José Ignacio Contreras Raggio

+41 78 339 64 47 • Schulhausstrasse, 8600 Dübendorf, Switzerland
joseiraggio@gmail.com • LinkedIn: @Jicr • Portfolio: JoseContreras.ch
Date of Birth: 03/03/1997 • Chilean | Swiss Residence Permit B (Family reunification)

Data-driven engineer with 7 years of experience in software development, machine learning, and image analysis. Led interdisciplinary research teams and developed automated segmentation and predictive modeling tools. Author and co-author of 10 scientific publications.

Education

Universidad Adolfo Ibáñez (UAI) & Empa/ETH Zürich Santiago, CL & Dübendorf, CH
PhD Candidate in Complex Systems Engineering Apr 2022 – Dec 2025 (expected)
Thesis: *"Investigating the mechanical and biological properties of seeded 3D-Bioplotted composite scaffolds in an in-vitro dynamic bone culture model".*
Multidisciplinary research integrating complex systems, bioengineering, and advanced manufacturing; data-driven approach to materials and biomechanics.

Universidad Adolfo Ibáñez (UAI) Santiago & Viña del Mar, CL
MSc in Bioengineering (GPA: 6.5/7.0) Mar 2020 – Dec 2022
Thesis: *"Fabrication and Characterization of 3D-Bioplotted Polycaprolactone–Bioactive Glass Composite Scaffolds for Tissue Engineering Applications".*
Grade: 7.0/7.0.

Universidad Adolfo Ibáñez (UAI) Santiago, CL
Professional Degree of Engineering in Bioengineering (GPA: 5.7/7.0) Mar 2018 – Jul 2021
Thesis: *"Design, Fidelity, and Structural Assessment of Controlled-Geometry 3D-Bioplotted Composite Porous Scaffolds".*
Grade: 6.9/7.0.

Universidad Adolfo Ibáñez (UAI) Santiago, CL
BSc in Bioengineering (GPA: 5.1/7.0) Mar 2015 – Dec 2020

Experience

Mechanical Systems Engineering – Empa/ETH Zürich Dübendorf, CH
  PhD Researcher Jul 2025 – Nov 2025
  - **Data Analysis & Automation**: Analyzed 10,000+ microscopy images using automated segmentation pipelines, combining machine learning tools and custom algorithms to extract quantitative biological data efficiently.

  PhD Researcher Jul 2023 – Sep 2024
  - **Project Leadership**: Led the development of 10+ bioactive composite formulations, integrating synthesis, 3D printing, and evaluation across mechanical, thermal, chemical, and biological domains.
  - **Research Output**: Characterized 200+ scaffold samples and accelerated experimental workflows by 40%, contributing to 2 publications and ongoing collaborative projects.

  Master's Internship Mar 2021 – Nov 2021
  - **Process Improvement**: Achieved a 98% printing success rate and improved dimensional accuracy to within 4% error margin using a custom Python script and process enhancements.
  - **Publications**: Submitted 2 peer-reviewed methods papers.

  Bachelor Internship (by IAESTE) Mar 2019 – Dec 2019
  - **Protocol Development**: Designed and validated 6+ standardized protocols for chemical, thermal, and mechanical characterization that are still in use by the laboratory.
  - **Publications**: Submitted 1 peer-reviewed paper.

Engineering Department – UAI   Santiago & Viña del Mar, CL
  Graduate Research Assistant   Mar 2020 – Nov 2025
  - **Project Leadership**: Designed and validated a dynamic bioreactor system for in vitro bone tissue engineering, enabling simultaneous perfusion and mechanical stimulation to better replicate physiological conditions.
  - **Mentoring**: Guided 8+ Master's students to successful thesis defense through research and academic writing support.

  Teaching Assistant   Aug 2016 – Dec 2020
  - **Instruction & Assessment**: Assisted 10 courses from introductory to senior level, leading problem-solving sessions, and contributing to exams and assignments across programming, calculus, microeconomics, tissue engineering, biomaterials, and biomechanics.

  Undergraduate Research Assistant   Jul 2016 – Feb 2020
  - **Fabrication Protocol**: Designed and validated 3 standardized methods for 3D-printed scaffold fabrication and mechanical testing, enabling reproducible workflows.

CloudLab – Sonda & UAI   Santiago, CL
  Senior Software Developer   Oct 2016 – Mar 2017
  - **Software Development**: Led development of a Laravel–Vue.js customer management dashboard for Sonda employees, used daily by 100+ users to streamline administrative workflows.

