Alexandra La Cruz

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Machine Learning Engineer

I am a machine learning engineer, having worked in data science, deep learning, and computer vision. My work experience covers sectors such as finance, higher education, healthcare, and technology product development (web and mobile), where I applied advanced techniques such as medical image processing and predictive analytics, I have collaborated with renowned institutions such as Citibank, Simon Bolivar University, Vienna University of Technology, and Imolko, working on cutting-edge projects related to AI in healthcare, machine learning model optimization, and big data analytics. My technical skills span different programming languages and platforms, as well as specialized tools for healthcare solutions based on medical data and images. With a strong background in AI research and product management. I am passionate about promoting interdisciplinary solutions that leverage deep learning algorithms and data science. I bring a strong background in technology consulting, model deployment, and cloud computing, and thrive on projects focused on scalable machine learning systems. I am excited to explore opportunities where I can contribute to impactful AI-driven solutions while fostering collaboration and maintaining clear communication in fast-paced environments.

Work Experience

University of Ibagué, Tolima, Colombia 2019-today
Associate Professor

- As an Associate Professor, I teach several courses for undergraduate students of System Engineering Program and in the Master in Industrial Management. I teach Oriented Object Programming and algorithms I and II (in Java), Business Intelligence, Intelligent Agent, Numerical Methods, and Data Analytic.

Main Technologies: Python, Java

Freelancer 2017-2024
Developer - Teaching - Consultant

- In 2017 I started a remote job as a freelancer directing several projects in the field of web and mobile development in Inteliti.com. Until 2019, when I started on-site at Ibagué University.
- In 2018, I also started teaching remotely once a year the course of Computer User Interface at Valencia International University, then in 2020 I started to teach also Artificial Intelligence. Until 2023, when I decided to finish this role. Currently, I am collaborating with this University directing some Master final works.
- During 2022-2023, I was collaborating on a specific task for developing a mobile app (tuara.app) for controlling the progress in the field of nutrition. I applied gradient descent algorithms as an optimization solution to estimate the most approximate quantity in grams per food type in a dish to keep a right diet according to anthropometric measurements and fitness goals .

- In 2023. During a month I worked adding some functionalities to the mobile app DrNabat (available on google play). The objective of this application is to use it on a farm to detect diseases of tomato, cucumber and paprika.

Main Technologies: Python, Java, Kottlin, Flutter, JavaScript, HTML, n-grok

University of Cuenca, Cuenca, Ecuador 2013-2016

PROMETEO Researcher

- As a PROMETEO researcher, I directed and developed three research projects: "A telemedicine system with medical image", "Automating medical image annotation using medical ontologies", and "Grid distribution system for distributed PACS". During this period several scientific papers were published in Scopus, IEEE, and Web of Sciences index.

Main Technologies: Python, VTK (Visualization Toolkit), Web Semantic tools, RDF, Ontologies (RadLex, Mesh, etc.), HTML, Javascript, 3DSlicer.

Computer Graphics Institute at Vienna University of Technology 2002-2006

PhD. Student - Research Assistant

- As a PhD Student together with a colleague we were developing a solution for the 3D modeling and visualization of peripheral arteries from lower extremities for patients with PAOD (peripheral artery occlusive diseases) from CTA (computed tomographic images). I was also working as a research assistant at the hospital university.

Main Technologies: C++, Windows, PACS (Picture Archiving and Communication System), DICOM (Digital Imaging and Communication in Medicine).

From Research Assistant to Associate Professor at Simon Bolívar University 1995-1998, 2006-2014

Venezuela University located in Caracas

- Starting as a research assistant during the period of 1995-1998 in the GBBA (Grupo de Bioingeniería y Biofísica Aplicada) under a Research project financed by FONACIT, then I moved to the technological industry at Hipercom. In this period I developed software for 3D modeling and visualization of angiographic images from coronary arteries. This work was a final research work to fulfill the Computer Science Engineering degree. Then, I started the Master in Biomedical Engineering, but the budget was finished and I moved to the industry, while finishing my Master Degree. During this time I had the opportunity to complete several internships at research institutes during three periods at the LTSI Laboratoire Traitement du Signal et de l'Image, Vienna University of Technology, Laboratoire Informatique de l'Université de Pau et des Pays de l'Adour (LIUPPA), and Computer Graphics Institute at the Vienna University of Technology. I also published several scientific papers in Scopus, IEEE, and Web of Sciences index.

