Personal information & contact

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- Google scholar
- Personal website
- Knowledge garden

Education

- PhD in Sciences - Astrophysics and Computer Vision, *Universite de Liege, Belgium*
- MSc in Astrophysics, *Universidad Complutense and U. Autónoma de Madrid, Spain*
- Specialization in Software Development, *Universidad del Magdalena, Colombia*
- BSc in Astronomy, *St. Petersburg State University, Russia*

Training and courses

- AI Agentic Design Patterns with AutoGen (2024, DeepLearning.AI)
- Functions, Tools and Agents with LangChain (2024, DeepLearning.AI)
- LangChain for LLM Application Development (2023, DeepLearning.AI)
- Building Systems with the ChatGPT API (2023, DeepLearning.AI)
- Deployment of Machine Learning models on Azure cloud (2023, The Bridge)
- Big data analytics (2020, PRACE Advanced Training Centres)
- ESA bootcamp for Earth observation innovation and startup creation (2018, ESRIN Italy)
- PRAIRIE Artificial Intelligence Summer School (2018, INRIA France)
- NUMEDIART Deep Learning workshop (2017, Universite de Mons Belgium)
- Courses on ML and statistical inference at the Montefiore Institute (2014, University de Liege, Belgium)

Carlos Alberto Gomez Gonzalez

Lead data scientist

With over 7 years of experience as data scientist and AI engineer, I have cultivated a deep understanding of AI-driven innovation and the intricacies of leading end-to-end ML projects across diverse sectors. My expertise ranges from orchestrating impactful R&D initiatives in Space and Earth sciences to driving ML projects in dynamic industries such as retail, manufacturing, and insurance within the private sector.

Work Experience

Lead Data Scientist — 2023 June – Present

Decide4AI (Decide Soluciones)

- Led the design and directed the development of the following projects:
  - Multi agent-based system with text-to-SQL and dynamic reporting capabilities for a SaaS workforce management company. This system is capable of generating automated visualizations and natural language explanations in response to user questions related to data stored in a PostgreSQL database. The multi-agent system was implemented with Autogen, OpenAI LLMs and validated using the AgentOps platform.
  - Document processing system for an InsurTech Spanish startup, enhancing their legacy pipeline built on Google cloud with AutoML models. Integrated custom text classification models and LLM-based (GPT-4o) knowledge extraction techniques to reduce the cost of inference by up to 50% and to improve relevant KPIs by a factor of 4.
  - Text categorization pipeline tailored for customer service dialogues, comparing diverse methodologies, including ML classification over TF-IDF encoding, fine-tuning of BERT, zero and few-shot learning with GPT-4, and both few-shot and LoRA fine-tuning with Llama3-8B-instruct.
  - Demand forecasting system for a large international power tools manufacturer. This solution accurately projected unit sales up to a 12-month horizon, and was containerized using Docker.
  - Credit scoring system for a prominent Chilean credit cooperative. Identified relevant metrics and enhanced performance up to 20% over their baseline model.
  - End-to-end forecasting solution (3 months horizon) tailored for a Chilean hygiene products manufacturer. This solution integrated a demand elasticity model for strategic decision-making. Our solution had very good MAPE metrics from 5% to 40% (for the most difficult time series) and was containerized with Docker to facilitate its deployment.
- Developed POCs for commercial demos focused on the usage of LLMs and multi-agent systems. For instance, a POC for contract audits integrating Computer Vision models for signature detection (fine-tuned YOLO), OCR and information retrieval via prompt engineering and RAG, using LangChain and the OpenAI API.
- Carried out research and development internal activities related to Causal ML by developing a python library for cost-sensitive uplift modeling.
- Provided support to data science teams working with external clients (InsurTech and energy sectors).
- Engaged in scan-and-vision meetings with prospective clients to understand their challenges and align them with tailored ML solutions.
- Contributed to public outreach on established conferences, for example on the topic of GANs and generative models at PyconES23.

Visiting Deep Learning Engineer — 2022 October – 2023 February

NVIDIA Corporation

- Carried out a research visit as part of a Marie-Curie Fellowship secondment.
- Worked on the design of AI-based super-resolution diffusion models for weather forecasting and the preparation of atmospheric variables (wind speed and direction at 100m). This effort was aligned with the Earth-2 digital twin project, relevant to the renewable wind energy sector.

Senior researcher in applied Data Science — 2019 – 2023

Barcelona Supercomputing Center

- Led the applied AI research line within the Earth Sciences department.
- Managed technical teams (junior researchers, data scientists and engineers) to tackle different projects involving problems such as time series forecasting, image and video super-resolution, semantic segmentation, anomaly detection, pre-processing of big climate datasets (hundreds of terabytes), and gridded/raster data visualization.
- Designed and implemented DL4DS, a python open source package with AI-based super-resolution techniques (statistical downscaling) for climate/weather and EO gridded data.
- Presented my work in international conferences (e.g., GeoPython, PyconES21, ESA Phi-week).
- Contributed to the writing of research proposals and supervised MSc students.
- Wrote peer-reviewed research technical articles and project deliverables.

