# Christos Tzagkarakis

*Curriculum Vitae*

✆ *+30 6949522747*
✉ *ctzagkarakis@gmail.com*
🖥 *www.linkedin.com/in/ctzag/*

## Summary

I am a research scientist specializing in Machine Learning, Signal Processing, and Data Analysis, with a solid foundation in Computer Science and Applied Mathematics. My work encompasses innovative applications of AI, signal processing, and data-driven technologies, tackling complex challenges across diverse domains. I am dedicated to staying at the cutting edge of technological and scientific advancements, using state-of-the-art methods to address real-world problems. Throughout my career, I have consistently demonstrated the ability to design and implement advanced algorithms that lead to breakthroughs in machine learning, signal processing, and data-driven technologies. My contributions are published in top-tier conferences, journals, and patents. I thrive in interdisciplinary team settings, delivering impactful solutions across academic, industrial, and startup environments.

## Experience

**10/2024–Present**   **Senior Signal Processing & AI Engineer**, *BreezeLabs, Switzerland*.

In this role, I design and develop advanced algorithms to analyze breathing patterns in athletes, focusing on optimizing running performance. By applying AI and signal processing techniques, I transform data from earbud microphones into actionable insights that enhance athletic performance. My work focuses on breathing signal analysis, utilizing deep learning models to improve system accuracy and efficiency.

***Key Responsibilities***:
- Develop cutting-edge algorithms for analyzing breathing patterns in athletes, with an emphasis on optimizing running performance.
- Leverage AI and signal processing techniques to convert earbud microphone data into actionable insights that drive performance optimization.
- Conduct research and development in breathing rate estimation by developing audio embedding solutions and exploring transformer-based deep learning models.
- Utilize Keras, TensorFlow, and PyTorch for deep learning model development, while applying signal processing techniques for audio feature extraction and analysis.

**7/2024–Present**   **AI Quant**, *Thira LLC*.

As an AI Quant, I contribute to the development of advanced statistical and AI models for time-series analysis, generating real-time insights to support financial decision-making. I design algorithms to process complex financial data while ensuring scalability and performance in production systems.

***Key Responsibilities***:
- Develop machine learning solutions for financial applications within a dynamic start-up environment.
- Design and implement real-time, data-driven models that support decision-making in the financial sector.
- Create, train, and evaluate trading algorithms, integrating them into production systems.
- Utilize Python, Keras, TensorFlow, and other relevant tools to develop, test, and deploy scalable machine learning models and quantitative statistical techniques.

**5/2023–07/2024**   **Career Break**.

During this period, I took a planned career break to focus on personal growth and development, ensuring I returned to the workforce re-energized and ready to contribute to impactful projects.

**9/2022–04/2023**   **AI Data Scientist (Contractor)**, *Oculus Technologies LLC, U.A.E.*.

Developed machine learning and deep learning models to analyze social media trends and enhance network traffic analysis, delivering data-driven solutions for real-world business challenges.

***Key Contributions***:
- Designed and implemented machine learning algorithms to monitor and detect significant events on Twitter, improving trend analysis and user engagement.

- Developed models to identify users by analyzing network traffic, enhancing platform security and user profiling.
- Proposed and deployed deep learning-based classification models for mobile identification, optimizing network traffic analysis.

**5/2021–09/2022**    **Applied AI Research Scientist (Contractor)**, *Focal Point sprl, Belgium*.

As an Applied AI Research Scientist, I led the development of innovative machine learning and AI models to improve cybersecurity risk assessment. I advanced the company's research initiatives, translating cutting-edge AI techniques into practical solutions aimed at mitigating security threats within healthcare IT infrastructures.

***Key Contributions***:
- Designed and implemented advanced machine learning algorithms and AI-driven models to assess threats and vulnerabilities in the healthcare sector, bolstering cybersecurity measures and enabling real-time, data-driven risk management strategies.

**2/2018–8/2022**    **Research Associate**, *Foundation for Research & Technology - Hellas, Greece*.

As a Research Associate, I contributed to several high-impact projects, including SEMIoTICS, CyberSANE, AI4HEALTHSEC, and MARVEL. These projects focused on IoT security, cybersecurity for critical infrastructures, AI solutions for healthcare security, and multi-modal data analytics for smart cities. My role involved developing novel algorithms, applying machine learning techniques, and delivering impactful results across diverse domains.

