Vasileios SKARAMAGKAS
Electrical Engineer, BEng, MEng

Date of Birth : 02/02/1996
linkedin.com/in/vskaramagkas96
+30 6981497840
vskaramagkas96@gmail.com
Heraklion, Greece

EDUCATION

Present – May 2022 | **PhD Candidate, DEPT. OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE, HMU, Greece**

Early diagnosis of Parkinson's disease symptoms based on multimodal data and Deep Machine Learning methods.

Currently, I am pursuing my PhD Degree in Health Informatics and Engineering under the supervision of Prof. Manolis Tsiknakis. The long term goal of my research is the processing of Parkinson's disease (PD) patient data and the implementation of deep learning (DL) methods towards the development of a PD diagnostic device/tool that collects and processes cardinal PD characteristics from the whole body and efficiently provides with essential information upon the condition of the patient, aiding to serve as a real-time clinician assistant. Particularly, the study has the following sub-objectives :

- To provide a comprehensive review about the cardinal PD characteristics related to multiple body parts and the cutting-edge deep learning methods for estimating the disease stages or other PD related information.
- To design and execute a series of participatory studies towards the collection of data from multiple measurement points of PD patients. Specialized Neurologist Z. Kefalopoulou from the Department of Neurology, Patras University Hospital and Assoc. Prof. C. Spanaki from the Neurology Department, University General Hospital of Heraklion will aid in this endeavor as discussions have already taken place, and there is also a history of past collaborations. Additionally, this procedure requires the development of sensory equipment for data acquisition.
- To implement and test a wide variety of Data analysis and DL methods towards :
  - the development of early prediction models and
  - disease evolution monitoring and phenotype estimation, with the objective to optimize treatment response.
- To test a variety of sensors, microprocessors and additional equipment in terms of performance, power consumption and size and develop a real-time, wireless PD diagnostic device.
- In the context of this work we will adopt a user centered approach and will seek to collaborate with clinicians and patients in order to decide upon the dimensions, placement and operation of the device and provide with an easy to use GUI with a plug-and-play diagnostic tool.

Spyder | Matlab/Simulink | LabVIEW | Tensorflow | Keras | NumPy | PyTorch | LaTeX

September 2019 – September 2014 | **BEng - MEng, DEPT. OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE, University of Patras, Greece**

Integrated Master's degree in Electrical and Computer Engineering focused on Robotics, Control Systems and Automation. Apart from its primary target, it also provides knowledge in a wide spectrum of other fields, such as artificial intelligence, biomedical engineering, programming, signal processing, CAD design, electronics, engineering mechanics, power systems, network and telecommunications theory, among others.

The studies at the Dept. of Electrical Engineering and Computer Science unfold in an Undergraduate Program of ten (10) semesters leading to a Diploma of Engineering (with clear and full professional rights) and recognition of the 5-year course of study as a postgraduate degree institutionally recognized as equivalent to the Integrated Master of Engineering degrees of foreign universities.

Spyder | Matlab/Simulink | LabVIEW | DEV C++ | AutoCAD | Coppelia (V-REP) | Eagle | Arduino IDE | Origin | Code Composer studio | Soldering | LaTeX

September 2019 – March 2018

Master Thesis, Dept. of Electrical Engineering and Computer Science, University of Patras, Greece

Identification of Parkinson's and Essential tremor and investigation of its suppression via use of robotic exoskeletal glove

My Thesis was conducted in cooperation with Asst. Prof. Georgios (George) Andrikopoulos from KTH Royal Institute of Technology, Sweden and Prof. Nikolaos Koussoulas from Electrical and Computer Engineering Department, University of Patras. The Thesis focused on the assembly and development of a pneumatically actuated soft wearable device consisting of 3D designed components and sensors to investigate the potential of Essential and Parkinson's tremor suppression. As additional target, the Thesis involved the attempt to effectively identifying the two tremor conditions by utilizing machine learning techniques and the design and development of a signal acquisition device. In particular, my Master Thesis involved the following :

