



Alexandru-Toma Andrei

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WORK EXPERIENCE

Head of the GIS Software and Services Office

ROU Cyber Command [01/04/2024 – Current]

City: Bucharest | Country: Romania

1. Publishing geospatial web services
2. Configuring and deployment of ArcGIS Enterprise
3. Developing geo-oriented WebApps
4. Testing interoperability across NATO members at FMN standard
5. Providing geospatial information and base maps for C2, COP, or FAS software
6. Participating in national and international military-technical exercises such as CWIX

Head of Geospatial Web Services Department

Geospatial Defense Information Agency [01/01/2019 – 01/04/2024]

City: Bucharest | Country: Romania

1. Dissemination of geospatial information through web services such as WMS, WFS, and WMTS.
2. Administration of the institution's geoportal.
3. Implementation of the EU INSPIRE Directive for the datasets in the responsibility of MoD: geo names, DEM, and aerial imagery.
4. Integration of meteorological and oceanographic data into the geospatial data (GeoMetOc).
5. Testing interoperability between NATO members' capabilities, systems, or software such as C2 software, FAS, and NCOP.
6. Participating in national and international military-technical exercises such as CWIX
7. Working with Esri technology and open-source, such as Geoserver and QGIS

IMINT specialist

Military Topographic Directorate [01/12/2017 – 31/12/2018]

City: Bucharest | Country: Romania

1. Downloading and preparing imagery from "hot" areas for vector data collecting.
2. Populating geospatial databases with meaningful intelligence information about military bases, military facilities, road and communication networks, security, fences, military technique, etc.
3. Creating products by editing, clipping, or transforming available data for different gainers.
4. Working with Esri technology, more specific vector-oriented tools.

Photogrammetry specialist

Military Topographic Directorate [01/08/2016 – 01/12/2017]

City: Bucharest | Country: Romania

1. Creating aerial imagery from raw data acquisition.
2. Handling the raw data through processes such as aero triangulation, orthorectification, and radiometric calibration.
3. Converting imagery data in different formats such as tiff, mrsid, jpeg2000, ecw using Erdas Image.
4. Working with Leica Geosystems and inpho Orthovista software.

Erasmus+ Scholarship

Royal Military Academy [12/01/2016 – 27/05/2016]

City: Bruxelles | Country: Romania

I worked on an ESA research project with Septentrio technology. I studied the impact of different jamming techniques on the L1 frequency, specifically, the L1-CA and L1-P(Y) for NAVSTAR-GPS and the L1-A and L1-BC for Galileo. The practical study was handled by analyzing a signal parameter called C/N_0 , which measures the received carrier strength relative to the power of the received noise. The impact was measured by three factors: how much time the signal resisted until dropping, how fast it recovered, and how much the C/N_0 value dropped.

PUBLICATIONS

[2024]

Development of a Very Low-Cost Deforestation Monitoring System Based on Aerial Image Clustering and Compression Techniques Clustering holds significant utility across a spectrum of several domains, including pattern recognition, image analysis, customer analytics, market segmentation, social network analysis, and numerous other areas. The main advantages of image clustering are its degree of freedom regarding data labeling and the lack of training and model deployment, which makes them suitable for the overall study's purpose of land cover segmentation and deforestation monitoring. In previous work, the Gaussian Mixture Model (GMM) technique has been established as the best option. Due to the necessity of implementing the algorithm on light unmanned airborne platforms for fast deforestation monitoring, the high resources and long computation time became an issue. This paper proposes several cost-efficient GMM clustering algorithms based on discrete transforms traditionally used for image compression. The results will show that the proposed methods maintain the clustering output quality while drastically decreasing the computation time and also lowering the memory needed to perform.