Main Technologies: C++, Unix, XtLib, OpenGL, Image Processing, 3D modeling and visualization, Java, Matlab.

From developer to CTO at Hipercom.com (today Imolko.com), Venezuela 1998-2002

A consultant company in the field of technology, developer of web applications

- I Started developing applications for CitiBank-Venezuela (intranet systems such as Bill Payments), then I became CTO. I was in charge of different projects for Citibank-Venezuela and CANTV (the main Venezuelan telecommunication company. While Hipercom was changing its vision to become Imolko. Under my supervision I had eight developers.

Main Technologies: SQL, ASP, PHP, Visual Basic, HTML, JavaScript.

Projects

DrNabat (Apr 2023). DrNabat is a mobile app for detecting diseases from leaf photos of tomato, cucumber and pepper. I developed new functionalities to the application.

Tuara.app (2022-2023). I support some methods developed for tuara.app, in particular, I implement the Gradient Descent as an optimization method for studying the best quantity combination of main food composed in a dish.

Machine learning techniques applied for Obesity Classification (ANN, K-means, ROC Curve analysis), Waist-to-Hip Ratio Diagnosis (ANN, SVM), Body Fat Prediction, and Physical Activity Classification with Neural Networks from anthropometric data (2020-2023). Explored neural networks and different machine learning techniques to classify and obtain the best metrics for evaluating obesity, diagnose abnormal waist-to-hip ratio values, and predicting body fat percentage abnormalities through anthropometric data analysis.

Machine learning techniques applied for Clickstream Customer Classification, time series analysis, Churn prediction, User Segmentation Using K-Means, and others for Imolko.com enterprise (2021-2023). Utilized neural networks for customer classification through clickstream data, time series analysis of customer behavior, churn prediction, and segmented users based on Google Analytics data using K-means clustering.

Heuristic Approaches for Resource Allocation at Universidad de Ibagué (2023-2024). Evaluation of heuristic methods for resource scheduling under conflicting constraints in academic settings at Universidad de Ibagué.

Detection of Respiratory Disease Patterns using Mask R-CNN (2023). Use of Mask R-CNN to identify respiratory disease patterns in medical imaging from CTA-Chest.

Big Data Techniques for NGO Stakeholder Analysis (2022). Apply big data techniques to analyze NGO stakeholder data from Unidos en Red.

Breast Cancer Screening Using Deep Learning (2022). Evaluation of several deep learning models (DenseNet, MobileNet, VGG-16, VGG-19) for breast cancer screening.

SIR Model for SARS-CoV-2 Epidemic Projections, for the US, Brazil, Venezuela and Ecuador (2020). Fitted SIR model parameters to estimate COVID-19 transmission in US, Brazil, Venezuela, and Ecuador.

ToraxIA - Virtual Radiology Assistant (2020). Contribution to the development of ToraxIA (https://www.alumbra.ai/toraxia/), a deep learning assistant for radiologists using chest X-ray images.

Cell Contour Methods in Microscopy (2020). Compared methods for closing cell contours in microscopy images.

Design of a Tele-radiology System using Medical Image Indexing Methods using Semantic Information (Feb 2015 - Apr 2016). This project mainly developed the Teleradiology platform WebMedSA: A Web-based Framework for Segmenting and Annotating Medical Images using Biomedical Ontologies.

Development of ADPi: a tool for Diagnostic Support in Footprint Diagnosis. The goal was to develop software techniques for analyzing contour and contrast images of the plantar footprint using a photo-podoscope, supporting the diagnosis of plantar footprint abnormalities.

Teleradiology, using medical image retrieval methods based on visual and semantic content under the GRID architecture (2014-2015). The objective of this project was to design, implement and validate strategies

that allow the retrieval of images based on their visual and semantic content stored in medical image databases with applications in tele-radiology, assuming that the databases are distributed and under a GRID architecture. System for medical/patient support. In this project we developed a Prototype named **WebMedSA (Web based medical semantic annotation)**.

