HAYTAM ELYOUSSFI
Ph.D. Candidate in Machine Learning
Geospatial Big Data

+212 658059946
haytam.elyoussfi@um6p.ma
haytamelyo.github.io

Research Interest

Methodology: GeoAI, Remote Sensing, Machine Learning, Deep Learning, Geospatial Big Data.
Applications: Agriculture and Hydrology.

Education

- **Visiting Research Scientist** / August 2025 - Present
  ETH Zurich, Swiss Data Science Center (SDSC), Switzerland.
  Supervisors : Dr. Michele Volpi.
- **Visiting Researcher** / April 2025 - August 2025
  KU Leuven, Earth and Environmental Sciences, Land surface remote sensing, modeling and data assimilation Group , Belgium.
  Supervisors : Prof. Gabrielle De Lannoy and Dr. Devon Dunmire.
- **Researcher Ph.D** / Dec 2022 - Present
  Center for Remote Sensing Applications (CRSA), College of Agriculture and Environmental Sciences (CAES), Mohammed VI Polytechnic University, Ben Guerir, Morocco.
  PhD Thesis Title : **"Towards a Water Decision Support System: Integrating Geospatial Big Data and AI Techniques"**, Supervised by Prof. Abdelghani Boudhar and Co-Supervised by Prof. Salwa Belaqziz.
- **Hilary 2024 program** / January 2024 - March 2024 (Eight-week)
  Oxford School of Climate Change (SoCC), Wellington Square, United Kingdom.
- **International MSc in Distributed Systems & Big Data** / Sep 2019 - 2021
  Department of Computer Science, Faculty of Sciences Agadir, Ibn Zohr University, Agadir, Morocco.
  Major of Class 2019-2021 Master Degree.
- **BSc in Software Engineer** / Sep 2018 - 2019
  Department of Computer Science, Faculty of Sciences Agadir, Ibn Zohr University, Agadir, Morocco.
  Major of Class 2018-2019 Bachlor's Degree.
- **General University Degree in Computer Mathematics** / Sep 2016 - 2018
  Department of Computer Science, Faculty of Sciences Agadir, Ibn Zohr University, Agadir, Morocco.

Additional Education

- **ESA-NASA International Workshop on AI Foundation Model for EO**, organizer by National Aeronautics and Space Administration (NASA) and European Space Agency (ESA), 5-7 May 2025, ESA-ESRIN, Frascati, Italy.
- **Advanced Training Course on Land Remote Sensing : Snow and Glaciers** , European Space Agency (ESA) and University of Innsbruck / 16-20 September 2024, Innsbruck, Austria.
- **Oxford Machine Learning Summer School (OxML)** / May-July 2023,University of Oxford, Remotely.
- **AI4Science Workshop** / December 12-16 2022, Google DeepMind & Fondation MAScIR, Rabat, Morocco.
- **Math for Machine Learning Summer School**, Ecole Polytechnique Paris and EMINES-UM6P / July 25-30 2022, Benguerir, Morocco.
- **International ICESCO Model Satellite (CanSat) Training Workshop & AeroSpace Symposium** / July 18-22 2022, ICESCO, Rabat, Morocco.
- **Trustworthy Artificial Intelligence for Environmental Science (TAI4ES)**, Summer School / June 27-30 2022, National Center for Atmospheric Research, USA.
- **African Regional Workshop on SciTinyML**: Scientific Use of Machine Learning on Low-Power Devices / April 25-29 2022, Harvard SEAS, TinyML, ICTP, Remotely.

- **SEEDS FOR THE FUTURE - Huawei Program** / December 2021, Casablanca, Morocco.
- **Summer University of Jyväskylä on Machine Learning and Digital Services** / August 09-20 2021, Finland.
- **Data Science for Sustainable Environment**, Summer School / June 27-29, 2021, Faculty of Sciences and Technicals, Beni Mellal, Morocco.
- **Remote Sensing Observations for the Monitoring of Water and Carbon Cycles Over Eco-agro-systems**, CESBIO Summer School (Centre d'Etudes Spatiales de la Biosphère) / June 21-25 2021, Remotely.
- **Geospatial Technologies for Sustainable Management of Natural Resources, Environment, Disaster Risk and Urban Land Use Planning**, Polydisciplinary Faculty of Taroudant / May 29-July 03 2021, Remotely.
- **Skilling African Youth - IBM Program** / April-May 2021, Remotely.

