Nicolás Biocca

Scientific Software Developer

Nationality: Argentinian – Italian

Residence: Italy

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Interests

- Software Development
- Object-Oriented Programming
- Numerical Analysis
- Data Structures
- High Performance Computing
- Multiphysics Simulation
- Linear Algebra and Calculus
- Tensor Algebra

Skills

Programming

Python | C | Fortran | Bash | Awk | MATLAB/Octave | Linux | Python/C interoperability

Computational Modeling

FEA | CFD | Meshing | Post-processing | Abaqus/CAE | Elmer FEM | OpenFOAM | FEniCS | GMSH | Paraview

DevOps

Git | Docker | GNU Make

HPC libs

MPI | OpenMP | PETSc

Data Visualization

Matplotlib | Seaborn | VTK | PyVista

Data Analysis (Python libs)

NumPy | SciPy | Pandas | Xarray

Languages

- **Spanish** ..... native
- **English** ..... professional working
- **Italian** ..... elementary

Summary

I am an experienced simulation engineer with 9+ years of experience developing software solutions with specific expertise in computational mechanics. I have experience developing ocean circulation and several mechanical engineering problems regarding Fluid Dynamics, Structural Mechanics, Heat Transfer, and Free Surfaces, among others. I am dedicated to simplify and integrate simulation workflows through process analysis, automation by scripts and standardization employing best practices.

Experience

Contractor
Sept. 2022 – ongoing

Euro-Mediterranean Center on Climate Change (CMCC). Italy

Contributing to the Global Coastal Ocean Division (GOCO) for the development of ocean circulation models for regional and global configurations. Optimization of numerical codes and ETL workflows in HPC environments for the preprocessing, computation and postprocessing procedures.

Research Assistant
Apr. 2016 – Aug. 2022

Group for Computer Aided Engineering (GIAC), Department of Mechanics at UNMDP
National Scientific and Technical Research Council (CONICET). Argentina

Developed computational modeling software to solve mechanical problems such as Computational Fluid Mechanics, Solid Mechanics, Heat Transfer and Multiscale. Worked on multiphysics solvers for FSI (both tracking and capturing interfaces approaches), thermal stresses, and Free-Surface problems. Some applications were made on topics like Ship Hydrodynamics, Friction Stir Spot Welding and Hemodynamics. Developed Mesh Dynamics solvers in the context of interface-tracking models based both on linear elasticity equations and nonlinear arterial wall mechanisms. Some of these activities have been published in international journals and delivered at conferences.
The undertaken activities were mainly funded by a competitive grant awarded by CONICET in December 2015.

Teaching Assistant
May 2016 – Aug. 2022

National University of Mar del Plata, Argentina

Duties within the departments of mechanical engineering and physics for the following courses:

- **Continuum Mechanics**, **Classical Mechanics**, **Solid Mechanics (Statics)**
  Responsible for the practical work in Classical Mechanics during the 2nd Semester of 2021, overseeing 60+ students.
  Lectured on Kinematics and Dynamics of continuum media to groups of over 50 upper-level engineering students. I wrote introductory notes on indicial notation within the context of continuum mechanics, developed a practical work guides, and made presetations for in-class exercises.
- **Physics II (Electromagnetism)**

Student Research Assistant
1st Sem 2015

Laboratory of Experimental Mechanics, division Mechanics of Materials, Research Institute for Material Science and Technology. Argentina

Worked on fatigue tests. Measurement of residual stress distributions and redistributions during the fatigue process by means of the Crack Compliance Method (CCM).

Education

Doctor of Philosophy in Mechanical Engineering
Apr. 2018 – Apr. 2022

National University of Mar del Plata (UNMDP). Argentina

Thesis: A biologically-inspired methodology for mesh optimization in fluid-structure interaction problems

Supervisors: Prof. Dr. Santiago A. Urquiza, Dr. Guillermo Lombera

Mechanical Engineer
Mar. 2009 – Nov. 2015

National University of Mar del Plata (UNMDP). Argentina

Thesis: Fractomechanical methods for the measurement and analysis of residual stress distributions and redistributions

Supervisors: Prof. Dr. Mirco Chapetti, Dr. Gustavo E. Carr