Use of Medical Ontologies to Improve Segmentation and Visualization Processes Medical (2014). This project proposed to make use of existing ontologies, exploiting the knowledge encoded in them together with the data and metadata contained in the DICOM standard. Once the images are annotated, intelligent searches could be performed on a database of medical images with respect to some tissue, some pathology, among other capabilities.

Design, analysis, modeling and design of a complete tele-medical system for application to remote patient monitoring in non-clinical environments, specifically oriented to remote medical image processing (Nov 2013 - Noviembre 2014). The project aimed to design two remote monitoring tools for non-clinical settings, focusing on remote medical image processing for potential integration into national healthcare in Cuenca, Ecuador. A prototype was developed, where we were able to connect several imaging servers from several medical imaging centers located physically in different places using a GRID architecture and encryption techniques for transferring data (images) between images servers (PACS). A server allowed to process, and visualize the images, a physician could manipulate the image and annotate it semantically using pre-loaded ontologies, between other facilities needed by physicians.

3D modeling and reconstruction of vascular structures from Intra vascular ultrasound (IVUS) images (Sep-Dec 2007). The main goal was to make a study about the state of the art and propose a solution for the 3D reconstruction from IVUS images, where the main challenge is that IVUS images have no geometrical information about the vascular structure. This research work was carried out at LTSI in Rennes, France as a short internship in a post-doc position.

3D Modeling and Visualization of Vascular Structures (2002-2006). The goal was to develop a solution for the 3D modeling and visualization of peripheral arteries from lower extremities for patients with PAOD (peripheral artery occlusive diseases) from CTA (computed tomographic images). I was also working as a research assistant at the hospital university. This work was part of my PhD research topic carried out at the Computer Graphics Institute at Vienna University of Technology. We developed **AngioVis** Work station for diagnosis support for the Hemodynamic Department from the Medical University of Vienna.

BillPayment and HelpDesk system for Citibank - Venezuela, and Management system for CANTV (Telecommunication Enterprises from Venezuela) (1998-2002). During my time in Hipercom I was mainly involved in projects for the Bank and Telecommunication industry as Project Manager and Developer in a few other projects.

Processing, 3D modeling, reconstruction and visualization of coronary arteries from angiographic images (1995-1998). I developed an application for processing (**ANIA - Angiographic Images ANalysis**), modeling, reconstruction and visualization of vascular structure from angiographic images. This app was developed on a Silicon Graphics Workstation under the Unix Operating System.

Skills

Tech Skills: Python, Java, C++, JavaScript, Kotlin, HTML, MATLAB, MySql, SQL, Spring Boot, Flutter, xampp, VTK (Visualization Toolkit), 3DSlicer, RDF, Ontologies (RadLex, MeSH, etc.), REST API, DICOM, PACS, ASP, PHP, Visual Basic

Agile Methodologies: Scrum, Kanban
Other Tools: n-grok for local development and testing, and various IDEs for software development (e.g., Visual Studio, Eclipse, IntelliJ), AWS (Knowledge but not practice).
Languages: Spanish (mother tongue), English (B2-C1), German (A1), French (B1)

Education

Vienna University of Technology, Vienna, Austria 2006
PhD. Certification in Science of Technology

Universidad Simón Bolívar, Caracas, Venezuela 2000
Magister in Biomedical Engineering

Universidad Simón Bolívar, Caracas, Venezuela 1995
Computer Sciences Engineering

Courses

Coursera - several course in the field of artificial intelligence, machine learning, deep learning 2018-2023
Several certifications from coursera, all of them are available in Linkedin profile:
- Sequences, Time Series and Prediction
- Introduction to TensorFlow for Artificial
- Introduction to Deep Learning
- Transfer Learning for NLP with TensorFlow Hub

Certifications

Google Cloud Platform Google Cloud Computing Foundations 2022
Cloud Computing Fundamentals, Networking and Security in Google Cloud, Infrastructure in Google Cloud, Create and Manage Cloud Resources and Google Cloud Essentials. Public profile at Google Cloud Platform: https://www.cloudskillsboost.google/public_profiles/e7ec774a-2b2a-485b-8974-8f8107d4ca06