Research Experience

Dec 2021 - Feb 2025 **Research Staff Member**
"MorSnow" and "GEANTech" projects UM6P/OCP, Morocco.

Achievements

- Collecting, cleaning, organizing, and analyzing large datasets related to water resources management, including geospatial data and remote sensing images.
- Using statistical and mathematical techniques to identify trends and patterns, and developing models and simulations to predict water system behavior.
- Designing and implementing data management systems and geospatial databases, creating maps and web-based applications to support water resources management.
- Automating data processing tasks with programming languages such as Python and R.
- Developing Deep Learning (DL) and Machine Learning (ML) models for snow hydrology applications.
- Collaborated with scientists and engineers, and supervised and taught students from various academic levels and backgrounds.

Sept 2024 - Jan 2025 **Teaching Fellow**
IT Center of Excellence, Agadir, Morocco

Achievements

- Prepare and deliver practical sessions for various modules, including "Content Management System (CMS)", "Databases and Modeling", and "Real-Time Programming (RTP)", for the Data Analytics and Artificial Intelligence (DAAI) and Software Engineering (SE) programs.
- Assist students in acquiring technical skills through interactive practical sessions.
- Organization of seminars, meetings with companies, and hackathons for the benefit of students.

Feb 2021 - Dec 2021 **Data Engineer - Internship Master Thesis**
Center for Remote Sensing Application (CRSA), Benguerir, Morocco

Achievements

- Downloading and preprocessing of satellite and ground Data.
- Visualization and automatic generation of graphs, interactive maps, statistics from available data.
- Modeling of Geospatial data Using Deep Learning (DL) and Machine Learning (ML) models.

Sep 2020 - Nov 2020 **Data Scientist - Internship**
ARAX-TECHNO, Agadir, Morocco

Achievements

- Development of a Python application for extracting useful information from invoice images.
- Use of the Cloud Vision API for extracting and recognizing text from invoices.

- Application of OpenCV processing to improve the quality of invoice images.
- Implementation of data visualization using Matplotlib, OpenCV, Seaborn, and Pillow.
- Automatic classification of invoices using AutoML.
- Testing and validation of the system to ensure its accuracy and reliability in real-time and Integration of the solution into an existing workflow to automate document processing.

Aug 2020 - Sep 2020 **Data Scientist - Internship (EYE METRIX Project)**
I-ETERIA, Rabat, Morocco

Achievements

- Development and implementation of a people counting and facial recognition system.
- Training Deep Learning models to improve analysis accuracy.
- Testing, validating, and optimizing algorithms for reliable performance.

Nov 2019 - Fev 2019 **Research Intern**
Information Systems & Vision Lab (LabSiv), FS Agadir, Morocco

Achievements

- Optimized image preprocessing workflows, reducing processing time.
- Developed and implemented Convolution Neural Network model (CNN) for medical image analysis, improving diagnostic accuracy.

Feb 2019 - Jun 2019 **Final Year Project - B.Sc (Research Project)**
Department of Computer Science, FS Agadir, Morocco

Achievements

- Application to recognition objects of multiple classes in images and videos using Deep Learning Models.

Selected contributions in open-source code repositories

- **MorSnowAI v1.0** : An Open-Source Python Package for Empowering Artificial Intelligence in Snow Hydrology - A Comprehensive Toolbox.
- **SnowMapPy v1.0**: A Python Package for Automated Snow Cover Mapping and Monitoring in the Mediterranean Atlas Mountains.

