Agustín Somacal

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I'm very enthusiastic about science and the possibility of using artificial intelligence to improve society. I have a strong background in physics and applied mathematics. I'm particularly interested in open science and new ways of creating and sharing knowledge.

EDUCATION

PhD in applied mathematics
Model reduction for forward simulation and inverse problems : towards non-linear approaches
Advisors : Albert Cohen, Olga Mula
Thesis : https://theses.hal.science/tel-04646204

Oct 2020 - May 2024
Sorbonne Université, LJLL
Paris, France

BSc/MSc in Physics (6.5 years program)
Integration of information in biological networks
Advisor : Ariel Chernomoretz
GPA : 9.74/10

Mar 2012 - Nov 2018
Universidad de Buenos Aires
Buenos Aires, Argentina

PROFESSIONAL EXPERIENCE

Postdoc
Topics : Natural gradient descent, Reduced Order Modelling, Optimal sampling
Advisor : Anthony Nouy

Jun 2024 - currently
Ecole Centrale de Nantes & LMJL
Nantes, France

Research engineer
Forward reduce modelling and inverse problems

Jan 2020 - Sep 2020
Sorbonne Université, LJLL
Paris, France

Data Scientist
Machine Learning and Statistical Learning

Sep 2016 - Dec 2019
Aristas S.R.L
Buenos Aires, Argentina

Scientific popularizer
Explaining physics to society through experiments

Mar 2014 - Dec 2015
Universidad de Buenos Aires
Buenos Aires, Argentina

TEACHING EXPERIENCE

Teacher assistant
Pyhton for mathematics : https://python.guillod.org/

Oct 2020 - Jun 2023
Sorbonne Université
Paris, France

Teacher assistant
— Complex networks applied to social and biological systems
— Electricity and magnetism
— Optics and thermodynamics

Mar 2015 - Dec 2018

Universidad de Buenos Aires
Buenos Aires, Argentina

OTHER EXPERIENCE

Tai Chi Chuan Teacher
Secretaría de Extensión, Cultura Científica y Bienestar

Jan 2018 - Dec 2019
Universidad de Buenos Aires
Buenos Aires, Argentina

LANGUAGES AND SKILLS

Spanish: native   English: advanced   French: advanced   Italian: advanced   Arabic: elementary

Programing languages : 🐍Python, C++, R, Matlab
Other technologies : ⊙Ubuntu/Debian 🐧Linux, **git**GIT (Version control), Latex, Unix shell

Publications

Natural gradient descent with momentum — 2026
Manuscript in preparation;
A. Nouy, A. Somacal

High order recovery of geometric interfaces from cell-average data — 2025
ESAIM : Mathematical Modelling and Numerical Analysis; arXiv:2402.00946
A. Cohen, O. Mula, A. Somacal

State estimation of urban air pollution with statistical, physical, and super-learning graph models — 2024
Advances in Computational Science and Engineering (Vol. 2, No. 2); arXiv:2402.02812
M. Dolbeault, O. Mula, A. Somacal

Nonlinear compressive reduced basis approximation for PDE's — 2023
CRAS : Comptes Rendus Academie des Sciences; HAL:hal-04031976v1
A. Cohen, C. Farhat, A. Somacal, Y. Maday

Nonlinear approximation spaces for inverse problems — 2023
Analysis and Applications; arXiv:2209.09314
A. Cohen, M. Dolbeault, O. Mula, A. Somacal

Deep learning-based schemes for singularly perturbed convection-diffusion problems — 2023
ESAIM : Proceedings and Surveys; arXiv:2205.04779
A. Beguinet, V. Ehrlacher, R. Flenghi, M. Fuente, O. Mula, A. Somacal.

