CV of Dr Milto Miltiadou

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As artificial intelligence continues to advance, leveraging large Earth Observation (EO) datasets holds immense potential for advancing forest-related research. In recent years, there has been a continuous launch of satellites and a subsequent release of EO data, along with the creation of open benchmarking LiDAR databases that provide vast amounts of information about Earth. However, their full potential remains largely untapped. This is due to the need for better pre-processing approaches to clean and harmonise data, user-friendly tools for extracting EO data at thousands of locations that ground truth have been collected, and improved AI methodologies to better understand forests. My research focuses on interpreting large EO datasets and making them accessible to forest ecologists by implementing new processing pipelines, methodologies, and tools, as well as working on various machine learning applications for giving meaning to the data.

Research Experience and Education:

2022- ongoing: **Postdoctoral Research Associate** at *University of Cambridge, United Kingdom*

Open source software for fusing data from thousand of plots with Earth Observation (EO) data and deriving spectral-temporal signatures capturing both the temporal and spectral dimensions.

Produce large scale data driven predictions of forest variables relating to climate change (in progress).

2017- 2022: **Special Scientist – Researcher** at *Cyprus University of Technology, Cyprus*

2020-2022 "ASTARTE", RIF Excellence hubs:

Timeseries SAR Analysis for Finding the Drivers Causing Phenological Changes in Paphos Forest:
Two main annual peaks detected in SAR time-series: (1) the drop in between is associated with the act of pityocampa, (2) summer peak is associated with the regeneration of the new needles
Low Nov temp reduces the act of pityocampa and this may be visible in SAR
Increased temperatures in spring were associated with a delayed summer peak in 2018
Drought year of 2015-16 is associated with the outliers of Feb 2016.

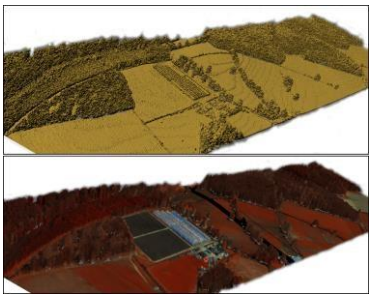
2018-2020 "FOREST", RIF 2nd Opportunity for H2020 Marie Curie Individual Fellowship

Multi-scale 3D windows improved prediction of dead tree detection in full-waveform lidar data as it accounts height differences of native Eucalypt forests.
Co-registration and fusion of LiDAR with satellite data
Accounting occlusions in a forested environment while collecting full-waveform LiDAR showed increased information at lower heights

2017-2018 "SEO-DWARF", H2020 Research Innovation and Staff Exchange, Feb 2017-May 2018:

Introduction of clustering approaches (k-means and mean shift) for improving ocean current front detection and comparison of results with canny edge and Laplacian detection algorithms.

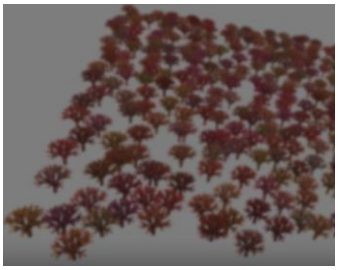
2012-2017: **EngD** in Efficient Accumulation, Analysis and Visualisation of Full-Waveform lidar in a Volumetric Representation with Applications to Forestry - *Industrial Based Doctorate degree that includes an additional year of taught units*



Department of Computer Science, University of Bath, United Kingdom
Remote Sensing Group of Plymouth Marine Laboratory, United Kingdom

Improved prediction of forest canopy by fusing full-waveform lidar data with hyperspectral images in a Gaussian mixture model
Dead trees are important for biodiversity but Eucalypts in Australia are difficult to detect in low resolution point clouds. A non-delineation algorithm was proposed that uses extraction of structural elements to train a classifier and detects dead trees. It was shown that it is possible to detect them without tree delineation.