- Experimentation with Pneumatic Artificial Muscles (PAMs) and the evaluation of their operation for tremor suppression.
- Development of control strategies aiming to tremor repression.
- Data and signal processing and filtering.
- Design and construction of an easily adjustable signal acquisition device for tremor recognition.
- Collection of arm tremor data from Parkinson's and Essential tremor patients and controls with the use of accelerometers, force and vision sensors.
- Training and testing of machine learning algorithms towards Parkinson's and Essential tremor identification based on real patient data, leading to promising results.
- 3D design and printing of plastic components for the device assembly, later tested during experimental tasks.
- Experimental evaluation of constructed setups in patients with diagnosed tremor.
- Creation of a publicly available Arm Tremor Database

Furthermore, the Thesis involved the firm collaboration with Assoc. Prof. Panagiotis Polychronopoulos and Resident Zinovia Kefalopoulou, Neurologists from Department of Medicine, University of Patras who handed me the opportunity to meet with a wide range of patients and practice my communication skills. Additionally, I was able to cope with complex issues and make critical decisions.

LabVIEW | Matlab/Simulink | FESTO pneumatic artificial muscles | Solidworks | Ultimaker Cura | Makerbot | Arduino IDE | Soldering | LaTeX

June 2014 – September 2011

Secondary Education Degree, 1^{st} High School of Volos, Greece

Focused on the field of Mathematics, Physics, Circuit Design and Biochemistry. Graduated with honours and a grade of 18.7/20.0. In 2014, I participated at the National University Entrance Exams which I succeeded with a GPA of 18.374/20.000.

Professional Experience

Present – November 2019

Research Engineer, Computational BioMedicine Laboratory, ICS FORTH, Greece

Head of the Lab : Marias Kostas, Ph.D., Associate Professor of Medical Image Processing, Dept. of Electrical & Computer Engineering, Hellenic Mediterranean University

Group leader : Manolis Tsiknakis, Ph.D., Professor of Biomedical Informatics and eHealth, Department of Electrical and Computer Engineering, Hellenic Mediterranean University , Affiliated Researcher

- Developed two GUIs which were tested and evaluated by over 100 participants during experimental trials.
- Developed and evaluated ML methods towards the differential diagnosis of early stages of Parkinson's disease based on gait characteristics.
- Developed an algorithm for synchronous computation of over 50 eye related features.
- Implementation of novel ML and AI approaches for estimating various levels of emotional arousal and valence as well as cognitive processes.
- Leader in the development and successful execution of three experimental trials, one of them in a fully-functional hospital during working hours. Applied participant selection criteria based on gender equality awareness.
- Designed and printed adjustable 3D components with proven high performance during experimental trials.
- Converted AutoCAD drawings and hand sketches into SolidWorks 3D models, later used by employees for several experimental purposes.
- Developed eye-tracking and Parkinson's disease related databases, currently available to the research community.
- Collaborated with clinicians and with over 130 patients and handled efficiently problems during pressure.
- Skilled in assembling and testing of wearable solutions.
- Published work in high impact factor academic journals and recognized conferences.
- Experienced in writing project deliverables, technical reports and experimental protocols.
- Weekly communication and collaboration with project partners across Europe.

Matlab/Simulink | Spyder | Keras | Tensorflow | Solidworks | Ultimaker Cura | LulzBot | Sensing | Soldering | LaTeX

October 2021 – September 2021

Visiting Research Engineer, KTH Royal Institute of Technology, Sweden

Research visit under the supervision of Asst. Professor Georgios (George) Andrikopoulos at the Mechatronics and Embedded Control Systems Unit of KTH Royal Institute of Technology in Stockholm, Sweden. During the visit I focused on the development and testing of a Parkinson's symptoms monitoring device. The goal of this task was the continuation of the data collection and processing efforts, initiated during my Master Thesis, for developing an early tremor diagnosis system and for further populating the open Arm Tremor Database. Specifically, during my research visit I undertook successfully the following tasks :

- Designed and developed an IMU based MoCap system, optimally outperforming commercial solutions.
- Tested numerous off-the-shelf microprocessors with respect to their performance, connectivity and dimensions.
- Evaluated methods for optimally reducing the energy consumption of the MoCap device.
- Designed and 3D printed a protective case for the MoCap device with attention to detail.
- Thorough editing of printing settings in Cura and 3D printer to serve the printing requirements of small pieces.
- Developed and modified existing algorithms for efficient wireless data acquisition (WiFi, BLE, Bluetooth).
- Practiced my communication skills and teamwork abilities with members of the Unit.