Reduced order modeling for elliptic problems with high contrast diffusion coefficients — 2023
ESAIM : Mathematical Modelling and Numerical Analysis; HAL:hal-03549810
A. Cohen, W. Dahmen, Dolbeault M., A. Somacal

Uncovering differential equations from data with hidden variables — 2022
Physical Review E (Vol. 105, No. 5); arXiv:2002.02250
A. Somacal, L. Boechi, M. Jonckheere, V. Lefieux, D. Picard, E. Smucler

Clustering high dimensional meteorological scenarios : Results and performance index — 2021
International Journal of Approximate Reasoning (Vol. 139, 1-11); arXiv:2012.07487
Y. Barrera, L. Boechi, M. Jonckheere, V. Lefieux, D. Picard, E. Smucler, A. Somacal, A. Umfurer

Anhysteretic remanent magnetization : model of grain size distribution of spherical magnetite grains — 2018
Studia Geophysica et Geodaetica (62 (2), 339-351);
C. Vasquez, F. Sampienza, A. Somacal, S. Fazzito

Conferences

MORTech `Talk` — Nov 2025
Contributed talk : Natural gradient descent with momentum — *Zaragoza, Spain*

Approximation, geometry and probability in high dimensions `Attended` — Sep 2025
Attended conference — *Będlewo, Poland*

ENUMATH `Invited speaker` — Sep 2025
Mini-symposium : optimization for scientific ML — *Heidelberg, Germany*

Computation and learning in high dimensions `Attended` — Aug 2025
Attended conference — *Oberwolfach, Germany*

Workshop in honour of Albert Cohen `Invited speaker` — Jul 2025
Plenary talk : Natural gradient descent with momentum — *Paris, France*

SMAI `Organise mini-symposium` `Talk` — Jun 2025
Mini-symposium : Scientific Machine Learning
Talk : Natural gradient descent with momentum — *Carcans, France*

SIGMA Workshop `Attended` — Oct 2024
Attended conference — *Marseille, France*

CaLISTA Workshop Geometry-Informed Machine Learning `Attended` — 2024
Attended conference — *Paris, France*

Grenoble Artificial Intelligence workshop `Poster` — May 2024
Poster : State estimation of urban air pollution — *Grenoble, France*

Lions-Magenes days `Talk` — May 2024
Talk : High order recovery of geometric interfaces — *Pavia, Italy*

Physics of Complex Systems and Global Change `Poster` — Mar 2024
Poster : State estimation of urban air pollution — *Les Houches, France*

ICIAM `Invited speaker` — Aug 2023
Mini-symposium : non-linear subcell reconstruction — *Tokyo, Japan*

ICOSAHOM `Talk`   Aug 2023
Talk : Edge adaptive schemes and machine learning   *Seoul, South Korea*
CEMRACS : Scientific Machine Learning `Invited speaker`   Jul 2023
Practical session : Linear and Non-linear Schemes for Forward Model Reduction   *Marseille, France*
FoCM `Attended`   Jun 2023
Attended conference   *Paris, France*
Math 2 Product (M2P) `Invited speaker`   May 2023
Talk at mini-symposium : Modeling air pollution at a city scale   *Taormina, Italy*
Khipu : AI Latin-American meeting `Poster`   Mar 2023
Poster : Edge adaptive schemes and machine learning   *Montevideo, Uruguay*
YAMC : Second Conference of Young Applied Mathematicians `Invited speaker` `Talk` Sep 2022
Mini-course : Reduced models and ML
Talk : Edge adaptive schemes   *Arenzano, Italy*
Curves and Surfaces `Talk`   Jun 2022
Talk : Edge adaptive schemes and machine learning   *Arcachon, France*
CEMRACS : Data assimilation and model reduction `Invited speaker`   Jul 2021
Practical session : Approximation of multivariate functions   *Marseille, France*
Deep learning and partial differential equations `Poster`   Jun 2021
Poster : Edge adaptive schemes and machine learning   *INI, England*
PAISS : Artificial Intelligence Summer School `Poster`   Jul 2021
Poster : Edge adaptive schemes and machine learning   *Grenoble, France*
SMAI : Société de Mathématiques Appliquées et Industrielles `Poster`   Jun 2021
Poster : Edge adaptive schemes and machine learning   *Montpellier, France*
Khipu : First Latinoamerican meeting of Artificial Intelligence `Poster`   Dec 2019
Poster : Uncovering differential equations from data   *Montevideo, Uruguay*
Annual Conference of the Argentinian Physics Society `Talk`   Nov 2018
Talk : Multiplex network integration   *Buenos Aires, Argentina*
Machine Learning Summer School `Poster`   May 2018
Poster : Multiplex network integration   *Buenos Aires, Argentina*
Annual Conference of the Argentinian Physics Society `Poster`   Nov 2016
Poster : Grain size distribution of SD magnetite   *Tucumán, Argentina*

