Manolis Christoforou

Machine Learning Engineer with academic background and industry experience in designing, developing, and deploying ML solutions. Involved in research and open-source projects.
Passionate about leveraging AI to tackle real-world challenges and create impactful, scalable solutions.

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Links: Website | LinkedIn | Google Scholar | ResearchGate | GitHub

Work Experience

Jan 2024 – Present
Senior Machine Learning Engineer, Team Leader at *Optasia*

Dec 2022 – Dec 2023
Machine Learning Engineer at *Optasia*
Develop and deploy advanced algorithms, build ML flows, design, and develop statistical and machine learning algorithms and operationalize them in credit risk management.

Jul 2021 – Nov 2022
Machine Learning Solutions Engineer at *TAZI AI*
Designed and developed ML models for R&D projects. Worked on Anomaly Detection with Explainable AI for MRI device condition monitoring, and on Continual Learning benchmarking.

Jun 2018 – Mar 2019
Software & Machine Learning Engineer at *Pythagoras Systems*
Designed and developed rating and ranking systems for daily cryptocurrency evaluation (Blockchain, Technical & Twitter Sentiment Analysis) with neural networks and user defined weighted functions. Results were daily distributed to website.

Sept 2017 – Feb 2018
Software Engineer at *Inria*
Development and distribution of the algebraic-geometric modeling software AXL (`http://axl.inria.fr/`), within the AROMATH team of the Sophia Antipolis - Méditerranée research center.

Nov 2015 – Jan 2016
Software Engineer at *Helic*
Modified and integrated existing SaaS platform to a cloud infrastructure as part of a European project for CloudFlow.

Open Source Projects

2018 – Present
pycoingecko: *Python wrapper for the CoinGecko API*
Developed and maintain a Python wrapper around the CoinGecko API. Client is distributed through GitHub (MIT licence) and a PyPi package.
GitHub stats: 1k+ stars / 250+ forks / 15 contributors / Used by 4k+ repos

Education

2018 - Present
PhD student researching Approximate geometric algorithms for search and clustering supervised by Prof. Ioannis Z. Emiris
University of Athens, Athens, Greece

2018
Master of Science in Bioinformatics
University of Athens, Athens, Greece

2015
Undergraduate Degree in Computer Science
Athens University of Economics and Business, Athens, Greece

Skills

Programming Languages:	Python, SQL, C++, Java, Matlab, R, C, C#, LaTeX
Operating Systems:	Unix, Linux, Windows
Tools, Platforms, Frameworks:	PyTorch, TensorFlow, scikit-learn, MLflow, PySpark, Airflow, PyCharm, Git

Languages

Greek:	Mothertongue
English:	Advanced (C1)
German:	Zertificat (B1)

Research Projects

Apr 2020 – Jun 2021
PeGASUS - Approximate geometric algorithms and clustering with applications in finance
Institution: "Athena" Research and Innovation Center
Scientific Coordinator: Ioannis Emiris (NKUA)
Worked on clustering of bivariate probability distributions (copulas) in order to identify different financial states (normal, crisis & intermediate).

Dec 2019 – Apr 2020
INSPIRED - The National Research Infrastructures on Integrated Structural Biology, Drug Screening Efforts & Drug target functional characterization
Institution: National and Kapodistrian University of Athens (NKUA)
Scientific Coordinator: Constantinos Vorgias (NKUA)
Worked on the implementation of clustering and representation methods for proteins and protein trajectories in Python using several distance metrics.

Dec 2018 – Feb 2019
Human Brain Project SGA2
Institution: Biomedical Research Foundation, Academy of Athens (BRFAA)
Scientific Coordinator: Zoe Cournia (BRFAA)
Worked on clustering of long molecular dynamics simulations using Markov state models and approximate clustering techniques, such as the inverted-quantized k-means (IQ-means), to produce coarse-grained representations of the simulations.