A comparative study about data structures, including the introduction of a new data structure named integral tree, for efficient management of voxelised full-waveform airborne lidar data during 3D polygonal model creation (see visualisation on the right)
My open-source software DASOS, aiming to make full-waveform LiDAR data more accessible to scientists, was selected for inclusion in the Github 2020 Archive Program: http://miltomiltiadou.blogspot.com.cy/2015/03/las13vis.html



2012: **MSc** Computer Animation and Visual Effects – Distinction (1st)
Media School, Bournemouth University, United Kingdom
Small Projects: Automated tree and forest generator, cloth simulation
Major Project: Classification of 3D motion capture data for fall detection of elder people in their home environment.
Showreel: https://www.youtube.com/watch?v=11ImtFBytZk

2011: **BSc** Computer Science - Second-class, Upper division (2:1) *Department of Computer Science, University of Bristol, United Kingdom*
Individual Project: Geometrical correspondence tools for 3D noisy facial point clouds – 75% (first class mark)
Core Units: Image Processing and Computer Vision (e.g., Machine Learning and Signal processing), Artificial Intelligence, Computer Graphics, Animation Production

Research Funding & Scholarships (total successful funding for projects lead: 400,000EUR):

2019-2022 "ASTARTE" – EXCELLENCE/0918/034 - 250,000euro scored 14.56/15
Title: Analysis of SAR and thermal satellite data time-series for understanding the long-term impact of land surface temperature changes on forests.
Funded *through Cyprus Research Innovation Foundation: Excellence Hubs call*

2018-2020 "FOREST" - OPPORTUNITY/0916/MSCA/0005 - 150,000euro scored 90.04/100
Title: Advancement of tree structure observation algorithms for FOREST monitoring
Funded *through Cyprus Research Innovation Foundation: 2nd Opportunity for MSCA Postdoctoral Fellowship*

2012-2016 EngD (equivalent PhD) **Studentship**: - ~ 100,000gbp highly competitive four-year EngD studentship Funded by the UK Engineering and Physical Sciences Research Council's (EPSRC) through the Centre for Digital Entertainment (CDE), Department of Computer Science, University of Bath, UK. Funding included placement in industry, Remote Sensing Group at the Plymouth Marine Laboratory.

2008-2011 **Scholarship** from the Cyprus State Scholarship Foundation, awarded to students who scored excellent grades on their Lyceum Apolytirion.

2022 "AustrLiDAR" – MSCA Fellowship – 276,135.60euro scored 91.4/100
Title: Developing better algorithms for quantifying the role forests play in regulating terrestrial carbon cycle
Received ***Sealed of Excellence*** *under Horizon Europe*

Teaching Experience:

2023 : **propose and create a 2x2h practical** on Google Earth Engine for AI for Environmental Risks (AI4ER), University of Cambridge

2020-2022: **Co-supervised the PhD** of Mr Christos Theocharidis: Provided PhD subject and funded him for 2 years through the ASTARTE project at Cyprus University of Technology, Cyprus – He received a bursary to present his work at the 8th International Conference on Drylands, Deserts & Desertification in 2022.

2018-2021: **Co-advised the PhD** of Dr Rorai Pereira Martins-Neto at Sao Paulo State University (Unesp), Brazil Dr Rorai Pereira Martins-Neto.
- Tree Species Classification in a Complex Brazilian Tropical Forest Using Hyperspectral and LiDAR Data (paper: https://www.mdpi.com/1999-4907/14/5/945 - **Editor's Choice Article in 2023 Series,** ***Forests***).

- Identification of Significative LiDAR Metrics and Comparison of Machine Learning Approaches for Estimating Stand and Diversity Variables in Heterogeneous Brazilian Atlantic Forest (paper: https://www.mdpi.com/2072-4292/13/13/2444).
- Comparison of data collected at different flight heights for estimating biomass.

Thesis available at: https://repositorio.unesp.br/handle/11449/215634

2021: **Co-supervised MSc** thesis of Dimitris Apostolou at Cyprus University of Technology, Cyprus

2017-ongoing: **Graduate mentor for PhD** students
Providing pastoral guidance and support independently of their principal supervisor

2017-2021: **MSc Lecturing** at Cyprus University of Technology, Cyprus
Annually holding a 3hours lecture with practical specialised on theory of LiDAR, batch scripting and how to process lidar data with my open source software DASOS in command prompt.

