Costas Smaragdakis

Assistant Professor, University of the Aegean

https://kesmarag.github.io

1 Personal Information

- Born: August 15, 1982 in Heraklion Crete, Greece.
- Marital Status: Married (Irene Kasotaki) with 2 Children (Renos b.2012, Emmy b.2016).
- Languages: Greek and English.
- Military Obligations: Fulfilled.

2 Research Interests

Computational Mathematics, Mathematical Modelling, Numerical Analysis, Deep Learning.

3 Affiliations

(Since 2024): Assistant Professor, Department of Statistics and Actuarial–Financial Mathematics, School of Sciences, University of the Aegean.

(Since 2024): Member of IDEAL Lab, DSAFM and DFME, University of the Aegean.

(Since 2022) Member of FEMO Lab, School of Applied Mathematical and Physical Sciences, National Technical University of Athens (NTUA).

4 Education

(2005) **BSc in Applied Mathematics**, Department of Applied Mathematics, University of Crete.

(2008) **MSc in Mathematical Modeling and Scientific Computing**, Departments of Mathematics and Applied Mathematics, University of Crete. (Supervisor : Michael Taroudakis)

(2019) **PhD in Applied Mathematics**, Department of Mathematics and Applied Mathematics, University of Crete. (Supervisor : Michael Taroudakis)

- PhD thesis : Acoustic Signal Characterization using Hidden Markov Models with applications in Acoustical Oceanography.

5 Past Employments

(12) 2022/03-2023/12: Postdoctoral Researcher, (HFRI/ELIDEK), School of Applied Mathematical and Physical Sciences, National Technical University of Athens (NTUA).

(11) 2021/05-2022/02: Postdoctoral Researcher (TURNKEY - HORIZON), Institute of Geodynamics, National Observatory of Athens.

(10) 2020/02-2023/09: Adjunct Faculty, Department of Mathematics and Applied Mathematics, University of Crete.

(9) 2020/01-2020/03: Postdoctoral Researcher (KRHPIS/POLITEIA - General Secretariat for Research and Technology), IACM/FORTH.

(8) 2019/08-2019/11: Postdoctoral Researcher (KRHPIS/PERAN - General Secretariat for Research and Technology), IACM/FORTH.

(7) 2018/08-2019/07: Research Fellow (KRHPIS/PERAN - General Secretariat for Research and Technology), IACM/FORTH.

(6) 2017/04-2018/04: Research Fellow (ARCHERS - Stavros Niarchos Foundation), IACM/FORTH.

(5) 2016/01-2016/10: Research Fellow (SIEMENS - General Secretariat for Research and Technology), IACM/-FORTH.

(4) 2013/09-2015/08: Research Fellow (KRHPIS/PEFYKA - General Secretariat for Research and Technology), IACM/FORTH.

(3) 2010/08-2015/06: Tutor for high-school students in a tuition center in Heraklion, Crete (Themelio).

(2) 2006-2008 and 2012-2019: Teaching Assistant at Department of Mathematics and Applied Mathematics.

(1) 2003/02-2003/06: Work Placement, Sensitivity Kernels of the Green function in Ocean Acoustic Waveguides, IACM/FORTH (Supervisor : Emmanuel Skarsoulis).

6 Publications

6.1 Preprints / Submitted for Publication

(2) G. Akrivis, C. G. Makridakis, C. Smaragdakis: **Runge-Kutta Physics Informed Neural Networks: Formulation and Analysis.** Preprint and submitted for publication, 2024. [arXiv:2412.20575]

(1) E.H. Georgoulis, A. Papapantoleon, C. Smaragdakis: **A deep implicit-explicit minimizing movement method for option pricing in jump-diffusion models.** Preprint and submitted for publication, 2024. [arXiv:2401.06740]

6.2 Under Preparation

(2) Papadakis N, Taroudakis M., Dimari G, Smaragdakis C.: **A Fresh Frame of Reference on the Greek Migration Policy: Using a Pilot Prediction Model for Migration Flows to Generate Evidence-Based Policy Scenarios.**

(1) Smaragdakis C. and Melis N.: **Near-Field Ground Motion Simulations.**

6.3 Published

(10) Smaragdakis, C., Taroudaki, V., Taroudakis, M.I.: **Using Machine Learning Techniques in Inverse Problems of Acoustical Oceanography.** Stud Appl Math. 2024.;153:e12704

(9) Papadakis N, Taroudakis M., Dimari G, Smaragdakis C. and Kosmadakis N.: **The Absence of a Rationalized Migration Data Policy in Greece and the Discontinuity of Greek Migration Policy: A Glance at the First Results of the PreMiGro Project.** HAPSc Policy Briefs Series, 4(2), 45–5, 2024.