  Junior Software Developer   Jun 2016 – Sep 2016
  - **Performance Recognition**: Advanced to Senior Developer role in 4 months in response to high-quality project delivery, compared to the typical 1.5-year progression timeline.

Projects and Publications

*Shared first authorship.

[1] **Contreras Raggio, J.I.** *et al.*   In preparation for submission to *Biomaterials Advances*, 2025
From Seashells to Scaffolds: A Comparative Chemical, Mechanical, and Biological Characterization of Natural and Synthetic Calcium Carbonate in 3D-Printed PCL Composites

  - Synthesized natural seashell–derived bioactive material, compounded composites, and 3D-printed scaffolds.
  - Performed biological evaluations, microscopy imaging, and machine-learning-based cell morphology analysis.
  - Skills: Materials synthesis, DIW 3D printing, cell culture, microscopy, Python (segmentation, morphological descriptors).

[2] **Contreras Raggio, J.I.** *et al.*   In preparation for submission to *Biomaterials Advances*, 2025
Biocompatibility of Polycaprolactone-Bioglass Composite Scaffolds: Cellular and Molecular Insights for Tissue Engineering

  - Led complete fabrication workflow, from material compounding and 3D printing to post-processing.
  - Conducted morphological, chemical, and biological analyses of composite scaffolds.
  - Skills: Composite fabrication, rheology, SEM/EDS, confocal imaging, data interpretation, technical writing.

[3] Millan, C., Benjumeda, I., **Contreras Raggio, J.I.** *et al.*   Submitted to *Materials Today Communications*, 2025
Biocompatibility and Morphological Analysis of Argopecten purpuratus Carbonate Shells for Tissue Engineering Applications with Human Gingival Mesenchymal Stem Cells

  - Contributed to manuscript writing and performed microCT and chemical characterization.
  - Skills: MicroCT, data visualization, scientific writing.

[4] **Contreras Raggio, J.I.** *et al.*   Under review in *MethodsX*, 2025
Methodology to predict 3D printing parameters of custom-made inks based on characterization of ink rheology

  - Developed and verified analytical formulas correlating viscosity, shear rate, and print fidelity to minimize trial-and-error testing.
  - Skills: Rheology, experimental design, Python, data modeling, algorithm validation, scientific writing.

[5] **Contreras Raggio, J.I.** *et al.* *MethodsX*, 2025
PorMe: A validated open-source image-based pore size and porosity measurement tool for 3D-printed structures

- Developed an automated open-source tool for pore and porosity quantification of 3D-printed scaffolds.
- Skills: Python, image analysis, algorithm development, scientific writing, open-source software.

[6] **Contreras Raggio, J.I.** *et al.* *Polymers*, 2025
Effect of Processing Parameters on the Printability and Mechano-Biological Properties of Polycaprolactone–Bioactive Glass Composites for 3D-Printed Scaffold Fabrication

- Investigated the influence of 3D-printing parameters on scaffold structure and cell response.
- Synthesis, manufacture, characterization, and analysis of polymer–ceramic scaffolds for bone regeneration.
- Skills: DIW 3D printing, rheology, SEM, data visualization, scientific writing.

[7] Dreyer, M.J., Weisse, B., **Contreras Raggio, J.I.** *et al.* *Journal of Orthopaedic Research*, 2024
The influence of implant design and limb alignment on in vivo wear rates of fixed-bearing and rotating-platform knee implant retrievals

- Supported quantitative analysis of retrieved knee implants and in-vivo wear evaluation.
- Skills: Retrieval analysis, mechanical testing, data processing.

[8] **Contreras Raggio, J.I.***, Toro Arancibia, C.*, *et al.* *Polymers*, 2022
Height-to-Diameter Ratio and Porosity Strongly Influence Bulk Compressive Mechanical Properties of 3D-Printed Polymer Scaffolds

- Led design, printing, and testing of 3D-printed polymer scaffolds to analyze mechanical scaling effects.
- Skills: Mechanical testing, microCT, CAD design, data analysis, teamwork.

[9] Vallejos Baier, R.*, **Contreras Raggio, J.I.*** *et al.* *Biomaterials Advances*, 2022
Shape Fidelity, Mechanical and Biological Performance of 3D-Printed Polycaprolactone–Bioactive Glass Composite Scaffolds

- Synthesis, manufacture, characterization, and analysis of polymer–ceramic scaffolds for bone regeneration.
- Skills: Composite materials, 3D printing, microscopy, statistical analysis.