Spyder | LabVIEW | Solidworks | Ultimaker Cura | Creality Ender 3 | Soldering | Arduino IDE

Research Projects Participation

CARDIOCARE
2022-

Official website

Objective
The EU-funded CARDIOCARE project will focus on the elderly breast cancer population and through a holistic approach including eHealth applications, wearable sensors and biomarkers will provide the ability to patients to take part in their care process and enhance their physical and mental health, contributing to an individualised care plan and a psychological adaptation to their disease. CARDIOCARE will enable effective risk stratification mitigating cardiotoxicity and adverse events, minimising hospitalisation and enhancing QoL.

Involvement
Integration of wearables and mobile health application data for monitoring patients' response as well as the effect of behavioural and psychological interventions on intrinsic capacity and QoL are explored to assess the interplay between streaming data from sensors and the other data sources with respect to different clinically relevant endpoints. DL approaches are employed on raw sensor data for extracting important features to be used in t for the early diagnosis and management of cardiotoxicity and declines in QoL. The proposed architectures include 1-Dimensional Convolutional NNs (1D CNN) with fused sensor data, multi-sensor multi-path 1-D CNN, specialized architectures for longitudinal data analysis such as Recurrent Neural Networks (RNN) or Long-Short Term Memory (LSTM) Networks and unsupervised Auto-Encoders (AE). Furthermore, data augmentation techniques will be utilized to synthetically enhance the training set providing greater convergence and generalization. Transfer learning approaches will also be examined following proper data curation.

Spyder | Keras | Tensorflow | PyTorch | LaTeX

See Far
2019-

Official website

Objective
See Far smart glasses are being developed adapting the environment to the needs of the user by capturing the condition of the eye, detecting the problem and provide the appropriate adjustment through the integration of augmented reality technologies. See Far smart glasses empower older adults to solve the most meaningful problems, transform how they design, build, maintain and collaborate in their organization, perceive the world conveniently and enjoy a safer exploration in an indoor/outdoor environment. The project consists of two components, the See Far smart glasses and the See Far mobile application.

Involvement
Development of algorithmic approaches for the identification of emotional and cognitive processes and quantification of their states through eye tracking features. For this task, I had the leading role in designing and conducting experimental trials with over 100 participants, which required extensive literature research, familiarization with commercial eye-tracking equipment, GUI implementation in Python env. and excellent organization and communication skills. Furthermore, using CAD software, I designed and printed components for the smart glasses (experimental frames, sensor caps, chin rest etc.). Both traditional (featured based) machine learning approaches as well as deep learning methods are explored and evaluated with respect to accuracy, sensitivity and specificity in diagnosis and prediction. Among numerous scientific findings, this effort contributed with two publicly available annotated databases constituting of a wide variety of eye-tracking data.

Spyder | Tkinter | Keras | Tensorflow | Solidworks | Ultimaker Cura | LaTeX

Smart Insole
2020-

Official website

Objective
The Smart Insole project conducts research in the field of smart wearables in order to create a highly innovative product based on a radically different architecture compared to existing solutions for recording gait-related indications, and innovates both in the product innovation and service innovation market by designing innovative services for specific, large-scale markets (Parkinson's patients - for continuous monitoring of disease progression, and elderly people - focusing on predicting gait-related indications).

Involvement
My primary aspect of work is the identification of patterns among Parkinson's patients of different stages of the disease by analyzing gait characteristics. For this purpose, a plethora of Machine Learning algorithmic approaches have been employed and tested leading to significant to the research community discoveries and the creation of a novel dataset. Additionally, the task involved my cooperation with PDMonitor® and the collaboration with clinical neurologists specialized in Parkinson's disease and the construction and execution of an experimental protocol for gait data acquisition. Knowledge of wearable devices operation and functionality, teamwork abilities and communication skills were highly required for the procedure. Finally, I assist in the design and development of 3D printed testing equipment for the insoles as well as the smart insole assembly itself by testing various sensors.