Dec 2017 – Apr 2018
Learning and Analysing Massive / Big complex Data (LAMBDA)
Institution: National and Kapodistrian University of Athens (NKUA)
Scientific Coordinator: Ioannis Emiris (NKUA)
Visited GIE AXA (Paris, France) to work on a pipeline for driving behavior assessment, using clustering techniques on road segments represented as curves, taking into account both shape similarity and contextual criteria. Accident data and drivers' trajectories are used to learn the driving behavior per cluster and detect abnormalities.

Publications

[1] Chalkis, A., Christoforou, E., Dalamagas, T., and Emiris, I. Z. Modeling of crisis periods in stock markets. In *Learning and Intelligent Optimization* (Cham, 2021), D. E. Simos, P. M. Pardalos, and I. S. Kotsireas, Eds., Springer International Publishing, pp. 55–65.

[2] Chalkis, A., Christoforou, E., Emiris, I., and Dalamagas, T. Modeling asset allocations and a new portfolio performance score. *Digital Finance* (09 2021), 1–39.

[3] Christoforou, E., Blom, K., Gao, Q., Börü, M., and Cataltepe, T. Mri condition monitoring with explainable ai and feature selection. In *2022 30th Signal Processing and Communications Applications Conference (SIU)* (2022), pp. 1–4.

[4] Christoforou, E., Emiris, I., Florakis, A., Rizou, D., and Zaharia, S. Spatio-temporal deep learning

for day-ahead wind speed forecasting relying on wrf predictions. *Energy Systems* (09 2021), 1–21.

[5] Christoforou, E., Emiris, I. Z., and Florakis, A. Neural networks for cryptocurrency evaluation and price fluctuation forecasting. In *Mathematical Research for Blockchain Economy* (Cham, 2020), P. Pardalos, I. Kotsireas, Y. Guo, and W. Knottenbelt, Eds., Springer International Publishing, pp. 133–149.

[6] Christoforou, E., Leontiadou, H., Noé, F., Samios, J., Emiris, I. Z., and Cournia, Z. Investigating the bioactive conformation of angiotensin ii using markov state modeling revisited with web-scale clustering. *Journal of Chemical Theory and Computation 18*, 9 (2022), 5636–5648.

[7] Christoforou, E., Mantzaflaris, A., Mourrain, B., and Wintz, J. Axl, a geometric modeler for semi-algebraic shapes. In *Mathematical Software – ICMS 2018* (Cham, 2018), J. H. Davenport, M. Kauers, G. Labahn, and J. Urban, Eds., Springer International Publishing, pp. 128–136.

Conference Presentations

- "MRI Condition Monitoring with Explainable AI and Feature Selection", Christoforou, E., Blom, K., Gao, Q., Börü, M., and Cataltepe, T.
  Signal Processing and Communications Applications Conference (SIU), Safranbolu (Turkey), 15-18 May 2022
- "Neural Networks for Cryptocurrency Evaluation and Price Fluctuation Forecasting", Christoforou, E., Emiris, I. and Florakis, A.
  International Conference on Mathematical Research for Blockchain Economy (MARBLE), Santorini (Greece), 6-9 May 2019
- "Axl, a geometric modeler for semi-algebraic shapes", Christoforou, E., Mantzaflaris, A., Mourrain, B., and Wintz, J.
  International Congress of Mathematical Software (ICMS), South Bend (USA) Notre Dame, 24-27 July 2018

Posters

- "Advanced clustering methods for identifying bioactive molecular conformations", Christoforou, E., Cournia, Z., and Emiris, I.
  BioExcel 2nd SIG Meeting: "Advanced Simulations for Biomolecular Research" @ ECCB 2018, Athens (Greece), 8 September 2018. PDF

Workshops

- Unsupervised Feature Learning on 3D Point Clouds. In LAMBDA's Workshop on Retrieval and Shape analysis (Thursday 14 May 2020), NKUA, Athens, Greece. link | PDF
- Clustering of one-dimensional objects. In LAMBDA's Workshop on Un/Semi-supervised learning and Data Mining (14-15 October 2019), AXA, Paris, France. link | PDF

Scholarships

2016 **MSc Scholarship** for the student that has successfully completed all the courses of the 1st and 2nd semester, having a grade point average higher than 8.50 and the highest among the other classmates. The scholarship award also carries an exemption from tuition fees for the third semester of study.