***Key Contributions***:
- Developed innovative attack detection methods for IoT networks using lightweight sparse representation techniques.
- Conducted research in sound processing and classification by leveraging dictionary learning methodologies.
- Applied Large Language Models and machine learning techniques to enhance predictive analytics in healthcare data.
- Designed explainable machine learning models for bot detection on social media platforms such as Twitter.
- Led research in time series forecasting for IoT environments, utilizing low-footprint methods to optimize performance.
- Collaborated with industrial and academic partners to drive successful project outcomes.
- Delivered scientific publications, technical reports, and presentations to meet project milestones.
- Produced technical work using Python, Keras, TensorFlow, SQL, GitHub, LaTeX, and MS Office tools.
- Supervised bachelor and doctoral students, providing guidance and support for their research projects.

**9/2015–8/2017**    **Post-doctoral Researcher**, *Delft University of Technology, The Netherlands*.

In this role, I contributed to high-profile research projects, collaborating with Google Inc. and Huawei Technologies. My work focused on acoustic source localization, separation, and distributed audio systems, driving innovation and delivering impactful results reflected in scientific publications, patents, and enterprise reports.

***Key Contributions***:
- Led the research and development of Google Inc.'s project on acoustic source localization, designing and evaluating compressive sensing algorithms for wideband acoustic source localization and separation.
- Collaborated with Google Inc. and TU Delft partners to achieve project milestones, culminating in an invited lecture at the Chrome/YouTube research conference at Google Inc.'s HQ in Mountain View and contributing to a Google patent.
- Participated in the development of Huawei Technologies' project on distributed audio signal processing, implementing a room geometry estimation algorithm based on graph theory.
- Delivered comprehensive project reports and developed a demo for room geometry estimation, which was successfully presented at Huawei's research center in Munich to secure further project funding.

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| 7/2010–5/2014 | **Research Assistant**, *Foundation for Research & Technology - Hellas, Greece*. |

As a Research Assistant, I collaborated on cutting-edge projects funded by the Greek General Secretariat for Research and Technology, where I played a key role in creating and implementing algorithms aimed at optimizing sensor systems and improving communication technologies.

***Key Contributions***:

- Developed signal processing algorithms as part of the DISFER project on distributed sensor systems for emergency response.
- Invented sparse signal modeling algorithms applied to speech processing, enhancing signal analysis and recognition accuracy.
- Implemented and optimized algorithms for stream processing systems in high-demand applications, contributing to EU-MESH networks.
- Created and advanced multi-channel audio encoding and transmission algorithms, improving communication efficiency.
- Utilized Matlab, LaTeX, PHP, HTML, C, and C++ to deliver technical solutions and support research objectives.

## Education

**PhD degree**   Department of Computer Science, University of Crete, GPA: 9.33/10

Thesis: "Sparse and low-rank techniques for robust speaker recognition and missing-feature reconstruction". Supervisor: Assoc. Prof. Athanasios Mouchtaris.

**BSc degree**   Department of Mathematics, University of Crete, GPA: 7.33/10

**MSc degree**   Department of Computer Science, University of Crete, GPA: 9.71/10

Thesis: "Multichannel audio modeling and coding for immersive audio based on the sinusoidal model". Supervisor: Prof. Panagiotis Tsakalides.

**BSc degree**   Department of Computer Science, University of Crete, GPA: 8.00/10

Diploma Thesis: "Musical genre classification using statistical processing methods".

## Skills & Expertise

**Programming Languages**.

- Python, Matlab, C, C++, SQL, HTML, PHP

**Deep Learning Frameworks**.

- Tensorflow, Keras, Pytorch

**Machine Learning & Data Science Tools**.

- Scikit-learn, Pandas, NumPy, SciPy, Matplotlib, Seaborn

**Tools & Development**.

- Git, LaTeX, RESTful APIs Design, MS Office, Jupyter Notebooks

**Miscellaneous/Other Skills**.

- Adobe Software, Linux, Windows, MacOS

**Statistical & Signal Processing Techniques**.

- Signal Processing, Time Series Analysis, Anomaly Detection, Estimation Theory, Sparse Representation, Predictive Analytics, Statistical Signal Processing

**Organizational & Social Skills**.

- Organizational Skills: Experienced in hierarchical structures and team management, with a focus on project coordination and delivery within multidisciplinary teams.
- Social Skills: Quick integration into diverse teams, fostering collaboration across cultural and personality differences, and demonstrating excellent communication skills with both technical and non-technical stakeholders.