(8) Taroudaki V., Smaragdakis C. and Taroudakis M.I.: **Deblurring Acoustic Signals for Optimum Perception.** Advances in Social Sciences Research Journal, 9(11), 221–242, 2022.

(7) Smaragdakis C., Mastrokalos J. and Taroudakis M.I.: **Statistical Characterization of Seismic Signals.** Journal of Theoretical and Computational Acoustics. DOI: 10.1142/S25917285225000-49, 2022

(6) Smaragdakis C. and Taroudakis M.I.: **Acoustic signal characterization based on Hidden Markov Models with applications to geoacoustic inversions.** Journal of the Acoustical Society of America Vol. 148, pp 2337-2350, 2020

(5) Smaragdakis C. and Taroudakis M.I.: **Probabilistic Characterisation of Acoustic and Seismic Signals.** ERCIM News 122, Special Theme: Solving Engineering Problems with Machine Learning, pp. 35-36, 2020.

(4) Taroudakis M., Smaragdakis C and Chapman N.R.: **De-noising procedures for inverting underwater acoustic signals in applications of acoustical oceanography.** J. Comp. Acous. Vol. 25, pp. 1750015-1-23, 2017

(3) Taroudakis M.I., Smaragdakis C. and Chapman, N.R.: **Inversion of acoustical data from the 'Shallow Water 06' experiment, using a statistical method for signal characterization.** Journal of the Acoustical Society of America Vol. 136, pp. EL336-EL342, 2014

(2) Taroudakis M.I. and Smaragdakis C.: **Inversions of statistical parameters of an acoustic signal in range-dependent environments with applications in ocean acoustic tomography.** Journal of the Acoustical Society of America Vol. 134, pp 2814-2822, 2013

(1) Taroudakis M.I. and Smaragdakis C.: **Tomographic and Bottom Geoacoustic Inversions Using Genetic Algorithms and a Statistical Characterization of the Acoustic Signal.** Acta Acustica united with Acustica Vol 95, No 5, pp 814-822, 2009

7 Conference Talks/Proceedings and Workshops

(26) **(invitation only event)** Smaragdakis C.: **A deep implicit-explicit minimizing movement method for option pricing in Levy models.** 24w5257 - Modeling, Learning and Understanding: Modern Challenges between Financial Mathematics, Financial Technology and Financial Economics, Banff, Alberta, Canada, 10-15 November, 2024.

(25) **(Organizer of the minisymposium entitled Machine Learning Methods in Finance)** Smaragdakis C.: **A deep implicit-explicit minimizing movement method for option pricing in jump-diffusion models.** International Conference on Computational Finance, Amsterdam, 2-5 April 2024.

(24) **(Member of the scientific committee)** Smaragdakis C.: **Characterization of the migration dynamics in Greece using hidden Markov models.** Migration, Migration Flows Prediction Models and Migration Policy: trends, socio-political challenges and policy scenarios, International (online) workshop, 8 April 2024.

(23) Dimari G., Papadakis N., Smaragdakis C., Taroudakis M.: **Migration Flows Prediction Models and their Impact on the 'Politicalness' of Everyday Lives in Host States: the PreMiGro case.** ECPR General Conference, Charles University, 4-8 September 2023, Prague.

(22) Smaragdakis C., Papapantoleon A., Georgoulis E.: **A Splitting Deep Ritz Method for Option Pricing in Lévy Models.** Workshop: Stochastic Methods in Finance and Physics, 17-21 July 2023, Heraklion.

(21) Smaragdakis C., Papapantoleon A., Georgoulis E.: **A Splitting Deep Ritz Method for Option Pricing in Lévy Models.** SIAM Conference on Financial Mathematics and Engineering 2023, 6-9 June, Philadelphia, USA.