2017 - today: **Online Instructor** at GEOUniversity
- Teach online courses about Latex and LiDAR data (practical and theoretical respectively)

Sep 2010 - Jul 2011: **Teaching Assistant** at the Greek Supplementary School, Weston-Super-Mare, UK
- Planning classes and teaching Modern Greek language and Greek culture to children under the guidance of the senior teacher

2009- 2010: **Lab Demonstrator** at University of Bristol, Bristol, United Kingdom
- Helped first year students with their assignments on C programming.

Invited Lectures and Workshops:

2021 "Forestry & Allied Subject Topics: Emerging Trends" FAST organised by Prof Sas Biswas from Dolphin (P.G.) Institute of Biomedical & Natural Science Dehradun (DIBNS) Uttarakhand, India – Invited Speaker and Panellist

2020 Advancement of tree structure observation algorithms for forest monitoring using LiDAR technologies at National Technical University of Athens, Athens, Greece – Invited Speaker

2018 Moderator at ForestSAT conference

2017 Efficient accumulation, analysis and visualisation of full-waveform LiDAR in a volumetric representation with applications to forestry at University of Bari, Bari, Italy – Invited Speaker

2017 Efficient accumulation, analysis and visualisation of full-waveform LiDAR in a volumetric representation with applications to forestry at Planetek Italia, Bari, Italy – Invited Speaker

2016 Exploration and Visualisation of full-waveform LiDAR Data for Forestry Applications at National Institute For Space Research (INPE), San Jose dos Campos, Brazil – Invited Speaker

2016 Full day workshop on full-waveform LiDAR and the open-source software DASOS at Interpine Group Ltd, Rotorua, New Zealand – Invited Speaker / Workshop

Participation in industrial innovation

Carbomap (July 2018 – as part of the "FOREST" project)
- Improving efficiency of DASOS's functionalities.

Planetek Hellas - Athens, Greece and Planetek Italia, Bari, Italy (Apr 2017 - May 2017)
- Seconded as part of the SEO-DWARF project. Task included research implementation of remote sensing algorithms for ocean monitoring (fronts and turbidity), as well as scheduling secondment for the other team member.

Interpine Group Ltd, Rotorua, New Zealand (Jan 2016 - Mar 2016)
- Full-waveform LiDAR Analyst
- Collaborating with the foresters to write a user-friendly user-guide for the open-source software DASOS

NERC Airborne Research Facility, Plymouth Marine Laboratory, United Kingdom (Oct 2012 - Mar 2017 – as an EngD student)

- EngD placements provided me with tailored training, access to data (e.g., lidar) and the chance to work on real-world problems (i.e., after fullwaveform LiDAR being available for a few years and not particularly used, I was challenged to make them more usable by writing my own software and conducting relevant research around the functionalities implemented).

Organisational and Administrative Experience:

2017-2022: Cyprus University of Technology, Cyprus: my role included: project management – time, budget, task allocation, timesheets, planning secondments, communication with partners and funder, paper and proposal writing, organise workshops for university students and the public audience.

2022-ongoing: Volunteer at Robotex Competition. Which is organised annually by Cyprus Computer Society

Aug 2019-2022: Active member of "300,000 trees in Limassol"
- Meet with local municipalities to arrange land for planting trees, participate to educational seminars at schools for public engagement and volunteering at tree planting events

Sept 2019-Sept 2021: Committee member of "Friends of the Earth (Cyprus)" Duties include monitoring the progress of the projects running, define the future directions of the organisation, interviewing new employers

Oct 2013-Jun 2016: Writing Retreat Organizer for CDE (Centre for Digital Entertainment) students , at Stonebarrow Manor, Charmouth, United Kingdom
- Initiated the first writing retreat with a colleague
- Duties includes, but not limited to, interviewing potential speakers, hiring venue, arranging meals, scheduling and preparing entertainment
- Supervise and support the next generation of students to gain the appropriate experience and organise the following years writing retreats

Oct 2013-Sep 2014: Student Representative for the EngD students of CDE, United Kingdom
- Collecting feedback for improving student experience and productively participating at CDE board meetings that define the future of the centre.