## Distinctions

- First in class (with highest GPA): Master's programme, Department of Computer Science.
- Fifth in class (with highest GPA): Bachelor's programme, Department of Computer Science.

## Teaching

**Teaching Assistant**, *Department of Computer Science, University of Crete.*
- Prepared teaching material for lectures and discussion sessions.
- Corrected and evaluated exams/homeworks for the following courses: Calculus I, Pattern Recognition, Applied Mathematics for Engineers, Digital Audio Processing, Applied Stochastic Processes, Statistical Signal Processing, Multimedia Technologies, Introduction to Probability Theory

**Teaching Assistant**, *Hellenic Mediterranean University.*
- Coordinated and prepared teaching material for lab/hands-on sessions.
- Managed the following courses: Introduction to Informatics I – Department of Social Work, Introduction to Informatics II – Department of Social Work, Speech and Audio Processing – Department of Applied Informatics & Multimedia

## Grants & Scholarships

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| *PhD Scholarship* | Foundation for Research & Technology - Hellas, Institute of Computer Science (7/2010–5/2014) |
| *MSc Scholarship* | Foundation for Research & Technology - Hellas, Institute of Computer Science (7/2005–9/2007) |
| *BSc Scholarship* | Foundation for Research & Technology - Hellas, Institute of Computer Science (7/2003–9/2003, 7/2004–6/2005) |

## Patents

W. B. Kleijn, J. Skoglund and C. Tzagkarakis, "Joint Wideband Source Localization and Acquisition Based on a Grid-Shift Approach", US Patent, US 2020/0120419 A1, April 16, 2020.

## Spoken Languages

Fluent in English

Native in Greek

## Activities & Interests

frame drum percussionist, hiking, photography

## Invited Reviewer

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| Reviewer | IEEE Transactions on Audio, Speech and Language Processing |
| | Journal of Electrical and Computer Engineering (EURASIP) |
| | European Signal Processing Conference (EUSIPCO) |
| | IEEE International Workshop on Multimedia Signal Processing |
| | IEEE Symposium on Computers and Communications (ISCC) |
| | International Conference on Digital Signal Processing (DSP) |
| | International Conference on Information, Intelligence, Systems and Applications (IISA) |
| | World Congress on Information and Communication Technologies (WICT) |
| | International World Wide Web Conference (WWW) |
| | USENIX Security Symposium |
| | International Conference on Applied Cryptography and Network Security (ACNS) |
| Poster Evaluation Committee | womENcourage 2017 (4th ACM-W Europe Celebration of Women in Computing, Barcelona, Spain, September 2017) |
| | womENcourage 2016 (3rd ACM-W Europe Celebration of Women in Computing, Linz, Austria, September 2016) |

## Publication Record

- 25+ publications in refereed international conferences and journals
- H-index 10, 429 citations (as of November 2025)
- Conferences: ICASSP, EUSIPCO, ICWSM (AAAI sponsored), BIBE, WASPAA, GIoTS, SPARS
- Journals: IEEE TASLP, MDPI IJMS, MDPI Sensors, Elsevier SI
- Over 20 co-authors

## Invited Talks, Workshops, Seminars

Invited Talk — IBM Research, Zurich, "IoT challenges: Sparsity at the rescue", February 2021.

Invited Talk — Chrome/Youtube Research Conference, Mountain View, CA, August 2016.

Poster Presentation — Spring School on Sparse Representations and Compressed Sensing, Ilmenau, Germany, April 2016.

Poster Presentation — Google's 1st European Doctoral Workshop on Speech Technology, London, UK, April 2014.

Attendance — IEEE Winter School on Speech and Audio Processing for Immersive Environments and Future Interfaces, FORTH, Heraklion, Crete, Greece, January 2012.

## Scientific & Research Publications

Personal Google Scholar profile: `https://tinyurl.com/yctm8gaw`

### Book Chapters

1. A. Mouchtaris, C. Tzagkarakis and P. Tsakalides,, "Low Bitrate Coding of Spot Audio Signals for Interactive and Immersive Audio Applications", *New Directions in Intelligent Interactive Multimedia*, ISBN: 978-3-540-68126-7, Springer, 2008.