Matlab/Simulink | Spyder | Keras | Tensorflow | Solidworks | Ultimaker Cura | Sensing | Soldering | LaTeX

Skills

Programming	Python, Matlab/Simulink, LabVIEW, C/C++
AI Frameworks	Tensorflow, Keras, Pytorch
Automatic Control Theory	Adaptive, Optimal, Stochastic, Intelligent, Fuzzy control systems
CAD design	Solidworks, Autodesk Fusion 360, AutoCAD
3D printing	Ultimaker Cura, Makerbot, Creality Ender 3, Luzlbot
Robot simulation	Coppelia (V-REP), Simscape
Engineering mechanics	Statics, Dynamics, Strength of Materials
Academic writing	Research proposals, research articles, progress reports, technical reports, deliverables, presentations
Tools	LaTeX, Office, Linux, Git, Google Colab
Soft skills	Teamwork and Collaboration, Problem-solving skills, Written and Verbal Communication, Attention to Detail, Time Management, Critical Thinking, Gender equality awareness

Languages

Greek	●●●●●
English	●●●●●
German	●●●○○
French	●○○○○
Spanish	●○○○○

Journal Publications

J1 **Skaramagkas, V.**, Pentari, A., Kefalopoulou, Z., and Tsiknakis, M. (2023). Multi-modal deep learning diagnosis of parkinson's disease—A systematic review. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, Accepted for publication. https://doi.org/10.1109/TNSRE.2023.3277749

J2 **Skaramagkas, V.**, Ktistakis, E., Manousos, D., Kazantzaki, E., Tachos, N. S., Tripoliti, E., Fotiadis, D. I., and Tsiknakis, M. (2023). Esee-d : Emotional state estimation based on eye-tracking dataset. *Brain Sciences, 13*(4), 589. https://doi.org/10.3390/brainsci13040589

J3 Tsakanikas, V., Ntanis, A., Rigas, G., Androutsos, C., Boucharas, D., Tachos, N., **Skaramagkas, V.**, Chatzaki, C., Kefalopoulou, Z., Tsiknakis, M., and Fotiadis, D. (2023). Evaluating Gait Impairment in Parkinson's Disease from Instrumented Insole and IMU Sensor Data. *Sensors, 23*(8), 3902. https://doi.org/10.3390/s23083902

J4 **Skaramagkas, V.**, Pentari, A., Fotiadis, D., and Tsiknakis, M. (2023). Multi-modal Deep Learning Diagnosis of Parkinson's Disease—A Systematic Review. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*. Pending revision.

J5 Chatzaki, C., **Skaramagkas, V.**, Kefalopoulou, Z., Tachos, N., Kostikis, N., Kanellos, F., Triantafyllou, E., Chroni, E., Fotiadis, D. I., and Tsiknakis, M. (2022). Can gait features help in differentiating parkinson's disease medication states and severity levels? A machine learning approach. *Sensors, 22*(24), 9937. https://doi.org/10.3390/s22249937

J6 Ktistakis, E., **Skaramagkas, V.**, Manousos, D., Tachos, N. S., Tripoliti, E., Fotiadis, D. I., and Tsiknakis, M. (2022). COLET : A dataset for COgnitive workLoad estimation based on eye-tracking. *Computer Methods and Programs in Biomedicine, 224,* 106989. https://doi.org/10.1016/j.cmpb.2022.106989

J7 Chatzaki, C., **Skaramagkas, V.**, Tachos, N., Christodoulakis, G., Maniadi, E., Kefalopoulou, Z., Fotiadis, D. I., and Tsiknakis, M. (2021). The smart-insole dataset : Gait analysis using wearable sensors with a focus on elderly and parkinson's patients. *Sensors, 21*(8), 2821. https://doi.org/10.3390/s21082821