Sep 2012 - Apr 2013: Casual Admin Assistant, *University of Bath, United Kingdom.*
- Preparing papers for interviews and welcoming potential students during open days
- High confidentiality is required while accessing UCAS applications of students

Prizes and Awards:

2023 "Editor's Choice Article in 2023 Series, *Forests*
The article I co-supervised "Tree Species Classification in a Complex Brazilian Tropical Forest Using Hyperspectral and LiDAR Data" was selected as Editor's choice

2021 "Most Notable Article" in the category "Engineering Remote Sensing" - *Remote Sensing*
My article "A Comparative Study about Data Structures Used for Efficient Management of Voxelised Full Waveform Airborne LiDAR Data during 3D Polygonal Model Creation" was listed as one of the most Notable articles published in the *Remote Sensing* journal for the period of December 2020-February 2021.

2021 Distinguished manuscript contribution acknowledged by Ladies of Landsat
My name has been included in the Ladies of Landsat Manuscript Monday series, which is a weekly series highlighting cutting-edge research impacting the field of remote sensing (my manuscript is no. 104)
Link: https://github.com/ladiesoflandsat/LOLManuscriptMonday

2020 Artic code Vault Contributor of 2020 Github Archive Program

My open-source software, DASOS, available at the repository https://github.com/Art-n-MathS/DASOS was included in Github 2020 Archive Program (designed to last for more than 1000 years) aiming to preserve open-source software for future generations.

2020 "Audience Favourite Booth Award" at Researcher's Night of Cyprus
Our booth entitled "Forest monitoring using satellite imagery for understanding the effects of climate change", which was presented as part of her project "ASTARTE" (EXCELLENCE/0918/0341) was voted as the best booth by the audience.

2016 Ede and Ravenscroft Academic Prize for Excellence – Finalist: selected as one of the five finalists for this prestigious prize that recognises the work of the best postgraduate researcher at the University of Bath

2015 Student Poster Competition at Silvilaser Conference: promotes researchers at early career by granting them free entrance to the conference.

2012 "Queens Anniversary Prizes": Selected from my course to represent Bournemouth University at the ceremony

2012 "You are Brilliant" award: it was given to student representatives with high involvement at Bournemouth University. Nominated by three classmates.

2011 Bristol Plus Award: awarded by the University of Bristol's Career Service to students who have gained significant professional and life skills through extra-curricular experiences

Interests: Dancing, Theatre Improv

Languages: Greek (native), English (fluent)

List of Publications:

PhD Theses:

- **Extraction of structural variables using LiDAR data combined with hyperspectral images for classification of upper canopy tree species in Brazilian Atlantic Forest - 2021**
  Author: RP Martins Neto,
  Advisors: A. M. G Tommaselli, N. N. Imai, D. Hassan Camil, Miltiadou M.
  Universidade Estadual Paulista (Unesp)
  Link: https://repositorio.unesp.br/handle/11449/215634

- **Efficient accumulation, analysis and visualisation of full-waveform LiDAR in a volumetric representation with applications to forestry – 2017**
  Author: Milto Miltiadou
  Advisors: M. Brown, M. Grant, N DF Campbell, D Cosker
  University of Bath, UK and Plymouth Marine Laboratory, UK
  Link: https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.725395

Journal Papers:

- **Tree Species Classification in Complex Brazilian Tropical Forest Using Hyperspectral and LiDAR Data,** R.P.M. Neto, A.M.G Tommaselli, N.N. Imai, H.C. David, E. Honkavaara, M. Miltiadou, E. A. S. Moriya, H. C. David, *Forests* – 2023 – doi: 10.3390/f14050945
  Contribution: Software development, supervision – suggestions on methodology/validation, review of original draft

- **A Selection of Experiments for Understanding the Strengths of Time Series SAR Data Analysis for Finding the Drivers Causing Phenological Changes in Paphos Forest, Cyprus**, M. Miltiadou, V. Karathanassi, A. Agapiou, C. Theocharidis, P. Kolokousis, C. Danezis *Remote Sensing* – 2022 – doi: 10.3390/rs14153581
  Contribution: Conceptualization, Funding acquisition, Formal analysis, Validation, Writing of original draft