### Peer-reviewed Journals

2. S. Silvestri, S. Islam, S. Papastergiou, C. Tzagkarakis, M. Ciampi, "A Machine Learning Approach for the NLP-Based Analysis of Cyber Threats and Vulnerabilities of the Healthcare Ecosystem", *MDPI Sensors (Special Issue Intelligent Systems for Clinical Care and Remote Patient Monitoring)*, Vol. 23 (2), Jan. 2023.

3. V. Danilatou, S. Nikolakakis, D. Antonakaki, C. Tzagkarakis, D. Mavroidis, T. Kostoulas, S. Ioannidis, "Outcome Prediction in Critically-Ill Patients with Venous Thromboembolism and/or Cancer Using Machine Learning Algorithms: External Validation and Comparison with Scoring Systems", *MDPI International Journal of Molecular Sciences (Special Issue Artificial Intelligence in Biomarker Discovery)*, Vol. 23 (13), Jun. 2022.

4. A. Shevtsov, C. Tzagkarakis, D. Antonakaki and S. Ioannidis, "Explainable Machine Learning Pipeline for Twitter Bot Detection During the 2020 US Presidential Elections", *Elsevier Software Impacts*, Vol. 13 (100333), Jun. 2022.

5. A. Griffin, T. Hirvonen, C. Tzagkarakis, A. Mouchtaris and P. Tsakalides, "Single-channel and Multi-channel Sinusoidal Audio Coding Using Compressed Sensing", *IEEE Transactions on Audio, Speech and Language Proccesing*, Vol. 19 (5), pp. 1382-1395, Jul. 2011.

6. C. Tzagkarakis, A. Mouchtaris and P. Tsakalides, "A Multichannel Sinusoidal Model Applied to Spot Microphone Signals for Immersive Audio", *IEEE Transactions on Audio, Speech and Language Proccesing*, Vol. 17 (8), pp. 1483-1497, Nov. 2009.

### Peer-reviewed Conference Proceedings

7. C. Tzagkarakis, T. Palpanas and G. Tzagkarakis, "Efficient Pattern-Based Analysis of Network Flows in IoT Systems", *Digital Technologies for Future Cities Special Session, Proc. of International Balkan Conference on Communications and Networking (BalkanCom '25), Piraeus, Greece*, 17 Jul.–20 Jul., 2025.

7. C. Tzagkarakis, P. Charalampidis, S. Roubakis, A. Fragkiadakis and S. Ioannidis, "Evaluating Short-Term Forecasting of Multiple Time Series in IoT Environments", *in Edge-Fog-Cloud Machine Learning for Smart Cities Applications Special Session, Proc. of European Signal Processing Conference (EUSIPCO '22), Belgrade, Serbia*, 29 Aug.–2 Sep., 2022.

8. A. Shevtsov, C. Tzagkarakis, D. Antonakaki and S. Ioannidis, "Identification of Twitter Bots Based on an Explainable Machine Learning Framework: The US 2020 Elections Case Study", *in Proc. of International AAAI Conference on Web and Social Media (ICWSM) 2022.*

9. V. Danilatou, D. Mavroidis, D. Antonakaki, A. Kanterakis, C. Tzagkarakis, T. Kostoulas and S. Ioannidis, "Big-data and Machine Learning Prediction of Early and Late Mortality in ICU Patients with Venous Thromboembolism and Comparison with Classic Scoring Systems", *in 2021 International Society on Thrombosis and Haemostasis Congress (ISTH), Philadelphia, PA*, Jul. 2021.

10. V. Danilatou, D. Antonakaki, C. Tzagkarakis, A. Kanterakis, V. Katos and T. Kostoulas, "Automated Mortality Prediction in Critically-ill Patients with Thrombosis using Machine Learning", *in 2020 IEEE 20th International Conference on Bioinformatics and Bioengineering (BIBE), Cincinnati, OH*, Oct. 2020.

11. C. Tzagkarakis, N. Stefanakis and G. Tzagkarakis, "Impact Sounds Classification for Interactive Applications via Discriminative Dictionary Learning", *in European Signal Processing Conference (EUSIPCO '19), A Coruña, Spain*, Sep. 2–6, 2019.