Conferences / Publications

Publications:

- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Bousbaa.M, Nifa.K, Bargam.B and Chehbouni.A (2025):"Leveraging advanced deep learning and machine learning approaches for snow depth prediction using remote sensing and ground data", Journal. Hydrol. Reg. Stud., vol. 57, p. 102085, févr. 2025, `https://doi.org/10.1016/j.ejrh.2024.102085`
- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Bousbaa.M, Nifa.K, Bargam.B, B.Sebbar and Chehbouni.A :"Hybrid CNN-BiLSTM Approach for Local-Scale Snow Depth Forecasting in the Mountainous Regions of Morocco", Euro-Mediterranean Journal for Environmental Integration (Conference paper : EMCIE 2024 Accepted).
- **Elyoussfi.H**, Bousbaa.M, BECHRI.H, Belaqziz.S, A Sproles.E, Nifa.K, Acharki.S, Benzhair.F and Boudhar.A (2025):"SnowMapPy v1.0: An Automated GEE Python Tool for Snow Cover Mapping and Monitoring in the Moroccan Atlas Mountains ", Journal Software Impacts (Under Review).
- Nifa.K, Boudhar.A, ElJabiri.Youssra, Bousbaa.M, ElGarnaoui.M, Bargam.B, **Elyoussfi.H**, Karaoui.I, "Enhancing Streamflow Predictions through Basin-to-Basin Knowledge Transfer: A novel strategy for Deep Learning Models Adaptation and Generalization". (2025) Results in Engineering. `https://doi.org/10.1016/j.rineng.2025.107978`

- Acharki.S, Boudhar.A, Bouihrouchane.A, Bousbaa.M, Karaoui.I, **Elyoussfi.H**, Bargam.B, Elkhalki.EM, Hadri.A, Chehbouni.A: "Spatial modeling of snow water equivalent in the high atlas mountains via a lumped process-based approach". Scientific Reports Nature, 15, 26327 (2025). https://doi.org/10.1038/s41598-025-12163-8

- Bousbaa.M, Boudhar.A, Kinnard.C, **Elyoussfi.H**, Karaoui.I, Eljabiri.Y, Bouamri.H, Chehbouni.A (2024): "An accurate snow cover product for the Moroccan Atlas Mountains: Optimization of the MODIS NDSI index threshold and development of snow fraction estimation models". International Journal of Applied Earth Observation and Geoinformation 129, 103851.https://doi.org/10.1016/j.jag.2024.103851

- Nifa.K, Boudhar.A, Ouatiki.H, **Elyoussfi.H**, Bargam.B., Chehbouni.A., (2023). "Deep Learning Approach with LSTM for Daily Streamflow Prediction in a Semi-Arid Area: A Case Study of Oum Er-Rbia River Basin, Morocco". Water 15, 262. https://doi.org/10.3390/w15020262

- Bousbaa.M, Htitiou.A, Boudhar.A, Eljabiri.Y, **Elyoussfi.H**, Bouamri.H, Ouatiki.H, Chehbouni.A, (2022). "High-Resolution Monitoring of the Snow Cover on the Moroccan Atlas through the Spatio-Temporal Fusion of Landsat and Sentinel-2 Images". Remote Sensing 14, 5814. https://doi.org/10.3390/rs14225814

- Azamz.R, Belaqziz.S, **Elyoussfi.H**, Benzhair.F, ElHafyani.M, Boudhar.A:"Enhancing Climate Change Adaptation in Morocco: Predicting Air Temperature Variations Using Deep Learning Models", Advances in Science, Technology and Innovation (Conference paper: MedGU 2024 Accepted).

- Bousbaa.M, Boudhar.A, Kinnard.C, **Elyoussfi.H**, Nifa.K, Bargam.B And Chehbouni.A: "Seasonal Snow Cover Variability and Snow Trends Analysis in the Moroccan Atlas Mountains (2000-2023)", Euro-Mediterranean Journal for Environmental Integration (Conference paper : EMCIE 2024 Accepted).

- Sebbar.B, Merlin.O, Khabba.S, Simonneaux.V, ElHachimi.C, **Elyoussfi.H**, Bousbaa.M, and Chehbouni.A: "Assessing Groundwater Sensitivity: Impact of Topography on Evapotranspiration Uncertainty and Water Balance Closure at Basin Scale", Euro-Mediterranean Journal for Environmental Integration (Conference paper : EMCIE 2024 Accepted).