Languages

- Spanish (native)
- English (professional)
- French (intermediate)
- Russian (intermediate)
- Catalan (beginner)

Awards and honors

- 2nd Prize at the S2S AI challenge organized by the WMO and ECMWF (2022)
- Marie Sklodowska-Curie COFUND fellowship at the Barcelona Supercomputing Center (2019-2023)
- ESA Copernicus accelerator (2020)
- 2nd Prize at the Barcelona Copernicus hackathon (2019)
- 1st Prize at the InvEnterPrize startup competition (2018)
- 1st Prize at the ESA Phi-week startup bootcamp (2018)
- Personal grant "Exoplanet direct imaging meets AI" (UGA, 2018)
- Scholarships for under- and post-graduate studies in Astrophysics by ICETEX/Colombia (2002) and CSIC/Spain International Campus of Excellence (2012)

Researcher in applied Data Science — 2017 – 2019

Universite Grenoble Alpes (UGA), Grenoble Alpes Data Institute

- Implemented DL techniques for space sciences problems, such as the direct direction of extrasolar planets and the processing of satellite and Earth observation data.
- Supervised MSc and undergraduate students.
- Organized outreach and training activities (scientific programming and data science methods for scientists, Software Carpentry @ UGA).
- Presented my work in international conferences (PyconES18) and institutes (Caltech, Stanford).

Data science consultant — 2017 March

Pivigo Ltd (Science to Data Science program)

- Developed a web scraping system, aimed at studying correlations between the text presentation, taken from UK schools websites, with the national ratings of school performance.
- Integrated a suite of NLP techniques, such as Tf-idf and sentiment analysis, alongside ML techniques including clustering, dimensionality reduction and ordinal regression. This system enabled in-depth investigation and delivery of key insights through a dashboard interface.

PhD researcher — 2013 – 2017

Universite de Liege (STAR and Montefiore Institutes)

- Developed novel techniques for image processing and background subtraction: the LLSG algorithm (low-rank plus sparse decomposition of astronomical image sequences), and the SODINN technique for supervised detection of exoplanets using deep CNNs.
- Authored the VIP python library with a variety of ML-based image processing techniques under a clear API (docstrings, external documentation, Jupyter notebooks and CI with pytest/travis).

Junior researcher and lecturer — 2009 – 2010

Technological University ITM, Colombia

- Taught the course of introductory Physics for engineers.
- Conducted research in astronomy and served as scientific advisor at the Planetarium "Jesús Emilio Ramírez González" of the city of Medellin, Colombia.

Skills

Soft

- Leadership and collaboration in multidisciplinary teams.
- Communication to non-technical stakeholders.
- Critical and scientific rigorous thinking.
- Willingness to study new topics and acquire new skills.
- Time organization to meet critical deadlines.

Hard

- Broad knowledge of statistics, ML and AI fields.
- Software development and engineering.
- Ability to clean and preprocess datasets.
- Communication of complex technical concepts in a clear and accessible manner.
- Active learning attitude to stay up-to-date with new trends in the fields of ML and AI.

Technical

- [9+ years] Scientific Python ecosystem: Numpy, Scipy, Jupyter, Pandas, Xarray.
- [8+ years] Image processing and computer vision libraries: Opencv, Scikit-image, Pillow.
- [8+ years] Machine learning and statistical analysis: Scikit-learn, Pycaret, Gluon, Autogluon, Xgboost, Catboost, Prophet, CausalML, Scikit-uplift, Shap.
- [7+ years] Deep learning frameworks: Tensorflow/Keras, Pytorch, Cupy, HF-Transformers.
- [2+ years] LLMs and NLP: OpenAI-API, Langchain, Autogen, NLTK, Spacy, Tesseract OCR, Ollama.
- [4+ years] Project management: Jira, Trello, Confluence.
- [8+ years] Collaborative software development: Git, GitHub, GitLab.
- Development on clusters and cloud environments: Azure, AWS, HPC supercomputing clusters.
- Deployment and containerization: Docker.
- Quick dashboard/front-end development: Streamlit, Gradio
- Data visualization: Matplotlib, Bokeh, Plotly, Geoviews, Hvplot.
- Distributed ML workflows: Joblib, Horovod, Tf.distribute and Torch.distribute.
- Past experience in various languages: Fortran, C, C#, .NET, Java, SQL, R, LaTeX.