12. C. Tzagkarakis, N. Petroulakis and S. Ioannidis, "Botnet Attack Detection at the IoT Edge Based on Sparse Representation", *in Global Internet of Things Summit (GIoTS) '19), Aarhus, Denmark*, Jun. 17–21, 2019.

13. G. Hatzivasilis, N. Christodoulakis, C. Tzagkarakis, S. Ioannidis, K. Fysarakis, G. Demetriou and M. Panayiotou, "The CE-IoT Framework for Green ICT Organizations", *in $1^{st}$ International Workshop on Smart Circular Economy (SmaCE) '19, Greece*, May 30, 2019.

14. C. Tzagkarakis, W. B. Kleijn and J. Skoglund, "Joint Wideband Source Localization and Acquisition Based on a Grid-Shift Approach", *in Proc. of Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA '17), New Paltz, NY*, Oct. 15–18, 2017.

15. C. Tzagkarakis, S. Becker and A. Mouchtaris, "Joint Low-Rank Representation and Matrix Completion Under a Singular Value Thresholding Framework", *in Proc. of European Signal Processing Conference (EUSIPCO '14), Lisbon, Portugal*, Sep. 1–5, 2014.

16. C. Tzagkarakis and A. Mouchtaris, "Reconstruction of Missing Features Based on a Low-Rank Assumption for Robust Speaker Identification", **invited paper** *in Proc. of International Conference on Information, Intelligence, Systems and Applications (IISA 2014), Chania, Greece*, Jul. 7–9, 2014.

17. C. Tzagkarakis and A. Mouchtaris, "Sparsity Based Robust Speaker Identification Using a Discriminative Dictionary Learning Approach", *in Proc. of European Signal Processing Conference (EUSIPCO '13), Marrakech, Morocco*, Sep. 9–13, 2013.

18. C. Tzagkarakis and A. Mouchtaris, "Robust Speaker Identification Using Matrix Completion Under a Missing Data Imputation Framework", *in Proc. Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS '13), Lausanne, Switzerland*, Jul. 8–11, 2013.

19. C. Tzagkarakis and A. Mouchtaris, "Robust Text-Independent Speaker Identification Using Short Test and Training Sessions", *in Proc. of European Signal Processing Conference (EUSIPCO '10), Aalborg, Denmark*, Aug. 23–27, 2010.

20. A. Griffin, C. Tzagkarakis, T. Hirvonen, A. Mouchtaris and P. Tsakalides, "Exploiting the Sparsity of the Sinusoidal Model Using Compressed Sensing for Audio Coding", *in Proc. Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS '09)*, Saint-Malo, France, Apr. 6–9, 2009.

21. C. Tzagkarakis, A. Mouchtaris and P. Tsakalides, "Modeling and Coding of Spot Microphone Signals for Immersive Audio Based on the Sinusoidal Model", *in Proc. of European Signal Processing Conference (EUSIPCO '08), Lausanne, Switzerland*, Aug. 25–29, 2008.

22. C. Tzagkarakis, A. Mouchtaris and P. Tsakalides, "Low Bitrate Coding of Spot Audio Signals for Interactive and Immersive Audio Applications", *in Proc. International Symposium on Intelligent Interactive Multimedia Systems and Services, Piraeus, Greece*, Jul. 9–11, 2008.

23. C. Tzagkarakis, A. Mouchtaris and P. Tsakalides, "Modeling Spot Microphone Signals Using the Sinusoidal Plus Noise Approach", *in Proc. of Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA '07), New Paltz, NY*, Oct. 21–24, 2007.

24. C. Tzagkarakis, A. Mouchtaris and P. Tsakalides, "Sinusoidal Modeling of Spot Microphone Signals Based on Noise Transplantation for Multichannel Audio Coding", *in Proc. of European Signal Processing Conference (EUSIPCO '07), Poznan, Poland*, Sep. 3–7, 2007.

25. C. Tzagkarakis, A. Mouchtaris and P. Tsakalides, "Musical Genre Classification via Generalized Gaussian and Alpha-Stable Modeling", *in Proc. of International Conference on Acoustics, Speech, and Signal Processing (ICASSP '06), Toulouse, France*, May 14–19, 2006.