatial technologies, data infrastructure, and IoT capabilities. Explore opportunities for integrating emerging technologies, ensuring compatibility and interoperability.

**Spatial Data Infrastructure (SDI) Development**

Establish a robust SDI that includes protocols for data collection, management, and distribution. Define standards for geospatial data to ensure consistency and interoperability.

**Citizen Engagement Framework**

Develop a framework for citizen engagement using geospatial technologies. This could involve interactive maps, mobile applications, and online platforms. Consider privacy measures and provide transparent policies regarding citizen data.

**Collaborative Decision-Making**

Implement tools and processes that facilitate collaborative decision-making among city departments and stakeholders.

Ensure cross-departmental communication and shared access to geospatial information.

**Sustainability Integration**

Integrate sustainability principles into the framework, including eco-friendly urban planning, energy efficiency, and waste management initiatives. Leverage geospatial data for monitoring and optimizing sustainability efforts.

**Security and Privacy Measures**

Develop and implement robust security measures to protect geospatial data from unauthorized access and cyber threats. Ensure compliance with privacy regulations and establish protocols for handling sensitive information.

**Training and Capacity Building**

Invest in training programs for city personnel to build expertise in geospatial technologies.

**Pilot Programs and Iterative Implementation**

Implement pilot programs in specific areas to test the effectiveness of the framework and identify areas for improvement and refinement.

**Monitoring and Evaluation**

Establish metrics and key performance indicators (KPIs) to measure the success of the framework. Continuously monitor and evaluate the impact on urban planning, service delivery, and citizen satisfaction.

**Scalability and Future Proofing**

Design the framework to be scalable, allowing for the integration of new technologies and expansion to accommodate future growth. Regularly update the framework to align with

technological advancements and changing city needs.

**Documentation and Knowledge Sharing**

Document the framework design, implementation processes, and best practices. Facilitate knowledge sharing among city departments and with other municipalities pursuing similar initiatives.

**Community Outreach and Education**

Engage in ongoing community outreach and education programs to keep residents informed about the benefits and uses of the geospatial framework. Encourage active participation and feedback from the community.

**Adaptive Planning and Continuous Improvement**

Embrace adaptive planning methodologies, allowing for continuous improvement based on changing circumstances, technological advancements, and evolving city priorities.

By following this methodology, cities can develop a Smart City Geospatial Integrated Framework that aligns with their unique needs, fosters collaboration and contributes to the creation of a more efficient, sustainable, and livable urban environment.

**PhD Advisor**

Diofantos Hatzimitsis,  
Professor,  
Department of Civil Engineering  
and Geomatics,  
Cyprus University of Technology

**ΧΑΤΖΗΠΕΤΡΟΥ ΣΤΥΛΙΑΝΟΣ**

Τμήμα Πολιτικών Μηχανικών και  
Μηχανικών Γεωπληροφορικής

**Title of Dissertation**

Stochastic Reconstruction of Sentinel-1  
Wind Speed Image Time Series via  
Multiple-Point Geostatistical Simulation

**Abstract**

Offshore wind is expected to play a key role in future energy systems. Wind energy assessment studies often call for long-term and spatially consistent datasets. Despite the vast amount of available data sources, no current means can provide relevant sub-daily information at a fine spatial scale (~1km). Synthetic Aperture Radars (SAR) deliver wind field estimates over the ocean at fine spatial resolution but suffer from partial coverage and irregular revisit times. Numerical Weather Prediction (NWP) models, which are the basis of reanalysis products, can be queried at any time step but lack fine scale spatial variability. In this dissertation, a geostatistical methodology is developed to combine the advantages of both under the framework of Multiple-Point Statistics and is employed to realistically reconstruct wind speed patterns at time instances where satellite information is absent. Synthetic fine-resolution wind speed images are generated conditioned to co-registered coarse-scale regional reanalysis information. Available simultaneous data sources are used as training data to generate the synthetic image time series. The latter are then evaluated via cross-validation and statistical comparison against reference satellite data. Multiple realizations are also generated to assess the uncertainty associated with the simulation outputs. Overall, results demonstrate the effectiveness of the proposed method

in realistically reconstructing the fine-scale wind speed spatiotemporal variability over the offshore area of Cyprus and can provide the basis for an offshore wind resource assessment. The proposed framework can be generalized to other regions, scales or variables.