Conferences:

- **Elyoussfi.H**, ElMousadik.R, and Benrkia.R: "Machine Learning-Based Approach for wheat yield prediction in Morocco using soil and climate data", European Confederation of Soil Science Societies (ECSSS), EUROSOIL2025, Seville, Spain 8-12 Sept, 2025.

- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Bousbaa.M, Bechri.H, Eric A Sproles, Fatima Benzhair, Abdelghani Boudhar : "**SnowMapPy v1.0**: A Python Package for Automated Snow Cover Mapping and Monitoring in Mountain Regions", EGU General Assembly 2025, Vienna, Austria, 27 Apr–2 May 2025, EGU25-20632, https://doi.org/10.5194/egusphere-egu25-20632, 2025.

- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Bousbaa.M, Azamz.R, Acharki.S and Chehbouni.A : "Deep Learning-Based Approach for Predicting Snow Water Equivalent in the Atlas Mountains Morocco",6Th IAHR Africa Congress 2024, December 2024, Marrakech-Benguerir, Morocco.

- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Bousbaa.M, Azamz.R, Acharki.S and Chehbouni.A : "Large-Scale Snow Depth Estimation in the Moroccan Mountains Using Satellite Remote Sensing and Statistical Models for Water Resource Management", Mediterranean Geosciences Union (MedGU) 4Th Annuel Meeting (Track 6. Geo-Informatics and Remote Sensing), November 2024, Barcelona, Spain.

- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Bousbaa.M, Kinnard.C, Nifa.K, Bargam.B and Chehbouni.A : "Hybrid CNN-BiLSTM Approach for Local-Scale Snow Depth Forecasting in the Mountainous Regions of Morocco", 6Th Euro-Mediterranean Conference for Environmental Integration, May 2024, Marrakech, Morocco.

- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Bousbaa.M and Chehbouni.A : "Snow Depth Prediction in the Moroccan Mountains Using Analytical Modeling and Remote Sensing", 13th ESA Advanced Training Course on Land Remote Sensing: Snow and Glaciers, September 2024, University of Innsbruck, Austria.

- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Bousbaa.M, Nifa.K, Bargam.B, Karaoui.I, Bouihrouchane.A, Benmira.T and Chehbouni.A : "**MorSnowAI v1.0** : An Open-Source Python Package for Empowering Artificial Intelligence in Snow Hydrology - A Comprehensive Toolbox", EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024, EGU24-13159, https://doi.org/10.5194/egusphere-egu24-13159, 2024.

- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Bousbaa.M, Nifa.K and Chehbouni.A: "Towards a Deep-Learning Approach for Snow Depth Prediction Over Mountainous Area in Morocco", 44th Canadian Symposium on Remote Sensing, June 2023, Canada.