- **Time Series Analysis of Landsat Data for Investigating the Relationship between Land Surface Temperature and Forest Changes in Paphos Forest, Cyprus,** V. Andronis, V. Karathanassi, V. Tsalapati, P. Kolokoussis, M. Miltiadou, C. Danezis *Remote Sensing* – 2022 – doi: 10.3390/rs14041010
  Contribution: Conceptualization, Funding acquisition, Original draft review

- **A Comparative Study about Data Structures Used for Efficient Management of Voxelised Full Waveform Airborne LiDAR Data during 3D Polygonal Model Creation**, M. Miltiadou, N.D.F. Campbell, D. Cosker, M.G. Grant, *Remote Sensing* vol. 13, no. 4, p. 559 – 2021 – doi: 10.3390/rs13040559
  Contribution: Conceptualization, Formal Analysis, Validation, Writing of original draft

- **Do people understand and observe the effects of climate crisis on forests? The case study of Cyprus,** M. Miltiadou, E. Antoniou, C. Theocharidis, C. Danezis, *Forests* – 2021 – doi: 10.3390/f12091152

Contribution: Conceptualization, Funding Acquisition, Formal Analysis, Writing of original draft. We created the questionnaire with Friends of the Earth (Cyprus) and they collected most of responses

- **Identification of Significative LiDAR Metrics and Comparison of Machine Learning Approaches for Estimating Stand and Diversity Variables in Heterogeneous Brazilian Atlantic Forest**, R.P.M. Neto, A.M.G Tommaselli, N.N. Imai, H.C. David, M. Miltiadou, E. Honkavaara, *Remote Sensing*, vol. 13, no. 13, p. 2444 – 2021 – doi: 10.3390/rs13132444
  Contribution: Software development, supervision – suggestions on methodology/validation, review of original draft

- **Detecting Dead Standing Eucalypt Trees from Voxelised Full-Waveform Lidar Using Multi-Scale 3DWindows for Tackling Height and Size Variations,** M. Miltiadou, A, Agapiou, S. Gonzalez Aracil, D.G. Hadjimitsis, Forests, vol. 11, no. 2, p. 161 – 2020 – doi: 10.3390/f11020161
  Contribution: Software Development, Conceptualization, Funding Acquisition, Formal Analysis, Validation, Writing of original draft – The application ideas was provided by Interpine Group Ltd

- **Detection of dead standing eucalypt trees without tree delineation for managing biodiversity in native Australian forest**, M. Miltiadou, N.D.F Campbell, S. Gonzalez Aracil, T. Brown, M. Grant, *ELSEVIER International Journal of Applied Earth Observation and Geoinformation* – 2018 – doi: 10.1016/j.jag.2018.01.008
  Contribution: Software Development, Formal Analysis under supervision, Validation, Writing of original draft – The application ideas was provided by Interpine Group Ltd. The methodology was derived by both myself and my supervisor Matthew Brown (who asked me to not be included in the paper as I published it years after he left Uni of Bath)

Full-size conference papers:

- **AI applications in forest monitoring need remote sensing benchmark datasets.** E. R. Lines, M. Allen, C. Cabo, K. Calders, A. Debus, S. WD Grieve, M. Miltiadou, A. Noach, H. JF Owen, and S. Puliti *IEEE International Conference on Big Data (Big Data)* (2022). doi:10.48550/arXiv.2212.09937
  Contribution: Suggesting benchmark datasets and applications, review of original draft

- **Open source software DASOS: efficient accumulation, analysis, and visualisation of full-waveform lidar**, M. Miltiadou, M.G.Grant, N.D.F. Campbell, M. Warren, D. Clewley, D. G. Hadjimitsis, *SPIE - International Society for Optics and Photonics*, Seventh International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2019), vol. 111741 – 2019 – doi: 10.1117/12.2537915
  Contribution: Conceptualization, Software Development, Formal Analysis under supervision, Writing of first draft