(20) Smaragdakis C., Maris I., Taroudakis M.: **Identification of normal modes in underwater acoustic propagation using convolutional neural networks.** in Proceedings of 11th Acoustic Conference of HELINA, Thessaloniki (In Greek), 2022.

(19) Smaragdakis C., Melis N.: **Strong ground motion simulation in the near field: An application to the M7.0 Samos 2020 earthquake.**, 37th General Assembly of the European Seismological Commission, 19 - 24 Semtember 2020, virtual.

(18) Sambataro O., Smaragdakis C. and Taroudakis M.: **A comparison of processing techniques applied to time-frequency representation of acoustic signals intended for geoacoustic inversions.** in Proceedings e-Forum Acusticum 2020, pp 1769-1775.

(17) Smaragdakis C., Taroudakis M.: **Acoustic Signal Characterization using Hidden Markov Models with applications in Acoustical Oceanography.** Abstract in Proceedings ICA 2019 and EAA Euroregio, 9 - 13 September 2019, Aachen, Germany, pp 5399

(16) Smaragdakis C., Mastrokalos J. and Taroudakis M.: **Classification of acoustic and seismic signals based on the statistics of their wavelet sub-band coefficients.** The Journal of the Acoustical Society of America 144(3):1914-1914 DOI: 10.1121/1.5068386, 2018.

(15) Taroudaki V., Taroudakis M. and Smaragdakis C.: **Statistical optimal filtering method for acoustical signal deblurring.** The Journal of the Acoustical Society of America 144(3):1689-1689 DOI: 10.1121/1.5067509, 2018.

(14) Smaragdakis C., Taroudakis M.: **Similarity measurements of acoustical and seismic signals using Hidden Markov Models.** In Proceedings of 9th Acoustic Conference of HELINA, Patras (In Greek), 2018.

(13) Smaragdakis C. and Taroudakis M.: **A probabilistic approach based on Hidden Markov Models for the estimation of the geoacoustic parameters of the sea bottom** 4th Underwater Acoustics Conference and Exhibition, Skiathos, Greece, 2017.

(12) Taroudaki V., Smaragdakis C. and Taroudakis M.: **Statistical Near-Optimal Filtering Method with Application to Underwater Acoustics.** Abstract of Paper Procedings in AMS Meetings, Vol 38 No 1, Issue 187, p 220, 2017.

(11) Taroudaki V., Smaragdakis C. and Taroudakis M.: **Deblurring acoustic signals for statistical characterization in application of ocean acoustic tomography.** in the Journal of the Acoustical Society of America 140(4):3135-3135, 2016.

(10) Taroudakis M. and Smaragdakis C.: **Ocean acoustic tomography using a three-phased probabilistic model-based inversion scheme.** in Proceedings of the ICA 2016, Buenos Aires.

(9) Smaragdakis C. and Taroudakis M.: **Hidden Markov Models feature extraction for inverting underwater acoustic signals using wavelet packet coefficients.** EuroRegio2016, Porto, Portugal.

(8) Smaragdakis C., Taroudakis M.: **Ocean acoustic tomography using a three-phased probabilistic model-based inversion scheme.** In Proceedings of the 8th Acoustic Conference of HELINA, Piraeus (In Greek), 2016.

(7) Taroudakis M. and Smaragdakis C.: **De-noising procedures for inverting underwater acoustic signals in applications of acoustical oceanography.** in Proceedings of EuroNoise 2015 31 May - 3 June, Maastricht.

(6) Taroudakis M. and Smaragdakis C.: **A hybrid approach for ocean acoustic tomography in range dependent environments based on statistical characterization of the acoustic signal and the identification of modal arrivals** in Proceedings of FORUM ACUSTICUM 2014 (CD edition), Krakow, Poland, 2014.

(5) Smaragdakis C and Taroudakis M.: **Characterization of underwater acoustic signals, using a biomathematical model of the psycho-acoustic mechanisms of Humpback whales.** in Proceedings of 7th Acoustic Conference of HELINA, Thessaloniki (In Greek), 2014.