**PhD Advisor**

Phaedon Kyriakidis,  
*Professor,*  
*Department of Civil Engineering*  
*and Geomatics,*  
*Cyprus University of Technology*

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

**ΔΗΜΗΤΡΙΑΔΟΥ ΕΛΕΝΗ**

Τμήμα Πολυμέσων και Γραφικών Τεχνών

**Title of Dissertation**

Artificial Intelligence in Smart Learning  
Environments: An Overview and Case  
Studies

**Abstract**

This thesis provides a review of research work on smart classroom technologies, with a focus on emerging and Artificial Intelligence (AI)-related technologies. Smart classroom technologies related to the effective class management that enhance the convenience of classroom environments, the use of teaching aids during the educational process and the use of performance assessment technologies are presented. Apart from discussing the range of technological achievements in each of the aforementioned areas, the role of AI in smart learning environments is thoroughly discussed. Furthermore, the development of two automated artificial intelligence systems that aim to address modern education issues and enhance the professional skills of educators are presented. The first system aims to maximise the interaction between educators and students during tele-education, by monitoring the actions of the students in online courses while protecting as much as possible students' privacy. In addition, as an attempt to assist educators to improve their teaching style, a second system that assesses the body language of educators was developed. Furthermore, the operation, role and impact of these two proposed systems was assessed with comprehensive quantitative and qualitative evaluations. Conclusions derived from this thesis indicate the acceptance of stakeholders for AI-based systems that can facilitate the educational process through

the provision of tools that enhance the educator-student interaction, and tools that help educators improve their teaching style.

**PhD Advisor**

Andreas Lanitis,  
*Professor,*  
*Department of Multimedia*  
*and Graphic Arts,*  
*Cyprus University of Technology*

## ΤΙΜΟΘΕΟΥ ΣΤΕΛΛΑ

Τμήμα Πολυμέσων και Γραφικών Τεχνών

### Title of Dissertation

STEAM Learning Design in the Era of Maker Education



#### Abstract

STEAM through Making, as an integrated learning approach, has gained an increasing interest in the last few years amongst researchers, educators, and practitioners. However, learning environments where a STEAM through Making approach is applied are complex environments that require well-organized learning designs in order to enhance learning in terms of content knowledge, attitudes, and development of skills. The scarcity of learning designs for successful integration of STEAM and Making practices in authentic school-based learning environments has inspired the work of this dissertation. Throughout four design-based research (DBR) cycles of design and implementation, this dissertation sought to provide a deeper understanding of how the STEAM through Making approach can be implemented in authentic school settings. The first DBR cycle presents an exploration of the STEAM through Making approach to identify the conditions under which learning can be promoted. The second DBR cycle assessed the type of learning and skills evident when students engage with projects in a STEAM through Making approach. Furthermore, DBR Cycle 2 delved into students' development of learning and innovation (L&I) skills, presenting an analytical framework and coding scheme for the capturing and documenting of this evidence. Cycle 3 investigated the development of collaboration and creativity

skills as they occurred simultaneously during STEAM through Making activities. The fourth and final cycle of this DBR work validated and extended the learning design principles derived from the previous DBR cycles as well as the analytical framework and coding scheme for the assessment of L&I skills. The dissertation contributes to learning design research and practice for learning in STEAM through Making in authentic classroom contexts.