- **Elyoussfi.H**, Abdelghani.B, Belaqziz.S, Bousbaa.M, Nifa.K, Kaissi.O and Chehbouni.A : "MorSnowEO : A Geospatial Approach to Big Data for Water Resource Management". Doctoral Day 2023, University Mohammed 6 Polytechnic, Friday, September 25, 2023, Benguerir, Morocco.
- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Baba.MW, Bousbaa.M, Nifa.K and Chehbouni.A : "LSTM-based Deep Learning Approach for Prediction Snow Depth in Morocco : Case Study Tichki – Draa Valley". GESOC 2022, Symposium on Water Management in Semi-arid areas, Tools, Global changes, November 2022, Marrakech, Morocco.
- **Elyoussfi.H**, Abdelghani.B, Belaqziz.S, Baba.MW, and Chehbouni.A : "A Machine Learning-Based Approach For Predicting Snow Depth In A Poorly Gauged Basin In Morocco". Doctoral Day 2022, University Mohammed 6 Polytechnic, June 24, 2022, Benguerir, Morocco.
- **Elyoussfi.H**, Boudhar.A, Belaqziz.S, Baba.MW, Benmira.T, and Chehbouni.A : "A decision support package to simulate the snowpack evolution and to automatically download and pre-process ERA5 reanalysis dataset". International Conference on Soil, Water and Environment : Challenges and Solutions (SWECS 2022), Fkih Ben Salah-Morocco, March 28-29, 2022.
- Bousbaa.M, Boudhar.A, Kinnard.C, Vivone.G, **Elyoussfi.H**, Sproles.E.A, Bargam.B, Nifa.K and Chehbouni.A : "Remote Sensing of Mountain Snow from Space: Developing Accurate Snow Products for Efficient Water Resource Management in Morocco's Atlas Mountains", EGU General Assembly 2025, Vienna, Austria, 27 Apr–2 May 2025, EGU25-13326, `https://doi.org/10.5194/egusphere-egu25-13326`, 2025.
- Azamz.R, Belaqziz.S, **Elyoussfi.H**, Benzhair.F, ElHafyani.M, Boudhar.A:"Enhancing Climate Change Adaptation in Morocco: Predicting Air Temperature Variations Using Deep Learning Models",Mediterranean Geosciences Union (MedGU) 4Th Annuel Meeting (Track 1. Atmospheric Sciences, Meteorology, Climatology, Oceanography), November 2024, Barcelona, Spain.
- Bousbaa.M, Boudhar.A, Kinnard.C, **Elyoussfi.H**, Nifa.K, Bargam.B And Chehbouni.A: "Seasonal Snow Cover Variability and Snow Trends Analysis in the Moroccan Atlas Mountains (2000-2023)", 6Th Euro-Mediterranean Conference for Environmental Integration, May 2024, Marrakech, Morocco.
- Bargam.B, Boudhar.A, Kinnard.C, Nifa.K, Bousbaa.M, **Elyoussfi.H** and Chehbouni.A: "Evaluation of input variables determination on the SVM and the ANN model performance using PCA, KPCA, and sequential forward selection techniques SFS for weekly streamflow prediction", 6Th Euro-Mediterranean Conference for Environmental Integration, May 2024, Marrakech, Morocco.
- Sebbar.B, Merlin.O, Khabba.S, Simonneaux.V, ElHachimi.C, **Elyoussfi.H**, Bousbaa.M, and Chehbouni.A: "Assessing Groundwater Sensitivity: Impact of Topography on Evapotranspiration Uncertainty and Water Balance Closure at Basin Scale", 6Th Euro-Mediterranean Conference for Environmental Integration, May 2024, Marrakech, Morocco.
- Bousbaa.M, Boudhar.A, Kinnard.C, **Elyoussfi.H**, Elbouanani.N, Htitiou.A, Bargam.B, Nifa.K and Chehbouni.A : "Towards a Deep Learning-based Spatio-temporal Fusion Approach for Accurately Improving Snow Cover Mapping: A Case Study in the Moroccan Atlas Mountains with Performance Evaluation", EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024, EGU24-13030, `https://doi.org/10.5194/egusphere-egu24-13030`, 2024.
- Bargam.B, Boudhar.A, Kinnard.C, Nifa.K, Bousbaa.M, **Elyoussfi.H** and Chehbouni.A: "Enhancing SVM's robustness of weekly streamflow prediction based on three 1 feature selection algorithms", , EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024.
- Nifa.K, Boudhar.A, **Elyoussfi.H**, Eljabiri.Y, Bousbaa.M, Bargam.B, and Chehbouni.A : "Exploring Neural Network Performance in Hydrological Modeling in a Mountainous Region of Morocco: A Case Study on LSTM and GRU Architectures for Runoff Prediction", , EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024, EGU24-11621, `https://doi.org/10.5194/egusphere-egu24-11621`, 2024.
- Nifa.N, Boudhar.A, Ouatiki.H, **Elyoussfi.H**, Bargam.B and Chehbouni.A: "Evaluation of snow cover product for monthly streamflow simulation in semi-arid region using Deep Learning Technics: case study Oum Er-Rbia basin (Morocco)". GESOC 2022, Symposium on Water Management in Semi-arid areas, Tools, Global changes, November 2022, Marrakech, Morocco.
- Bousbaa.M, Boudhar.A, Htitiou.A, Eljabiri.Y, **Elyoussfi.H**, Bouamri.H, Ouatiki.H and Chehbouni.A : "Spatio-Temporal Fusion Approach of Landsat and Sentinel-2 Images for Snow Cover Mapping in the Moroccan Atlas". GESOC 2022, Symposium on Water Management in Semi-arid areas, Tools, Global changes, November 2022, Marrakech, Morocco.