Advances in Electrical and Computer Engineering

[2023]

Low-Cost Optimized U-Net Model with GMM Automatic Labeling Used in Forest Semantic Segmentation Currently, Convolutional Neural Networks (CNN) are widely used for processing and analyzing image or video data, and an essential part of state-of-the-art studies rely on training different CNN architectures. They have broad applications, such as image classification, semantic segmentation, or face recognition. Regardless of the application, one of the important factors influencing network performance is the use of a reliable, well-labeled dataset in the training stage. Most of the time, especially if we talk about semantic classification, labeling is time and resource-consuming and must be done manually by a human operator. This article proposes an automatic label generation method based on the Gaussian mixture model (GMM) unsupervised clustering technique. The other main contribution of this paper is the optimization of the hyperparameters of the traditional U-Net model to achieve a balance between high performance and the least complex structure for implementing a low-cost system. The results showed that the proposed method decreased the resources needed, computation time, and model complexity while maintaining accuracy. Our methods have been tested in a deforestation monitoring application by successfully identifying forests in aerial imagery.

[2023]

Mean Shift Clustering with Bandwidth Estimation and Color Extraction Module Used in Forest Segmentation (ATEE)

This study aims to implement a useful mean shift clustering method to identify forest areas on aerial images due to the need to combat and monitor deforestation worldwide. Two challenges have been addressed in the process: estimating the best algorithm bandwidth and friendly representation of the results. Also, a comparison has been done with previously implemented algorithms using the final computed accuracies.

The 13th International Symposium on Advanced Topics in Electrical Engineering

[2023]

Color Extraction Module for Unsupervised Image Classification Representation Even though working with unlabeled data has the main advantages of lower preprocessing time and resources, the drawback is that the algorithms implemented have no connection between the output and ground truth, therefore is extremely hard to represent the results. This paper proposes a deployable stand-alone module for extracting the real color of the identified classes for a more intuitive representation of the final results.

The 13th International Symposium on Advanced Topics in Electrical Engineering (ATEE)

[2022]

Gaussian Mixture Model Application in Deforestation Monitoring Pollution affects our daily routines without our knowing, degrading our health and the environment around us. There is a strong link between pollution and deforestation, one thrives in the presence of the other, and for too much time nothing has been made on this matter. Fortunately, Machine Learning techniques come in handy in identifying and monitoring forests all over the globe. This paper presents the application of the Gaussian Mixture Model in forest segmentation using high-resolution multiband aerial images and analyzes along the way the most suitable conditions and parameters for the implementation.

2022 International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT)

[2022]

Combating Deforestation Using Different AGNES Approaches The forest is called the green lung of the planet. Unfortunately, this sentence is forgotten day by day and various types of pollution do not help on this matter, especially the one that affects it directly - deforestation. To slow down this phenomenon, it can be used technological advancements in recent years in conjunction with machine learning techniques. This paper proposes a method for this matter, by applying an agglomerative clustering algorithm to a set of aerial images and analyzing different methods of metrics and linkage in the process, to monitor deforested areas. The study showed that Ward's method of the AGNES algorithm had the best results, even better than a previous k-means approach implemented on the same dataset.

2022 14th International Conference on Communications (COMM)

[2021]

Unsupervised Machine Learning Algorithms Used in Deforested Areas Monitoring There are many forms of pollution, and the negative human footprint is observed in many areas, including deforestation. Various organizations and environmental activists are trying to combat this increasingly widespread phenomenon. The development of Machine Learning in recent years and the proliferation of satellite imagery sources are suitable viable solutions to this problem. This paper aims to analyze and implement an unsupervised machine-learning algorithm to monitor deforested areas using its own set of aerial images.

2021 International Conference on e-Health and Bioengineering (EHB)

EDUCATION AND TRAINING

Ph.D. scholarship in Electronics, Telecommunication and Information Technology

Politehnica University of Bucharest [01/10/2018 – Current]

Address: Splaiul Independenței nr. 313, Bucharest (Romania) | Website: <https://upb.ro/en/> | Field(s) of study: Information and Communication Technologies: • Software and applications development and analysis
• Computer use | Thesis: Intelligent methods for the identification of terrestrial details based on the analysis of multispectral aerial images

The study implements various unsupervised machine learning algorithms fed with aerial imagery for the purpose of landcover segmentation.