#### PhD Advisor

Andri Ioannou,  
Associate Professor,  
Department of Multimedia  
and Graphic Arts,  
Cyprus University of Technology

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

## ΚΥΡΙΑΚΟΥ ΜΑΡΙΑ

Τμήμα Χημικών Μηχανικών

### Title of Dissertation

Development of Biochar-Based Biocatalysts for Fermentative Bioethanol Overproduction via Whole-Cell Immobilization



#### Abstract

Biofuels have received significant attention as an important source of renewable energy, holding numerous economic impacts. However, current biofuel production is based on food crops (first generation biofuels) that compete with agricultural lands and biodiverse landscapes. Bioethanol is considered as a feasible, sustainable and enduring energy source. Nevertheless, although bioethanol production is considered as one of the most promising alternatives to the use of petroleum-based fuels, bioethanol fermentations are impacted by a wide range of factors (e.g. substrate and product inhibition) decreasing process productivity. The study proposed the development of biochar-based biocatalysts as a sustainable technology aiming to enhance the efficiency of alcoholic fermentations. Towards this aim, different residues were applied as biowaste for biochar production. Moreover, repeated batch fermentations using free and supported cells of various yeasts applicable as industrial bioethanol producers were employed to evaluate the immobilised biocatalysts developed in terms of bioethanol production and reusability. The protective role of the technology developed against metabolic stress was evaluated employing *S. cerevisiae* in bioethanol fermentations under various harsh bioprocess conditions including heat, ethanol, oxidative and osmotic stress. Lab-scale bioreactor experiments applying different operation

modes were additionally conducted evaluating non-biological char for the production of bioethanol. The system demonstrated improved fermentation performance in terms of bioethanol titre and productivity achieved holding significant potential to tackle major challenges associated with the industrial bioprocess.

#### PhD Advisor

Michalis Koutinas,  
Associate Professor,  
Department of Chemical Engineering,  
Cyprus University of Technology

## ΚΩΜΟΔΙΚΗ ΑΝΤΙΓΟΝΗ

Τμήμα Χημικών Μηχανικών

### Title of Dissertation

The development of Environmental Science Agency for Primary School Students through an Environmental Entrepreneurship Intervention Programme



### Abstract

The pursuit of sustainability in the environment and the cultural heritage significantly depends on the cultivation of Environmental Science Agency (ESA) among individuals, particularly during the early education years. This dissertation delves into the effectiveness of an environmental entrepreneurship intervention programme aimed at nurturing ESA among primary school students, aged 11 to 12. ESA is conceptualized as comprising three vital components: knowledge, skills and norms, role development, and agency concerning environmental issues. Employing a Design-Based Research (DBR) methodology, the study unfolds across three distinct phases: Preparatory, DBR Cycle 1 involving 34 primary students and DBR Cycle 2 involving 139 students.

The intervention programme, tailored for the targeted age group, was structured in the framework of this study in order to deliver experiential learning opportunities and participatory actions, intended to shape future environmental behavior. A mixed-methods approach, encompassing both quantitative and qualitative techniques, was employed for data collection and analysis. Pre and post-intervention questionnaires were administered to students to capture changes in their ESA components, supplemented by interviews

with teachers and students to provide additional insights.

Quantitative analysis of the data unveiled notable advancements in the knowledge, skills and norms and role development components of ESA post-intervention. However, the agency component exhibited a decline, suggesting a complex interplay of factors influencing its development. Qualitative findings paint a more nuanced picture, portraying a positive and promising trajectory in students' attitudes and behaviors towards environmental sustainability.

Overall, the dissertation highlights the pivotal role of environmental entrepreneurship education in nurturing ESA among primary school students, thereby laying the groundwork for informed and proactive engagement with environmental and cultural sustainability challenges in the future.

### Keywords

entrepreneurship education, environmental entrepreneurship, environmental science agency, primary education

### PhD Advisor

Alexandros Charalambides,  
Associate Professor,  
Department of Chemical Engineering,  
Cyprus University of Technology

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

## ΚΩΝΣΤΑΝΤΙΝΟΥ ΜΠΑΡΜΠΑΡΑ

Τμήμα Χημικών Μηχανικών

### Title of Dissertation

Study of Low-Cost Supported Catalysts for the Selective Catalytic Reduction of Nitric Oxide Using Hydrogen, in the Presence of Oxygen (NO/H<sub>2</sub>/O<sub>2</sub>)



### Abstract

The present Doctoral Dissertation focuses on the study of low-cost supported catalysts (i.e., without the use of noble metals) for the selective catalytic reduction of NO using Hydrogen, in the presence of Oxygen (NO/H<sub>2</sub>/O<sub>2</sub>), at low temperatures. Aiming to find suitable solid materials, new solid materials were prepared by the wet impregnation method and compared in terms of their catalytic behavior towards the NO/H<sub>2</sub>/O<sub>2</sub> reaction.