Services & Activities

- **Reviewer** : Earth Science Informatics, Journal of Big Data, Discover Cities, Discover Artificial Intelligence.
- **Supervision or co-supervision** :
  - Shivali Singireddy (B.Sc. student at MIT, USA), Research project on ML and gradient based models for crop yield prediction (OCP/Pixel 2025).
  - Khadija Bouzzite (M.Sc. student at FSSM, Morocco), Research project on Deep Learning for Remote Sensing Data Fusion
  - Fatima Zahra oumellaik (M.Sc. student at FTP), Research project on Geospatial BIG DATA for hydrological decision support.
  - Zineb Aiach (M.Sc. student at FTSB), Research project on Snowmelt runoff simulation using SRM model Case study Oum Er Rbia.
  - Ayoub Oihi (M.Sc. student at FTSB), Research project on Groundwater prediction using machine learning Tools Case study Oum Er Rbia.
- **Invited Talks** :
  - Talk on **"Intoduction to Machine Learning"**, DigitalHub Network Webinars, November 27, 2023, virtually.
  - Talk on **"Real World Applications of Python"** at Higher School of Education and Training (ESEF) in Agadir, April 01, 2023.
  - Talk on **"Intoduction to Deep Learning"** at Faculty of Sciences, for Master's students in SIDBD, March 15, 2023.
- **Professional Societies & Networks** :
  - IEEE Geoscience and Remote Sensing Society (GRSS) - Morocco.
  - Member at Canadian Remote Sensing Society (CRSS-SCT).
- **Conference, Workshop, and Hackathon Organization**
  - Organizing Committee of the "TechNovate Hackathon - 1st Edition: AgriTech" , Sunday-Monday, December 30, 2024, IT Center of Excellence, Faculty of Science, Agadir.
  - Organizing Committee of the **"1st Workshop on Artificial Intelligence Fundamentals and Applications"**, November 23, 2024, IT Center of Excellence, Faculty of Science, Agadir.
  - Organizing Committee of the **"Internationnal Doctoral School on Remote Sensing and Spatial Technologies"**, held on 8-11 May 2023 at UM6P in Ben Geurir, Morocco.
  - Organizing Committee of the MorSnow-1 seminar on the theme **"Water Resources in Moroccan Mountains: Observations and Modeling"** held on June 9, 2022, at UM6P - Mohammed VI Polytechnic University

Certifications

- Spatial Data Infrastructures - **Spatial Applications Division Leuven (SADL)**.
- Advanced SQL - **Kaggle**.
- Google IT Automation with python - **Google**.
- Databases and SQL for Data Science - **IBM**.
- Google Cloud Platform Big Data and Machine Learning Fundamentals - **Google**.
- Deep Learning Specialization - **DeepLearningAI**
- Mathematics for Machine Learning - **IMPERIAL College London**.
- Python and Statistics for Financial Analysis - **The Hong Kong University of Science and Technology**.
- Structuring Machine Learning Projects - **DeepLearningAI**.
- Introduction to the Internet of Things and Embedded systems - **UC Irvine**.
- Python Data Structures - **University of Michigan**.
- Python for Data Science and AI - **IBM**.

- The Data Scientist's Toolbox - **The Johns Hopkins University**.
- Scrum Foundation Professional Certificate (SFPC) - **Certiprof**.

Languages and Skills

- **Languages:** English, French (Native/bilingual), Arabic (Native/bilingual).
- Tenacious, organized, reliable, fast-learner, highly motivated, creative, get the job done.
- Traveler 13+ countries.