- **Detection of marine fronts: a comparison between different approaches applied on the SST product derived from Sentinel-3 data**, M. Miltiadou, C. Papoutsa, V. Karathanassi, P. Kolokoussis, V. Lafon, D. Sykas, A. Sarelli, M. Prodromou, D. Hadjimitsis, *SPIE Library*, Seventh International Conference on Remote Sensing and Geoinformation of the Environment (RSCy2018), vol. 10773 – 2018 – doi: 10.1117/12.2324126
  Contribution: Conceptualization, Formal analysis, Validation, Writing of original draft

- **Alignment of hyperspectral imagery and full-waveform LiDAR data for visualisation and classification purposes**, M. Miltiadou, M. A. Warren, M. Grant, and M. Brown, *The International*

Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences vol. 40, no. 7, p. 1257 – 2015 – doi:10.5194/isprsarchives-XL-7-W3-1257-2015

Contribution: Conceptualization, Software Development, Formal Analysis under supervision, Validation, Writing of first draft

Other (short papers, extended and indexed abstracts):

- **Fusion of European forest inventories with Sentinel-1 and Sentinel-2 data for improving scalability in estimating forest variables** (No. EGU23-8720), M. Miltiadou, S. Grieve, J.T Triviño, J. Astigarraga, H. Owen, P.R. Benito and E., Lines. – 2023 – Copernicus Meetings doi: 10.5194/egusphere-egu23-8720

  Contribution: Software Development, Formal Analysis, Writing of first draft

- **Understanding phenological changes of coniferous forests in Cyprus using time-series of SAR data from 2015 till 2020,** M. Miltiadou, C. Theocharidis, V. Karathanassi, A. Agapiou, M. Nikolaidis, C. Danezis, *Proceedings of Silvilaser Conference* – 2021 – doi: 10.34726/wim.1962

  Contribution: Conceptualization, Funding acquisition, Formal analysis, Validation, Writing of original draft (data downloaded by Mr Theocharidis)

- **Structural features extracted from voxelised full-waveform LiDAR using the open source software DASOS for detecting dead standing trees.** M. Miltiadou, M. Prodromou, A. Agapiou, D.G. Hadjimitsis, 2020, May. In *EGU General Assembly Conference Abstracts* (p. 10915). – 2020 – doi: 10.5194/egusphere-egu2020-10915

  Contribution: Conceptualization, Funding acquisition, Formal analysis, Validation, Writing of original draft

- **Analysis of radar and thermal satellite data time-series for understanding the long-term impact of land surface temperature changes on forests.** Prodromou, M., Yfantidou, A., Theocharidis, C., Miltiadou, M. and Danezis, C., 2020, May. *In EGU General Assembly Conference Abstracts* (p. 10582). – 2020 – doi: 10.5194/egusphere-egu2020-10582

  Contribution: Conceptualization, Funding acquisition, Formal analysis, Validation, Writing of original draft

- **A comparison between different approaches for detecting fronts using the Sea Surface Temperature product of the Sentinel-3 SLSTR instrument.** Miltiadou, M., Papoutsa, C., Karathanassi, V., Kolokousis, P., Sykas, D., Lafon, V., Prodromou, M. and Hadjimitsis, D., 2018, April. In *EGU General Assembly Conference Abstracts* (p. 3738). – 2018 – Bibcode: 2018EGUGA..20.3738M

  Contribution: Conceptualization, Formal analysis, Validation, Writing of original draft

- **Improving and optimising visualisations of full-waveform LiDAR data**, M. Miltiadou, N.D.F Campbell, M. Brown, D.Cosker, and M. Grant, *Eurographics UK in Computer Graphics and Visual Computing* – 2016 – doi:10.2312/cgvc.20161295

  Contribution: Conceptualization, Formal analysis under supervision, Validation, Writing of original draft

- **Reconstruction of a 3D Polygon Representation from full-waveform LiDAR data.** *RSPSoc conference,* M. Miltiadou, M. Grant, M. Brown, M. Warren, & E. Carolan – 2014.

  Contribution: Conceptualization, Formal analysis under supervision, Validation, Writing of original draft