(4) Taroudakis M. and Smaragdakis C.: **A hybrid approach for ocean acoustic tomography based on statistical characterization of the acoustic signal and the identification of modal arrivals.** in Proceedings of the 2nd Underwater Acoustics Conference edited by J.S. Papadakis and L. Bjorno, Rhodes, Greece, pp 691-698, 2014.

(3) Taroudakis M. and Smaragdakis C.: **Inversions of Statistical Parameters of an Acoustic Signal in Range-Dependent Environments, with Applications in Ocean Acoustic Tomography.** in Proceedings of the 11th European Conference on Underwater Acoustics, Edinburgh, pp 962-969, 2012.

(2) Papadakis P., Smaragdakis C., Taroudakis M. and Tolstoy A.: **Hybrid inversion techniques for geoacoustic inversion.** in Proceedings of the 9th European Conference on Underwater Acoustics, Istanbul, 2010.

(1) Taroudakis M. and Smaragdakis C.: **Underwater Acoustic Signal Characterization in the presence of Noise.**, in Internoise 2010, CD Rom edition, Lisbon.

8 Invited Lectures / Talks / Summer-Schools

(5) 11/09/2024 - 21th Summer Meeting in Risk, Finance and Stochastics, Athens – RFS-2024: **Deep learning methods for option pricing in jump-diffusion models.**

(4) 19-23/06/2023 - 5th Summer School in Mathematics of Machine and Statistical Learning, National Technical University of Athens: **Hands-On Training: Learning the Black-Scholes price formula.**

(3) 03/03/2023 - National Technical University of Athens (workshop - New Challenges in Financial Mathematics and Mathematical Economics) : **A splitting deep Ritz method for option pricing in Lévy models.**

(2) 08/12/2021 - FORTH : **Classification of Acoustic and Seismic Signals.**

(1) 28/04/2021 - Eastern Washington University (USA) : **Characterization of Time-Series using Hidden Markov Models.**

9 Teaching

9.1 University of the Aegean

(1) Calculus II, (2) Differential Equations, (3) Financial Mathematics I, (4) Numerical Analysis (2 times).

9.2 University of Crete

(1) Analytical Geometry and Complex Numbers, (2) Applied Statistics, (3) Descriptive Statistics (4 times), (4) Parametric Statistics, (5) Partial Differential Equations, (6) Topics in Probability oand Statistics – Mathematical Finance, (7) Wave Propagation – Mathematical Seismology.

10 Supervision

10.1 University of the Aegean

(1) Sofia Vlami, PhD candidate (to be started).

10.2 University of Crete

(1) Olga Sambataro, role:Assistant mentor, Erasmus+ EQF level 7 (2019).

(2) Pantelis Sfakianakis, Diploma thesis (2020) Applying Machine Learning Techniques for Preventive Maintenance of Professional Equipment.

(3) Stelios Grammatikakis, Diploma thesis (2022) Statistical Analysis of Seismicity in Arkalochori.

(4) Vassiliki Kalogera, Diploma thesis (2022) Machine Learning and Geographic Information Systems.

(5) Dionysia Petropoulou, Diploma thesis (2022) Music genre classification using machine learning techniques.

(6) Alvertos Poponidis, Diploma thesis (to be started).

11 Short–Term Visits

(3) 2023/09/03-2023/09/12: Institute of Applied Mathematics, TU Delft (invited by Prof Antonis Papapantoleon)

(2) 2023/05/24-2023/06/01: Applied Mathematics and Computational Science, KAUST (invited by Prof Raul Tempone)

(1) 2022/12/11-2022/12/18: Institute of Applied Mathematics, TU Delft (invited by Prof Antonis Papapantoleon)

12 Technical Skills

12.1 Programming Languages

(1) C, (2) C++, (3) EMACS Lisp, (4) Python, (5) Rust

12.2 Operating Systems

(1) GNU/Linux (Fedora, RHEL, Gentoo)

12.3 Computer Codes

(1) GrMot (Strong Ground Motion Library) – link

(2) hmm-gmm-tf2 (Hidden Markov Model Library) – link

(3) stationary-wavelet-packet-transform (Library) – link

(4) Smaller projects in my public repository – link