Based on literature review, the research carried out within the present work, focused on the synthesis and development of Ag-supported catalysts on simple and mixed oxidic supports such as MgO, CeO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> and MnO<sub>2</sub>. The results of the detailed study concerning the effect of the active phase as well as the chemical composition of the support on the selective catalytic reduction of NO, led to the synthesis of a new supported-Ag catalyst on a mixed oxide support, consisting of MgO and Al<sub>2</sub>O<sub>3</sub> (Ag/MgO-Al<sub>2</sub>O<sub>3</sub>), which was found to exhibit excellent catalytic behavior towards the NO/H<sub>2</sub>/O<sub>2</sub> reaction.

For the first time ever, the catalytic performance and N<sub>2</sub>-selectivity of the novel 1wtAg/MgO-Al<sub>2</sub>O<sub>3</sub> catalyst toward H<sub>2</sub>-SCR of NO was investigated in the low temperature range of 100-400°C. In particular, the 1wtAg/MgO-Al<sub>2</sub>O<sub>3</sub> catalyst presented excellent activity, selectivity and

stability for reducing NO to N<sub>2</sub>. Based on the results of the present work, the 1wtAg/MgO-Al<sub>2</sub>O<sub>3</sub> catalyst was found to show the highest activity (X<sub>NO</sub> ≥ 75%) and selectivity towards N<sub>2</sub> (S<sub>N<sub>2</sub></sub> > 95%) compared to any other non-noble metal catalyst, reported in the literature, to date, for the NO/H<sub>2</sub>/O<sub>2</sub> reaction, in the very low-temperature range of 100-250°C. It is noted that the 1wtAg/MgO-Al<sub>2</sub>O<sub>3</sub> catalyst showed maximum NO conversion at 125°C, a temperature which is considered ideal, since it falls well within the temperature range of the exhaust gases of stationary emission sources. It is also worth to mention that the latter catalyst showed high stability with reaction time on stream, in the presence of 50ppm SO<sub>2</sub> in the gas feed, a fact which makes it a strong candidate for possible practical application. Additionally, in the context of this work, the reduction of N<sub>2</sub>O was studied in an attempt to simultaneously reduce the latter molecule along with NO. It was found that the reduction of N<sub>2</sub>O is only possible in the absence of oxygen in the reaction gas feed.

The characterization of the catalysts prepared within the present work was carried out using a series of cutting-edge techniques in order to determine their specific surface area, the actual metal loading, as well as the dispersion of the latter on the support. In addition, the texture of the catalysts was studied through SEM

and TEM. Finally, measurements of the electronic properties, as well as mechanistic studies by the Temperature Programmed Desorption (TPD) and Reaction (TPSR) dynamic techniques. The results of the physicochemical characterization of the studied solids, proved the importance of the electronic properties of the solids towards their catalytic behavior. It is noted that the Ag/MgO-Al<sub>2</sub>O<sub>3</sub> catalyst, which was found to exhibit the best catalytic behavior, also exhibited the highest dielectric constant, dielectric loss and conductivity. Strong evidence was also found regarding the role of the chemical composition of the support in the formation of different intermediate species of the reaction, which may determine the catalytic behavior of the solids (activity and selectivity).

#### PhD Advisor

Costas Costa,  
Professor,  
Department of Chemical Engineering,  
Cyprus University of Technology

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

#### ΠΑΠΑΓΕΩΡΓΙΟΥ ΜΑΡΙΟΣ

Τμήμα Χημικών Μηχανικών

#### Title of Dissertation

Study of microorganism *Sagittula Stellata*, *Roseobacter Litoralis*, *Roseobacter Denitrificans* and *C. Ceratosporus* through spectroscopy techniques



#### Abstract

*Sagittula stellata* is a heterotrophic member of the alpha proteobacteria *Roseobacter* clade typically found in marine environments responsible for the degradation of cellulose, lignin related compounds and for the oxidation of dimethylsulfide (DMS) to dimethyl sulfoxide (DMSO) that is coupled to ATP synthesis and other organic sulfur compounds typically found in surface environments. Also, *Sagittula stellata* contribute to several biochemical cycle of N, P και S.