Seminars and forums

Séminaire d'Analyse Numérique et Calcul Scientifique `Talk`   2025
Natural gradient descent with momentum
Beçanson, France

Applied mathematics seminar at Laboratoire de Mathématiques Jean Leray `Talk`   2024
Non-linear inverse problems and applications to image reconstruction
Nantes, France

Instituto de Tecnologías Emergentes y Ciencias Aplicadas (ITECA) seminar `Talk`   2023
Metodos lineales y machine learning para modelado de sistemas fisicos mediante ecuaciones diferenciales
Buenos Aires, Argentina

Séminaire Jeunes Chercheurs de Reims `Talk`   2022
Edge adaptive schemes and machine learning for high-accuracy finite volume schemes
Reims, France

Jacques Luis-Lions PhD student's seminar `Talk`   2022
Modelling air pollution at a city scale
Paris, France

Universidad de Chile PhD student's seminar `Talk`   2021
Non linear reduced models for forward modelling and inverse problems : applications to model air pollution
Virtual

Club of Rome Global Youth Summit `Moderator`   2020
Virtual

Seminar of Machine Learning at Calculus Institute `Talk`   2018
Neworks : from comunities to learning and biology
Buenos Aires, Argentina

South American Bussines Forum `Invited speaker`   2018
Progress. To where ?
Buenos Aires, Argentina

Geophysics Communication Meeting `Talk`   2016
Models for Artiftial Magnetization
Buenos Aires, Argentina

Honors and awards

PhD thesis `Scolarship` — 2020
Sorbonne Université, Institut des Sciences du Calcul et des Données (ISCD)

Hackathon TechTreck `Prize` — 2019
1st prize in Finance
Argentina

UAM-Santander scholarship `Scolarship` — 2016
1 semester of studies
Universidad Autonoma de Madrid

Hackathon Agro `Prize` — 2016
1st prize
Argentina

In International Olympiads

III Latinamerica Olympiad of Astronomy and Astronautic `Prize` — 2011
Silver medal
Brasil

XV Iberoamerican Physics Olympiad `Prize` — 2010
Silver medal
Panamá

In National Olympiads

Mathematics

National Olympiads in Mathematics `Prize` — 2004–10
Annual Honourable Mentions

Metropolitan and regional rounds in Mathematics `Prize` — 2006–2010
Honourable Mentions

International Mathematical Olympiad Selection Process `Prize` — 2009
7th and 1month training

Ñandú Argentina Mathematical Olympiad Metropolitan Round `Prize` — 2003–2005
1st, 2nd and 3rd place

Informatics

National Programming Tournament `Prize` — 2013–15
Finalist

International Collegiate Programming Contest `Prize` — 2014
South American Regionals finalist

12th Computing and Math Tournament `Prize` — 2009
Honourable mention

Physics

National Physics Olympiads `Prize` — 2010-11
1st Prize and Highest grade in the Theory exam

Metropolitan Physics Olympiads `Prize` — 2010, 2011
1st Prize and Highest grade

National Physics Olympiads `Prize` — 2009
2nd Prize

Astronomy

Argentina Astronomy Olympiad `Prize` — 2010
1st place

Chemistry

Argentina Chemistry Olympiad `Prize` — 2008–9
Bronze medal, Silver medal

Other distinctions

Academic Recognition `Prize` — 2009
Distinction from University of Buenos Aires

Microscholarship English Access from US embassy `Scolarship` — 2010
1 year program