Francisco Zambrano

- Providencia, Santiago, Chile
- Chilean-Italian

Skills

R 10+ yrs.

R | {tidyverse} 3+ yrs.

R | {tidymodels} 1+ yrs.

Python 2 yrs.

Amazon Web Service (AWS|EC2) 3 yrs.

Dockers 2 yrs.

GIS 10 yrs.

Rmarkdown 6 yrs.

Quarto 1 yrs.

Spatial data analysis 10 yrs.

R-Shiny 6 yrs.

Software

- Git
- RStudio - Positron
- VS Code

Summary

Spatial data scientist with over ten years of experience managing and analyzing large volumes of data. I specialize in machine learning, deep learning, and geospatial analysis applied to decision-making. I have proven experience developing predictive models, data visualization, and managing high-impact technology projects. I have led large-scale projects and published in high-impact scientific journals, which supports my ability to generate applied knowledge and actionable results.

Data Science Experience

PM 2.5 **2025**
https://frzambra.shinyapps.io/app_pm25
Developer

I modeled monthly particulate matter 2.5 for continental Chile using Machine Learning algorithms, data from the SINCA network (National Air Quality Information System), and satellite data. In addition, I developed a prototype of a web platform for visualizing the results.

SatOri **2025**
https://s4tori.cl/app
Director

I led and worked on spatial data processing for the development of the Satellite System for Irrigation Optimization in fruit orchards (SatOri). I modeled the spatial and temporal variation of xylem water potential in cherry trees using Sentinel-2 satellite data and Machine Learning algorithms.

ODES-Chile **2022**
https://odes-chile.org/app/unidades
Director

I led and worked on spatial data processing for the drought observatory for agriculture and biodiversity in Chile (ODES). I processed ERA5-Land climate data and calculated drought indicators for all continental Chile. I generated spatial aggregation across different hydrological and administrative units.

IAF app **2021**
https://frzambra.shinyapps.io/iaf_shinyapp/
Developer

I developed a mobile-adapted application that allows calculating the area of a leaf, supporting the calculation of the Leaf Area Index (LAI).

Drought prediction **2017**
https://frzambra.shinyapps.io/drought_prediction/
Developer

I developed a web application in which I implemented the results of my research article on the prediction of agricultural drought in Chile.

- Terminal
- QGIS
- SAGA
- SNAP

Spatial data

- MODIS
- ERA5/ERA5-Land
- CHIRPS
- Sentinel-1/2
- Landsat 7/8/9
- SoilGrid
- CMIP6

Data Science

- R-programming
- Getting and cleaning data
- Exploratory data analysis
- Reproducible Research
- Statistical Inference
- Regression Models
- Practical Machine Learning
- Developing Data Products

Awards

- Hackaton Winner in the OpenGeoHub Summer School, Siegburg, Germany, 2022.
- PhD Scholarship, National Agency for Research and Development, Chile, 2014.

Education

03/2014 - 09/2017

Ph.D in Agricultural Engineering, Mention in Water Resources
Universidad de Concepción

Thesis: Agricultural Drought in Chile: From Assessment to Prediction Using Satellite Data

Other professional experiences

Associate Professor — **02/2018 - 08/2025**
Earth Observation Center
Hemera - Universidad Mayor

I secured and led ANID-funded projects for more than 600 million CLP, including an Initiation Fondecyt, a FONDEF IDeA, and a drought research fund. I coordinated the development of the ODES-Chile and SatOri platforms, focused on climate change adaptation through Earth observation and spatial analysis. In academia, I taught undergraduate and graduate courses on GIS (QGIS) and spatial data science with R, training students in technologies applied to environmental and territorial management.

Visiting Doctoral Researcher — **09/2016 - 12/2016**
Faculty of Geo-Information Science and Earth Observation (ITC)
University of Twente, Enschede, The Netherlands

I led a study to predict drought-induced declines in agricultural productivity in Chile, integrating time series of satellite data (MODIS, CHIRPS) and advanced spatial analysis techniques. The results of this research were published in the journal Remote Sensing of Environment.

Visiting Doctoral Researcher — **01/2016 - 06/2016**
Center for Advanced Land Management Information Technologies (CALMIT)
National Drought Mitigation Center (NDMC)
University of Nebraska, Lincoln, Nebraska, United States

I led a study evaluating satellite products for estimating precipitation in Chile and their applicability in drought monitoring. The results were published in the journal Atmospheric Research.

Research Assistant — **14/2012 - 03/2015**
Quilamapu Regional Research Center
National Institute for Agricultural Research (INIA)

I processed and analyzed climate station and satellite data for the study and monitoring of drought in Chile. In addition, I automated the generation of monthly drought and agroclimate reports, which were incorporated into regional agroclimatic bulletins.

Various — **09/2007 - 12/2012**
Public Services
CNR | DGA | INDAP

I worked as an engineer in public services such as the General Water Directorate (DGA), the National Irrigation Commission (CNR), and the Agricultural Development Institute (INDAP), in different regions of Chile, on issues related to water resources, agriculture, and water user organizations (WUOs).

Awarded competitive projects

Projects awarded by the National Research and Development Agency (ANID)

03/2000 - 09/2007

Civil Engineering

Universidad de Concepción

Contact

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Crea Ciencia 2030 **01/2025 -10/2025**

Director

Title: Impact of climate change on the phenology of avocado trees and the native sclerophyll forest according to potential groundwater access in the Aconcagua River basin

ODES-Chile (FSEQ210022) **03/2022 - 10/2023**

Director

We created ODES-Chile, a multiscale drought observatory for Chile, an early warning system to mitigate agricultural and ecological impacts (https://odes-chile.org).

SatOri (ID21I10297) **03/2022 - 12/2024**

Director

We created SatOri, a satellite-based system for irrigation optimization in cherry orchards (https://s4tori.cl).

Fondecyt Initiation 11190360 **03/2020 - 03/2022**

Principal Investigator

I led research evaluating biomass prediction in wheat and corn using satellite data and machine learning techniques.

Fondecyt Postdoctoral **03/2023 - 03/2025**

Sponsoring Researcher

I sponsored the project entitled 'Assessment of current and future water availability for agriculture and terrestrial ecosystems under different land use scenarios in the Aconcagua River basin: towards drought adaptation.'

Fondecyt Regular (1210526) **03/2021 - 12/2024**

Co-Investigator

Title: Multivariate drought monitoring system: biophysical modeling, remote sensing, and hydroclimatic information for drought analysis and prediction in agriculture.