

# ALEJANDRO IBARRA

Physical Engineering  
Doctor Of Engineering Sciences, Mention In Materials Science

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## APTITUDES

*Teamwork, Innovation, Problem Solving*

*Data Analysis, numerical simulations, mathematical modeling*

**Programming tools:**

**Python:** Statistical data analysis, time series analysis, image analysis. Programming of actuators. Predictive models. GUI design.

**MATLAB:** Data and Image analysis, predictive models. GUI design.

**C++(Arduino):** Desing and implementation of embedded system as robots and data acquisition devices.

**Numerical simulations tools:**

**FEM (COMSOL):** Structural analysis, hyperplastic models, CFD, Multiphysics models.

**DEM (Yade):** Granular Experiments, Granular structure interaction.

**Data Analysis tools (Python):** Scikit-Learn, Scipy, Numpy, Statsmodels

## EDUCATION

**Doctor of Engineering Sciences, mention in Materials Science.**

*Universidad de Santiago, Faculty of Engineering, Department of Metallurgy (2021)*

**Internship ECOS/Conicyt**  
ESPCI, PMMH (2015)

**Physical Engineer**

*Universidad de Santiago, Faculty of Sciences, Department of Physics (2015)*

## Professional Resume

I am a Doctor in Engineering and Material Sciences with expertise in scientific and engineering project execution, prototype creation, and automated fabrication techniques. I also have extensive experience in data analysis, numerical simulations, and mathematical modeling. Furthermore, I excel at working collaboratively in a team to achieve shared goals, making me an ideal candidate for roles that require proficiency in engineering and scientific research.

## Professional Experience

PMMH – ESPCI

Paris, France

• **POST DOCTORATE RESEARCHER (2022-)**

- The focus of the research lies in fabricate structures capable of self-shape morphing. These structures are made with 3D printers modified for each case, also the path programing is made by code wrote in Python. Other aspect is the project it's solve the inverse problem, given a target final shape predict which initial shape will produce it, to solve this problem a searching algorithm was implemented based in a novel method of error minimization.
- London Desing Biennale (2023) participation in the exhibition with the multidisciplinary group *Automorph*. My contribution was the construction of the system of inflation for different kinds of soft robots. The control system consist in a PID algorithm implemented in C++ for the Arduino platform for set the pressure inside each soft robot controlling air pumps and valves.

SMATC – Universidad de Santiago

Santiago, Chile

• **PHD RESEARCHER (2016-2021)**

- Development of additive manufacturing technique called direct-injection printing to construct electronic circuits within elastomers to manufacture soft sensors. Construction of the 3D robotics platform and volumetric extrusion system and through numerical simulations and data analysis a process of sensor design was implemented.
- Study of the mechanisms of locomotion in granular media inspired by the observation of nature, the experimentation was carried by the implementation of robots and numerical simulations (DEM).

• **RESEARCH ASSISTANT (2012-2016)**

- Study of fracture in thin anisotropic sheets and wrinkling of granular surfaces. Through algorithms of image analysis for fracture path detection (As Laplacian filtering and image segmentation) and 3D surface reconstruction(Stereoscopic depth estimation and Fourier fringe analysis).

Geoaire Ambiental Spa.

Santiago, Chile

• **SCIENTIFIC CONSULTANT (2014-2015-2021)**

- Development post processing tools for meteorological simulations to implement pollution transport models through Lagranian trajectory prediction.
- Implementation of CFD simulation coupled with species transport equations to characterize different types contamination sources. Also, to estimate sources speed, particle image velocimetry (PIV) were used.

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Physical Engineer  
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## List of publications

| Title  | Year |
|--|------|
| <a href="#">Designing a Contact Fingertip Sensor Made Using a Soft 3D Printing Technique</a>       | 2022 |
| A Ibarra, B Darbois-Texier, F Melo<br>Soft Robotics 9 (6), 1210-1219                               |      |
| <a href="#">Propulsion by reciprocal motion into granular media</a>                                | 2021 |
| BD Texier, A Ibarra, F Melo<br>Physical Review Fluids 6 (3), 034604                                |      |
| <a href="#">Guided Tearing: the ruler test</a>   | 2021 |
| A Ibarra, JF Fuentealba, J Bico, B Roman, F Melo<br>Physical Review Materials 5 (2), 025601        |      |
| <a href="#">Predicting tearing paths in thin sheets</a>  | 2019 |
| A Ibarra, JF Fuentealba, B Roman, F Melo<br>Physical Review E 100 (2), 023002                      |      |
| <a href="#">Friction of a sphere rolling down a granular slope</a>                                 | 2018 |
| BD Texier, A Ibarra, F Vivanco, J Bico, F Melo<br>Europhysics Letters 123 (5), 54005               |      |
| <a href="#">Optimal propulsion of an undulating slender body with anisotropic friction</a>         | 2018 |
| BD Texier, A Ibarra, F Melo<br>Soft Matter 14 (4), 635-642   |      |
| <a href="#">Helical locomotion in a granular medium</a>  | 2017 |
| BD Texier, A Ibarra, F Melo<br>Physical review letters 119 (6), 068003                             |      |
| <a href="#">Low-resistive vibratory penetration in granular media</a>                              | 2017 |
| B Darbois Texier, A Ibarra, F Melo<br>PloS one 12 (4), e0175412                                    |      |
| <a href="#">The tearing path in a thin anisotropic sheet from two pulling points: Wulff's view</a> | 2016 |
| A Ibarra, B Roman, F Melo<br>Soft Matter 12 (27), 5979-5985  |      |

## Conferences

| Title  | Year |
|--|------|
| <a href="#">Direct 3D printing of baromorph structures</a>                       | 2023 |
| A Ibarra, E Reysat, J Bico, B Roman<br>Bulletin of the American Physical Society |      |