Aerobic anoxygenic phototrophic bacteria (AAPB) are aerobes that capture light energy and store it as ATP by anoxygenic photosynthesis. Anoxygenic phototrophy is a central metabolic process. Most of the AAPB belong to the *Roseobacter* and *Erythrobacter* clades which are the most intensively studied groups of marine bacteria due to their worldwide distribution in marine environments. The *Roseobacter* lineage is a heterogeneous group of a-Proteobacteria in the marine environment which plays an important role for the global carbon and sulfur cycles and also in aerobic anoxygenic photosynthesis (AAP).

Diatoms are unicellular photosynthetic organisms responsible for 20% of the photosynthesis that takes place on the planet. The FCPs (Fucoxanthin Chlorophyll Proteins) complexes consist of chlorophylls

a/c and the carotenoids fucoxanthin and diadinoxanthin which are responsible for light harvesting. These organisms utilize photoprotection mechanisms to ensure their survival under intense and variable light conditions.

In this thesis, a combination of Uv-vis, resonance Raman, FTIR and Fluorescence spectroscopy as well as the analytical technique of high-performance liquid chromatography are used to investigate the response of *Sagittula stellata* in different growth conditions with heavy metals and different pH.

Also, investigated the LH membrane from the bacteria *Roseobacter litoralis*, *Roseobacter denitrificans* in different growth conditions of light different colors of light, in different pH, in oxidation and reduction phase and the binding with CO. Finally investigated the FCPs from the diatom *C. Ceratosporus* in a different growth condition of light.

#### PhD Advisor

Constantinos Varotsis,  
Professor,  
Department of Chemical Engineering,  
Cyprus University of Technology

## ΠΕΡΑΤΙΚΟΥ ΣΤΕΦΑΝΗ

Τμήμα Χημικών Μηχανικών

### Title of Dissertation

Development of Data-Driven Techniques for Solar PV Energy Production Forecasting



#### Abstract

The global shift towards the utilization of renewable energy sources has driven the development of photovoltaics (PVs) and the need for their mass integration into the energy markets. Despite the many environmental and economic benefits of PV systems, there are still some significant issues in integrating high PV penetration into the distribution grid, mainly due to the dependence on uncertain environmental parameters. Accordingly, the power generation from PV systems changes dynamically in a given future time period.

Nevertheless, electricity storage is not yet an affordable option, and thus, baseload power plants must produce excess electricity as a spinning reserve to compensate for the fluctuations in electricity generation from photovoltaics. An alternative solution is a reliable forecasting scheme that could reduce this fluctuating generation from photovoltaics. Based on this, an accurate prediction of PV power output is a key challenge, as it contributes to the optimal management and flexibility of the power grid, thus enabling the development of flexible green power electricity grids across cities.

The overall aim of the present doctoral dissertation is to help system/grid operators evaluate the performance of PV systems over time, ensure grid stability, and enable efficient capacity management and planning

of solar PV plants. To this end, this work addresses the development of new methods for estimating PV performance under clear skies, the cloud cover over a given area, and predicting PV power generation from distributed PV systems. The main objective is to provide the solar PV energy sector with important information for an accurate prediction of PV power output.

Timely prediction of PV power generation under clear skies is an important aspect to quickly identify the causes of system losses and avoid any delays in correcting system failures. Therefore, as a first step, this study focused on developing a methodology to predict a smoothly varying curve representing the PV power output signal during clear sky conditions. For this purpose, the time series of PV power output was used and analysed in terms of the mean value, the maximum value, and the standard deviation value. It should be noted that the developed model was tested with data from Cyprus and Spain. The predicted signal was compared with the best visible smooth signal indicating that the proposed method can provide good approximation of the actual signal under clear sky conditions.