J8 **Skaramagkas, V.**, Giannakakis, G., Ktistakis, E., Manousos, D., Karatzanis, I., Tachos, N. S., Tripoliti, E., Marias, K., Fotiadis, D. I., and Tsiknakis, M. (2021). Review of eye tracking metrics involved in emotional and cognitive processes. *IEEE Reviews in Biomedical Engineering, 16,* 260–277. https://doi.org/10.1109/RBME.2021.3066072

J9 **Skaramagkas, V.**, Andrikopoulos, G., Kefalopoulou, Z., and Polychronopoulos, P. (2021). A study on the essential and parkinson's arm tremor classification. *Signals, 2*(2), 201–224. https://doi.org/10.3390/signals2020016

J10 **Skaramagkas, V.**, Andrikopoulos, G., and Manesis, S. (2021). Towards essential hand tremor suppression via pneumatic artificial muscles. *Actuators, 10*(9), 206. https://doi.org/10.3390/act10090206

Conference Publications (Peer-reviewed)

C1 **Skaramagkas, V.**, Pentari, A., Fotiadis, D., & Tsiknakis, M. (2023). *Using the recurrence plots as indicators for the recognition of Parkinson's disease through phonemes assessment.* 45th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC), Sydney, Australia. Accepted for publication.

C2 Boucharas, D. G., Androutsos, C., Tachos, N. S., Tripoliti, E. E., Manousos, D., **Skaramagkas, V.**, Ktistakis, E., Marias, K., Tsiknakis, M., & Fotiadis, D. I. (2022). *AI methods for personalized suggestions on smart glasses based on human activity recognition.* 2022 IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI), 01–04. https://doi.org/10.1109/BHI56158.2022.9926869

C3 **Skaramagkas, V.**, Ktistakis, E., Manousos, D., Tachos, N. S., Kazantzaki, E., Tripoliti, E. E., Fotiadis, D. I., & Tsiknakis, M. (2021). *A machine learning approach to predict emotional arousal and valence from gaze extracted features.* 2021 IEEE 21st International Conference on Bioinformatics and Bioengineering (BIBE), 1–5. https://doi.org/10.1109/BIBE52308.2021.9635346

C4 **Skaramagkas, V.**, Ktistakis, E., Manousos, D., Tachos, N. S., Kazantzaki, E., Tripoliti, E. E., Fotiadis, D. I., & Tsiknakis, M. (2021). *Cognitive workload level estimation based on eye tracking : A machine learning approach.* 2021 IEEE 21st International Conference on Bioinformatics and Bioengineering (BIBE), 1–5. https://doi.org/10.1109/BIBE52308.2021.9635166

C5 Boucharas, D., Androutsos, C., Tachos, N. S., Tripolitit, E. E., Manousos, D., **Skaramagkas, V.**, Ktistakis, E., Tsiknakis, M., & Fotiadis, D. I. (2021). *Exploring Artificial Intelligence methods for recognizing human activities in real time by exploiting inertial sensors.* 2021 IEEE 21st International Conference on Bioinformatics and Bioengineering (BIBE), 1–4. https://doi.org/10.1109/BIBE52308.2021.9635486

C6 Tsakanikas, V. D., Dimopoulos, D. G., Tachos, N. S., Chatzaki, C., **Skaramagkas, V.**, Christodoulakis, G., Tsiknakis, M., & Fotiadis, D. I. (2021). *Gait and balance patterns related to Free-Walking and TUG tests in Parkinson's Disease based on plantar pressure data.* 2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC), 236–239. https://doi.org/10.1109/EMBC46164.2021.9629637

C7 **Skaramagkas, V.**, Andrikopoulos, G., Kefalopoulou, Z., & Polychronopoulos, P. (2020). *Towards differential diagnosis of essential and parkinson's tremor via machine learning.* 2020 28th Mediterranean Conference on Control and Automation (MED), 782–787. https://doi.org/10.1109/MED48518.2020.9182922

C8 **Skaramagkas, V.**, Andrikopoulos, G., & Manesis, S. (2020). *An experimental investigation of essential hand tremor suppression via a soft exoskeletal glove.* 2020 European Control Conference (ECC), 889–894. https://doi.org/10.23919/ECC51009.2020.9143932

Conference Abstracts

A1 Kefalopoulou, Z., Chatzaki , C., **Skaramagkas, V.**, Chroni , E., Tachos, N., Fotiadis, D., & Tsiknakis, M. (2022). *Pressure Sensor Insole Gait Assessment for Parkinson's Disease patients : A pilot study.* Mov Disord, 37. https://www.mdsabstracts.org/abstract/pressure-sensor-insole-gait-assessment-for-parkinsons-disease-patients-a-pilot-study/.