Selected Projects

PhD

- Approximate geometric algorithms and clustering with applications in finance
- Unsupervised Feature Learning on 3D Point Clouds
- Capacitated Vehicle Routing Problem with Time Windows for fuel distribution in Greek market using Google's OR-Tools
- Time-series forecasting using Neural Networks (cryptocurrencies & wind speed/power)

MSc

- Machine learning classifiers to evaluate the coding potential of expressed transcripts
- Investigating transcription factor binding sites with NGS data

BSc

- Implementation of *Reversi* and *Connect Four* games with Minimax algorithm in Java
- Speech Recognition system for cinema (infos, buying tickets etc.) in C#

Postgraduate Thesis

Advanced clustering methods for identifying bioactive molecular conformations
Supervised by: Professor Ioannis Z. Emiris

Investigated the free energy landscape of Angiotensin II in order to unravel its bioactive conformations, using multiple trajectories that were analysed with clustering techniques and Markov State modeling. The efficiency of an inverted-quantized k-means algorithm (IQ-means) on data from trajectories of MD simulations was validated, as a fast approximate clustering technique with reasonable trade-offs between time and accuracy. Also, a metadata representation, where each conformation is converted into a single 3D point was validated and Markov State Models were extracted using various clustering techniques for the generation of microstates (k-means, IQ-means), macrostates (PCCA, BACE) and for the selection of the macrostate representatives (GROMOS).

This work has been published in the 2019 annual volume "Selected Graduate and Diploma Theses" of the Dept. of Informatics and Telecommunications of the National and Kapodistrian University of Athens, which includes summaries of the best graduate and undergraduate theses in the Department (http://di.uoa.gr/en/highlights/thessis).
http://di.uoa.gr/sites/default/files/documents/Studbook_2019.pdf#page=77 (pp. 75-89)

Undergraduate Thesis

Simplifying Mixture Models using Variational Expectation Maximization
Supervised by: Professor M. K. Titsias

Concerns an efficient algorithm for reducing a large mixture model into a smaller mixture model by applying a principled variational EM algorithm that minimizes the KL divergence between the large mixture model and the smaller one.
It was tested as an image retrieval system on CIFAR-10, a dataset of 60000 images (32x32 color images in 10 classes), and compared to k-Nearest Neighbor (k=1).

Co-Supervised Theses

2021 Efthymia C. Malesiou. BSc Thesis, supervisor: Prof. Ioannis Z. Emiris
Title: **Analysis of monthly payment delays using machine learning**

2020 Dimitrios A. Gangas. BSc Thesis, supervisor: Prof. Ioannis Z. Emiris
Title: **Deep Learning for cryptocurrency assets: Employing series forecasting models for price prediction and uncertainty quantification**

Nikos G. Koutsovasilis. BSc Thesis, supervisor: Prof. Ioannis Z. Emiris
Title: **Vehicle routing optimization**

Dimitrios K. Gounaris. BSc Thesis, supervisor: Prof. Ioannis Z. Emiris
Title: **Wind speed forecasting using past data**

2019 Charalambos E. Tzamos. BSc Thesis, supervisor: Prof. Ioannis Z. Emiris
Title: **VentusNet: Deep Learning for Wind Speed prediction**

Alexandros G. Kalimeris. BSc Thesis, supervisor: Prof. Ioannis Z. Emiris
Title: **Deep Learning on Point Clouds for 3D Protein Classification Based on Secondary Structure**

Other Activities

Working experience on small family business (pension).