Ramiro **Vignolo**

QUANTITATIVE ANALYST & DEVELOPER · NUCLEAR ENGINEER

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Summary

Applied Scientist Vast experience in mathematical modeling, numerical simulation and programming applied in both open source and proprietary software for solving scientific problems in different domains, such as finance and reactor physics.

Professional Experience

CRISIL   *Buenos Aires, Argentina*

LEAD QUANTITATIVE ANALYST OR TECHNICAL MANAGER   *Apr. 2019 - Present*

- Leading technical design, development and implementation of a a high-performance library for fast and advanced quantitative finance calculations, including:

  - Numerical Solution of Stochastic Differential Equations using time discrete approximations with different strong/weak order of convergence, non-autonomous coefficients and w/ and w/o diagonal noise, which allow solving any System of SDEs found in the financial domain.
  - One and Multi-Factor Short Rate Models of Affine and Quadratic type, including efficient on the fly computation of Zero Coupon Bonds by solving the corresponding Riccati System of Ordinary Differential Equations. These Short Rate Model types take into account the simple and well known cases: Vasicek, Cox-Ingersoll-Ross, Hull-White, Gaussian Short Rate (GSR) and Quadratic Gaussian. However, many more complicated models can be specified and solved as well.
  - Libor Market Model (LMM) framework including all basic fixed income securities and interpolation using, for example, the Schlögl methodology.
  - Heath–Jarrow–Morton (HJM) general framework including all basic fixed income securities.
  - Local Volatility and Stochastic Volatility models.
  - Monte Carlo universal pricing engine for non-callable, callable and cancellable equity and hybrids products with arbitrary basis layers (from polynomials to neural networks). Greeks computation via automatic differentiation.
  - Day counters for many different conventions.
  - Yield curve construction.
  - Domain Specific Language (DSL) design and implementation for syntactically-sweetened inputs.
  - Automatic documentation for both code and theory.

CRISIL   *New York, USA – Buenos Aires, ARG*

SENIOR QUANTITATIVE ANALYST   *Sep. 2017 - Mar. 2019*

- Consultant for Tier-1 US Investment Bank – Model Validation Group:

  - Development of plausible forecasts for macroeconomic and market variables in the context of Current Expected Credit Loss (CECL) models by coding a forecasting suite which implemented:

    * $AR(p)$, $MA(q)$, ARMA, ARIMA and Seasonal ARIMA + Independent Variables (SARIMAX) models.
    * Error Correction Model (ECM).
    * Kalman Filtering.
    * Automatic documentation including many statistical tests presented in both textual and graphical format, allowing quick identification of model correctness.

- Consultant for Tier-1 US Investment Bank – Front Office – Equity & Hybrids Group:

  - Worked on different performance testing strategies and model life-cycle duties for a variety of Products and Base models, including:

    * Analyzing different underlying dynamics for currencies, equity, FX and interest rate processes using several types of Volatility Models (Local Volatility and Stochastic Volatility) and Term Structure Models (deterministic rates, Short Rate Models of Affine and Quadratic class and Libor Market Model) for benchmarking purposes.
    * Pricing by means of Analytic, Trees, Finite Difference (PDE) and Monte Carlo methods.
    * Benchmarking against different Product Models by formulation of comprehensive comparisons.
    * Parametric testing modifying relevant dynamics and/or payoff related parameters.
    * Life-cycle testing for schedule sensitive parameters.
    * Limiting cases validation collapsing each product model to simple Vanilla-Like Derivatives, among others.
    * Calibration impact studies for each Model Dynamics using different methodologies.
    * Multi-currency curve handling and construction rationale.
    * Risk-Not-In-Model assessment against complex dynamics, e.g. Stochastic Volatility dynamics w/ and w/o jumps.
    * Convergence, computational performance and Hedging studies.
    * Stress Testing scenarios for standardized & required regulatory scenarios.
    * Technical documentation, where all the relevant information and results were detailed for the correct and comprehensive use of each Product Model.

BESNA   *Buenos Aires, Argentina*

NUCLEAR ENGINEERING CONSULTANT   *Dec. 2016 - Dec. 2017*

- Design and development of Heat Transfer – Two-Phase Flow complex calculation codes for Nuclear Reactors:

    - Implemented a program that performs steady-state analysis of thermo-hydraulic systems involving mixtures of steam and water (Two-Phase Flow) in one dimensional, but still complex, geometries. Coupled capabilities with other CFD tools (Ansys CFX) was included as well.
    - Calculations for the Helical-Coiled Steam Generator of CAREM25 Nuclear Reactor.

TECNA   *Buenos Aires, Argentina*

S/SR NUCLEAR ENGINEER   *Oct. 2014 - Aug. 2017*

- Development of Reactor Physics (neutronic, thermo-hydraulic and control) high performance calculation codes:

    - Implemented the Method of Characteristics approximation for the Neutron Transport Equation (including efficient ray tracing algorithms).
    - Designed and developed cell models to obtain condensed and homogenized macroscopic cross sections with DRAGON V5 for Atucha II Nuclear Power Plant.
    - Consultancy regarding the development of computational codes in order to reproduce coupled safety transients and update the Final Safety Analysis Report (FSAR) for Atucha I Nuclear Power Plant.
    - Consultancy regarding Spatial Kinetics calculations coupled with plant and control codes.
    - Conducted several updates for Neutron Spatial Kinetics programs.

Academic Formation

Balseiro Institute, Cuyo National University & National Atomic Energy Commission   *San Carlos de Bariloche, Argentina*

BACHELOR AND MASTER OF SCIENCE IN NUCLEAR ENGINEERING   *2011 – 2014*

- Thesis: *Conceptual Design of a Compact Nuclear Research Reactor Core.*
- Director: PhD. Eduardo VILLARINO.

National Technological University, Haedo Regional Faculty   *Buenos Aires, Argentina*

AERONAUTICAL ENGINEERING   *2009 – 2011*

- Completed the first two years.

Research Internships

INVAP S.E.   *San Carlos de Bariloche, Argentina*

NUCLEAR ENGINEERING DEPARTMENT   *Jun. 2013 – Jun. 2014*

- Nuclear Engineering graduate dissertation.

Honors & Awards

2011 – 2014   **Bachelor and Master of Science Scholarship,** National Atomic Energy Commission.   *San Carlos de Bariloche, Argentina*

Skills

Programming   C/C++/C#, Julia, Python, FORTRAN, R, Scripting (bash, AWK, sed, curl, etc), TeX, etc.
Software   Git (CI/CD), GNU/Linux, GNU Scientific Library, PETSc, SLEPc, GNU Octave, Matlab, Mathematica, etc.

Other

Citizenship   Argentinean.
Birth year   1990 (30 years old).
Languages   Spanish (native) and English (fluent).