Reviewer Assignments

IEEE	Journal of Biomedical and Health Informatics
MDPI	Sensors
MDPI	Biomedical Informatics
IEEE	BIBE2021
IEEE	EMBC2021
IEEE	EMBC2023
IEEE	Transactions on Affective Computing
Taylor & Francis	International Journal of Human–Computer Interaction

Teaching and Mentoring

June 2023 – March 2023 | **Advanced Topics in Biomedical Informatics, ECE, HMU**

- Deeper knowledge in the area of biomedical informatics/engineering.
- Conduction of independent literature review and critical analysis of the current state of the art.
- Definition of a clear research question, design and conduct of a preliminary study, both in the form of a literature study and a limited scope research project.
- Selecting and implementing concrete solutions to selected problems/questions in biomedical informatics/engineering.
- Analysis of the results of the study and evaluation of the potential of the specific solutions implemented.

Python | Matlab | LaTeX

February 2023
September 2022

Biomedical Technology, ECE, HMU

- Basic principles of biological systems functions
- Basic categories of biomedical technology and their specific characteristics, such as bio-electrics and biomechanics
- Development of efficient technologies based on biology.
- Design and implementation of integrated systems using sensors and biosensors of different types.
- Design and implementation of wireless body area networks (WBAN) or body sensor networks (BSN).

Matlab

Certifications and Licences

2022 **Certified SOLIDWORKS Associate (CSWA) in Mechanical Design, ID : C-SXEUAZBG5T**

The CSWA certification is proof of SOLIDWORKS® expertise with cutting-edge skills featuring :

- 3D modeling,
- design concepts and
- sustainable design

2022 **Autodesk CAD/CAM/CAE for Mechanical Engineering Specialization, ID : A94KMLPCSPX4**

I have successfully completed the Coursera specialization offered by Autodesk® that introduced me to the foundations of applying computer aided design (CAD), computer aided engineering (CAE), and manufacturing principles while developing my technical skills within Autodesk Fusion 360. This specialization comprises of the following courses :

- Introduction to Mechanical Engineering Design and Manufacturing with Fusion 360.
- Modeling and Design for Mechanical Engineers with Autodesk Fusion 360.
- Simulation Analysis for Mechanical Engineers with Autodesk Fusion 360.
- CAM and Design Manufacturing for Mechanical Engineers with Autodesk Fusion 360.

2022 **Simscape Onramp License**

Interactive tutorial that certifies my ability to develop control systems and test system-level performance by text-based authoring of physical modeling components, domains, and libraries.

2022 **Simulink Onramp License**

Interactive tutorial that certifies my ability to create, modify, and troubleshoot Simulink models that simulate dynamic systems and perform basic signal analysis.

2022 **Control Design Onramp with Simulink License**

Interactive tutorial that certifies my knowledge of the basics of feedback control design in Simulink.

2022 **Matlab Onramp License**

Interactive tutorial that certifies my knowledge of the basics of Matlab programming.

Seminars

2022 **Deep Learning for Medical Imaging**

Summer school intended for medical imaging beginners and experts (students, post-docs, research professionals, and professors) on the fundamentals of deep learning and how it translates to medical imaging.

2017 **Aeroworks : Autumn School on Aerial Robotics**

Seminar which introduced me to high tech knowledge topics concerning aerial manipulation, vision for aerial manipulation, cooperative aerial coverage, modeling and control of UAVs, estimation and sensor fusion for UAVs and aerial reconstruction and inspection.

2016 **Shaping the University of "Tomorrow"**

Seminar with distinguished speakers on the opportunities for engineers in the labour market and the necessary configurations of the educational institutions structures.