Cloud cover directly affects the stability and reliability of PV system performance and should be considered as an important

factor in accurately evaluating short-term PV power generation. In this context, estimating the percentage of cloud cover over a given area was the purpose of the second step of this thesis. In particular, animated maps based on the proposed method for predicting PV power output under clear skies were created. Since no other factors (e.g., location, tilt, orientation, technology) changed, any decrease in PV energy production indicated the presence of partial or complete cloud cover. Image processing of the maps based on the HSB thresholds was performed and the area of cloud cover was calculated. The predicted cloud cover was correlated with the actual cloud cover for the same time and day for validation purposes. A correlation coefficient of 0.9311 was achieved.

To enable high PV penetration rates in the power grid, a spatiotemporal PV power prediction model was developed in the third step, which is crucial for building a smart grid for cities or regions and provides valuable information for solar power planning and prediction. Continuous data from a dense network of 21 PV systems were used. After preprocessing the data, the SGCRF forecasting model was applied within the scope of this work. The effect of aggregation of PV plants with different distances between them was also considered. A total of three datasets have been used, indicating that a uniform distribution of PV plants in the studied area gives better results when considering

the proposed model. The average relative error of all PV systems in each dataset ranges from 0.142 to 3.211.

In general, all proposed methods delivered satisfactory results, and it can also be argued that PV data alone can provide interesting information. Based on the analysis of each implemented method, they can assist in decision making for the management, optimization, and visualization of microgrids and power systems.

Notably, all the proposed methods adopt direct forecasting techniques which depend solely on historical time series of PV performance. This is the innovative concept of this dissertation, as all methods rely on historically available data that can be easily accessed by existing PV plant monitoring equipment, resulting in low equipment and data -ixacquisition costs. In addition, the proposed methodologies are generalizable and not computationally intensive. This means that they can be used for different time series and multiple PV stations, which implies that they are site-independent.

#### PhD Advisor

Alexandros Charalambides,  
*Associate Professor,*  
*Department of Chemical Engineering,*  
*Cyprus University of Technology*



## ΦΩΤΙΟΥ ΠΑΝΑΓΙΩΤΑ

Τμήμα Χημικών Μηχανικών

### Title of Dissertation

Sustainable Phosphate Recovery from Wastewater using Biowaste-based Materials



### Abstract

Phosphorus plays a crucial role in plant growth and biological processes. Recovering phosphorus from waste streams is important for sustainable food production and environmental stewardship. Bio-based materials can be used for effective phosphate recovery through adsorption. This sustainable and cost-effective methodology reduces environmental pollution and eutrophication and contributes to the circular economy. The recovered phosphate solid can be used as a soil conditioner or fertilizer, promoting efficient nutrient management and sustainable agriculture. Thus, following this approach, this work aimed to explore low-cost biowaste materials for effective phosphate recovery from real wastewater. Various biowastes, including orange peels, spent coffee residues, fish scales, seagrass residues of *P. oceanica*, biochar produced from olive kernels, and biochar generated from vineyard prunings, were tested for their phosphate adsorption capacity. Thermally treated seagrass (SG-TT) and eggshell (EGSL-TT) residues exhibited the highest capacity from the biowastes examined. The optimum pre-treatment temperature and exposure time were determined as 500°C for 1 h and 900°C for 30 min, respectively. Moreover, chemical leaching experiments of phosphate from dewatered anaerobic sludge (DWAS) were conducted, evaluating sonication and inorganic acids (sulfuric acid (SA),

thermal-sulfuric acid (TSA), and nitric acid (NA)) as extraction methods to determine the most suitable acid medium to leach out phosphate. SA and TSA processes with 84.9 and 93.2% extraction efficiency, respectively. Adsorption batch experiments with real wastes (anaerobic effluent wastewater and leached solution from DWAS), demonstrated that SG-TT and EGSL-TT have high adsorption efficiency and selectivity towards phosphate (>78.4% for both materials). After phosphate adsorption, the solid residues were mixed with compost in different ratios and then tested as fertilizer substitutes on plant growth. The SG solid residue after adsorption produced from anaerobic effluent or synthetic solutions imposed a positive effect on plant growth with germination index (GI) values 96.7 – 111.1%, for all types of seeds tested (*Solanum lycopersicum*, *Lepidium sativum*, and *Sinapis alba*), while the solid residue after adsorption produced from DWAS leached solution negatively affected the germination of seeds, probably due to potentially refractory compounds contained in DWAS. Similar behaviour was observed in EGSL solid residue remaining after adsorption from DWAS leachate, while a positive effect was distinguished on plant growth for *Sinapis alba* and *Lepidium sativum* seeds. EGSL-TT were additionally tested in AD systems as a new approach to counteract excessive