Advanced logistic course for engineers

Military Technical Academy [25/01/2022 – 04/03/2022]

City: Bucharest | Country: Romania | Website: www.mta.ro | Field(s) of study: Business, administration and law: • Management and administration

Geoprocessing using Python scripts - Entry level

Esri Corporation [12/12/2018 – 16/12/2018]

Website: www.esri.com

Image analysis using ArcGIS Desktop

Esri Corporation [07/12/2018 – 11/12/2018]

Website: www.esri.com

IMINT Training - Image Intelligence

SATCEN - EU Satellite Centre [24/09/2018 – 02/10/2018]

Address: 28850 Torrejon de Ardoz. Madrid., | Website: www.satcen.europa.eu/

Using ArcGIS for Geospatial Intelligence

Esri Corporation [07/11/2017 – 22/11/2017]

Website: www.esri.com

Geospatial concepts for Intelligence Operations

Esri Corporation [03/11/2017 – 06/11/2017]

Website: www.esri.com

Master in Geomatics

Technical University of Civil Engineering [01/10/2016 – 01/08/2018]

Address: Bdul. Lacul Tei 122-124, Bucharest (Romania) | Website: <https://utcb.ro/en> | Field(s) of study: Natural sciences, mathematics and statistics: • Mathematics • Statistics • Earth sciences ; Engineering, manufacturing and construction: • Building and civil engineering ; Information and Communication Technologies: • Computer use | Thesis: Realization of the digital orthophoto plane at the resolution of 50 cm

I continued my studies related to geodesy, cartography, coordinate systems, and photogrammetry to strengthen my knowledge.

Bachelor's Degree - Geodesy Engineer

Military Technical Academy [01/10/2012 – 01/08/2016]

Address: George Coșbuc 81-83, Bucharest (Romania) | Website: www.mta.ro | Field(s) of study: Natural sciences, mathematics and statistics: • Mathematics • Statistics • Earth sciences ; Engineering, manufacturing

and construction: • Building and civil engineering ; Information and Communication Technologies: • Computer use | **Thesis:** Analysis of jamming of GNSS signals

I studied courses such as geodesy, photogrammetry, GIS, cartography, programming languages, topography, analysis, and algebra. I also attended military modules in order to become a full-time officer in the Ministry of Defense.

High school Graduate in Mathematics

National Military Highschool "Dimitrie Cantemir" [15/09/2008 – 01/07/2012]

Address: Bdul. Republicii 75, Breaza (Romania) | Website: <http://www.cantemircml.ro/>

I studied a mathematics-oriented curriculum with military modules and a full-time boarding school.

WORKING GROUPS

[24/09/2019 – Current]

GeoMetOc Focus Area

Capability Leader in CWIX (Coalition Warrior Interoperability Exercise) GeoMetOc Focus Area, a group of supporting systems that provides geospatial, climatology, observations, and forecasts information in a coalition operation.

[01/10/2017 – 01/01/2024]

NATO JGSWG

Romania's representative in NATO JGSWG (Joint Geospatial Standardization Working Group), dealing with NATO-level geospatial standards.

[01/01/2017 – Current]

SRFT

Member of the Romanian Photogrammetry and Remote Sensing Society.

[01/09/2018 – 01/04/2024]

CINIS

Member of the Romanian council (CINIS) responsible for the national implementation of the EU INSPIRE Directive and coordinator of the Metadata & Spatial Data Working Group of the Council.

[15/05/2024 – Current]

FMN CIAV WG

Member of the FMN Coalition Interoperability Assurance and Validation Working Group, the authoritative body for interoperability, assurance, verification and validation of all capabilities that are added, removed or modified in the FMN portfolio for all FMN Environments defined in the NATO Federated Implementation Plan.

LANGUAGE SKILLS

Mother tongue(s): Romanian

Other language(s):

English

LISTENING C2 READING C2 WRITING B2

SPOKEN PRODUCTION B2 SPOKEN INTERACTION B2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

DIGITAL SKILLS

Keras / Numpy / Scikit-Learn / Remote Sensing

Microsoft Office

Microsoft Powerpoint / Microsoft Word / Microsoft Office / Microsoft Excel / Microsoft Teams

ESRI

ArcGIS Pro / ArcGIS Portal / ArcCatalog / ArcGIS Server / ArcMap / ArcGIS Online

Open source

QGIS / Geoserver / python

DRIVING LICENCE

Driving Licence: AM

Driving Licence: B1

Driving Licence: B

ORGANISATIONAL SKILLS

Very good organisational skills

COMMUNICATION AND INTERPERSONAL SKILLS

Good communication skills