[10] Vallejos Baier, R., **Contreras Raggio, J.I.** *et al.* *Materials Science and Engineering C*, 2021
Structure–Function Assessment of 3D-Printed Porous Scaffolds by a Low-Cost/Open-Source FFF Printer

- Evaluated printing fidelity and mechanical properties using low-cost 3D-printing technologies.
- Skills: FDM printing, mechanical analysis, open-source tools, reproducible research.

[11] **Software Development Project** Internal Project, SONDA-UAI, 2016
Development of a Web Dashboard for Client Data Management and Decision Support

- Led the development of a full-stack web application integrating Vue.js and Laravel for client data visualization and workflow optimization.
- Managed a small development team, coordinating feature planning, implementation, and testing.
- Improved information accessibility and decision-making efficiency for internal and client operations.
- Skills: Software architecture, full-stack development, project management, leadership.

Skills & Interests

Technical Skills:

- **Characterization:** MicroCT, Optical/Fluorescence Microscopy, SEM/EDS, XRD, FTIR, DSC, TGA, Rheology, Water Contact Angle, Mechanical Testing (ASTM: compression, bending, tensile), Cell Culture, Live/Dead Assays
- **Modeling, Image Analysis & Data Processing:** Digital Volume Correlation (DVC), ImageJ/Fiji, Ilastik, CellProfiler, Mimics, VGStudio, Avizo Fire, Python (NumPy, Pandas, Matplotlib, Open3D), MATLAB, R, Machine Learning (Segmentation, Morphology Analysis), Data Visualization, Process Automation
- **Fabrication & Prototyping:** 3D Printing (DIW, FFF), CAD (SolidWorks, Fusion 360, Autodesk Inventor), Composite Processing, Milling, Material Synthesis, Bioreactors, G-code Generation, Prototyping Workflow Design

Software & Tools:
- **Advanced:** Python, R, Git/GitHub, ImageJ/Fiji, VGStudio, Avizo Fire, Jupyter Notebook, SolidWorks, Excel, PowerPoint, Word
- **Intermediate:** MATLAB, C++, JavaScript, SQL, LaTeX, scikit-learn, TensorFlow, Machine Learning, Autodesk Inventor, ParaView, Mimics, Fusion 360, Arduino
- **Basic:** C#, Docker, REST APIs, AWS, Bash/Linux scripting

Soft Skills: Team-oriented, solution-driven, goal-focused, resilient, adaptable, fast learner, self-motivated, problem-solving mindset, positive attitude, leadership experience

Languages: Spanish (Native), English (C1), German (A2)

Interests: Golf, Padel, Sailing, Wakeboard, Water Ski, Snowboard, Hiking, Cycling, Chess, Volleyball, Bowling, Gaming, Motorbike Riding, Horse Riding

Leadership & Volunteering

IAESTE Switzerland – Committee Member (IT Responsible)   2021 – Present | Zürich, CH
- Volunteer work supporting international trainees; responsible for IT infrastructure and event organization for exchange students

di Raggio CL (Entrepreneurship) – CEO   2021 – 2024 | Santiago, CL
- Managed a family clothing business overseeing marketing, strategy, and financial operations.

LoL UAI – Committee President   2015 – 2018 | Santiago, CL
- Led a student organization, coordinating sponsored events and securing university funding for student activities.

Team Chile (Bowling) – National Youth Team Member   2011 – 2016 | Santiago, CL
- Represented Chile in international bowling tournaments with professional training and national competition experience.

Ankama Games – Community Ambassador   2012 – 2015 | Santiago, CL
- Organized local gaming community events and media coverage as part of the official ambassador program.

Scouting – Patrol Leader   2006 – 2010 | Santiago, CL
- Guided and mentored youth members through leadership, teamwork, and outdoor activities.

References

Prof. Dr. Juan F. Vivanco — PhD Supervisor, UAI — juan.vivanco@uai.cl
Prof. Dr. Ameet Aiyangar — PhD Co-Supervisor, Empa & University of Bern — ameet.aiyangar@empa.ch
Mr. Bernhard Weisse — Group Leader, Empa — bernhard.weisse@empa.ch
Dr. Gilberto Siqueira — Co-Supervisor, Empa — gilberto.siqueira@empa.ch

Contact details available upon request.