acidification and alleviate low pH in anaerobic digestion and showed substantially higher methane generation than the control. This new proof of concept contributes to the circular economy; the EGSL-TT is integrated with anaerobic digestion both in-situ for buffering acidification and ex-situ for phosphorous removal and potential use as a soil conditioner. Finally, a process for the valorisation of different type of wastewaters was developed, which was including SAnMBR system in combination with adsorption method. The first system involved the combination of a submerged anaerobic membrane bioreactor (SAnMBR) and two biowaste adsorption columns (SG-TT and EGSL-TT) to assess the recovery of phosphates from low-strength wastewater relatively high in phosphate ion (reject wastewater from anaerobic sludge dewatering process). The results showed a chemical oxygen demand (COD) removal of 50%. However, the phosphate removal efficiency in the reactor was low and as such, the effluent from SAnMBR was then passed through two columns containing SG-TT and EGSL-TT residues for further removal (resulting in over 95% recovery). In addition, the fractionation analysis of phosphorus showed that inorganic phosphorus was the substantial phosphorus fraction in eggshell and seagrass end product, accounting for 92.6 and 95.7% of TP, respectively. Eggshell end product had the highest

proportion of apatite phosphorus fraction (87.4%), which require further time for the dissolution process, leading to low concentrations of bioavailable phosphorus fractions and consequently poor germination of seeds. Overall, this study shows that the seagrass and eggshell could be effectively reclaimed as selective adsorbents towards phosphates in advanced wastewater treatment processes when combined with a SAnMBR. The second system used a SAnMBR to treat synthetic and domestic wastewater. The COD was effectively treated, with average removal percentages of 82.3 and 87.8% for synthetic and domestic wastewater, respectively. Then, the SAnMBR effluent was independently exposed to EGSL-TT and SG-TT, and the phosphate ions were recovered with percentages up to 71.8 - 99.9% and 60.5 - 78.0%, respectively, for all the flow rates tested. The effluent from EGSL and SG was exposed to powder-activated carbon (PAC), and the COD was further reduced to a concentration of 20.2 ± 5.2 and 57.0 ± 13.3 mg L<sup>-1</sup>. The respective final effluent was evaluated in phytotoxicity trials demonstrating that the SAnMBR effluent after the PAC treatment was significantly better for *Lepidium sativum* and *Sinapis alba* seeds tested than the untreated domestic wastewater. Finally, the determination of volatile organic compounds (VOCs) depicted a significant decrease from the very first steps of the

process, with a reduction of common wastewater contaminants such as dimethyl disulfide, dimethyl trisulfide, phenol, p-cresol, nonanal and decanal. The tested technology might be considered a promising treatment system since can effectively treat domestic wastewater, reduce the VOC, generates biogas for energy, produces solid products high in inorganically bound phosphate and the effluent can be used for irrigation.

#### PhD Advisor

Ioannis Vyrides,  
Assistant Professor,  
Department of Chemical Engineering,  
Cyprus University of Technology

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

#### ΑΝΔΡΕΑΔΗΣ ΕΛΕΥΘΕΡΙΟΣ

Τμήμα Χρηματοοικονομικής, Λογιστικής  
και Διοικητικής Επιστήμης

#### Title of Dissertation

Technological Advancements: Effects  
on Local Economy Trends and Public  
Finance Dynamics



#### Abstract

This dissertation investigates the risks and opportunities arising from recent technological advancements, with a specific emphasis on the economic repercussions of cyberattacks targeting local entities in the United States and the adaption of artificial intelligence (AI) technologies within U.S. counties. The research offers insight into these implications by analyzing their impacts on both local economies and financial markets, with particular attention to the U.S. municipal bond market.

Cyber attacks targeting local government entities pose significant challenges to municipal finances. This research investigates the economic repercussions of cyberattacks at the local government level. Employing a difference-in-differences approach to identify causal effects, the findings show significant increases in bond yields and reductions in bond issuance for municipalities situated in counties most exposed to cyberattacks targeting local entities and their pertinent news. Heterogeneous effects related to investor clientele suggest a capital supply channel. Municipalities respond to financing shortages by drawing their cash holdings and by reducing their more elastic investments. The awareness and prevalence of cybersecurity risk hinder local government entities' access to capital by limiting their ability to provide public services and infrastructure.

In parallel, the adoption of AI technologies at a local level presents opportunities for economic revitalization. This dissertation investigates the economic impact of AI technologies on municipalities using spatial variation in labor investments in artificial intelligence (AI). Employing an instrumental variable analysis, difference-in-differences regressions, and an entropy balancing approach, causal effects are identified while controlling for economic conditions and demographics. The findings show increases in labor investments in AI within a county lead to lower yields, which prompts municipalities to issue longer-term bonds. Qualitatively similar results that exploit the introduction of ChatGPT, further support causality. Differential effects of labor investments in AI within a region on economic activity and government revenues suggest an economic revitalization channel.

By integrating insights from both cyber risk and AI adoption, this dissertation offers a comprehensive understanding of the evolving landscape of local finances and economic development. It underscores the importance of robust cybersecurity measures to mitigate risks and ensure the resilience of municipal finances, while also highlighting the potential of AI technologies to drive economic prosperity at the local level. This research contributes to the discourse

on leveraging technology for sustainable development, informing strategic decision-making for policymakers, practitioners, and stakeholders navigating the complexities of an increasingly digital world.

#### PhD Advisor

Christodoulos Louca,  
Associate Professor,  
Department of Finance, Accounting  
and Management Science,  
Cyprus University of Technology

2024

Διδακτορικές  
Διατριβές  
Αποφοίτων  
Τεχνολογικού  
Πανεπιστημίου  
Κύπρου

#### ΔΗΜΗΤΡΙΑΔΗΣ ΚΩΝΣΤΑΝΤΙΝΟΣ

Τμήμα Χρηματοοικονομικής, Λογιστικής  
και Διοικητικής Επιστήμης

#### Title of Dissertation

Investigating Risk Characteristics and  
Dynamic Connectedness among Traditional  
and Modern Investments during Crises



#### Abstract

This PhD thesis examines the risk-return characteristics and dynamic interconnection of a diverse group of modern financial instruments. Such investments include 'environmentally friendly' stocks, which are vulnerable to systemic risk and the impact of non-normal distributions. Furthermore, well-known financial instruments such as gold, oil, and sectoral stock indices are examined, as well as emergingly popular investments such as wheat. Notably, this thesis focuses not only on highly innovative digital investment tools such as cryptocurrencies, but also on the most modern forms of digital assets, such as 'environmentally-friendly' cryptocurrencies, which are considered riskier but have the potential to become the most appealing to investors in the medium to long term. Diversification or hedging against higher systemic risk through the optimal synthesis of portfolios based on a thorough assessment of risk-adjusted performance dynamics may be a valuable tool for investors during crises such as the Covid-19 or the Russia-Ukraine conflict.

#### PhD Advisors

Christos C. Savva,  
Professor,  
Department of Finance, Accounting  
and Management Science,  
Cyprus University of Technology

Demetris Koursaros,  
Assistant Professor,  
Department of Finance, Accounting  
and Management Science,  
Cyprus University of Technology



**ΤΕΧΝΟΛΟΓΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΥΠΡΟΥ**

Αρχιεπισκόπου Κυπριανού 30, 3036 Λεμεσός

Τ.Θ. 50329, 3603 Λεμεσός

Τηλ: +357 25 00 25 00

Φαξ: +357 25 00 27 50

E-mail: [administration@cut.ac.cy](mailto:administration@cut.ac.cy)

[www.cut.ac.cy](http://www.cut.ac.cy)