

Luis Ángel

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Computational Scientist · Software Engineer

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Education

PhD in Computer Science

University of California, Santa Barbara · UCSB, Sep 2018 – Dec 2022.

MSc in Computer Science

University of California, Los Angeles · UCLA, Sep 2010 – Mar 2012.

BEng in Computer Systems

Tech. Institute of Ciudad Guzmán · ITCG, Aug 2003 – Jul 2008.

Technical Skills

Artificial intelligence and data science. Machine learning, neural networks, reinforcement learning, and evolutionary computing.

◆ **Proficient:** TensorFlow, Keras, Scikit-learn, Pandas, and SciPy.

Scientific computing and applied mathematics. Matrix analysis, ODEs and PDEs, conservation laws, level-set method, physics-based simulations, image processing, and particle systems.

◆ **Advanced:** Matlab, C/C++, and Python (NumPy).

Computer graphics. Computer animation, real-time high-quality rendering, and computational geometry.

◆ **Proficient:** OpenGL.

Full-stack development. Web applications, API and database programming, version control, CI-CD, containerization, and Jira.

◆ **Proficient:** Java, Servlets, and JSPs; Apache Tomcat, Lucene, Axis2, and ActiveMQ; MySQL, MonetDB, MongoDB, Snowflake, HTML, XML, JavaScript (jQuery), CSS, and GIT.

◆ **Intermediate:** Scala, Docker, PHP, Logi Analytics, and Airflow.

◆ **Beginner:** ReactJS and Go.

Graphic design. Adobe Creative Cloud Suite (Photoshop, Illustrator, InDesign), Corel Draw.

General-purpose software. Windows, Linux, macOS, and IDEs (IntelliJ, GoLand, CLion, PyCharm, PHPStorm, Xcode, VS Code, Eclipse, NetBeans).

Publications

LÁLC and F. Gibou. **Machine learning algorithms for three-dimensional mean-curvature computation in the level-set method.** *J. Comput. Phys.*, 478: 11195, 2023. [10.1016/j.jcp.2023.111955](https://doi.org/10.1016/j.jcp.2023.111955).

LÁLC and F. Gibou. **Error-correcting neural networks for semi-Lagrangian advection in the level-set method.** *J. Comput. Phys.*, 471: 111623, 2022. [10.1016/j.jcp.2022.111623](https://doi.org/10.1016/j.jcp.2022.111623).

LÁLC and F. Gibou. **Error-correcting neural networks for two-dimensional curvature computation in the level-set method.** *J. Sci. Comput.*, 93(1): 6, 2022. [10.1007/s10915-022-01952-2](https://doi.org/10.1007/s10915-022-01952-2).

LÁLC and F. Gibou. **A hybrid inference system for improved curvature estimation in the level-set method using machine learning.** *J. Comput. Phys.*, 463: 111291, 2022. [10.1016/j.jcp.2022.111291](https://doi.org/10.1016/j.jcp.2022.111291).

LÁLC and F. Gibou. **A deep learning approach for the computation of curvature in the level-set method.** *SIAM J. Sci. Comput.*, 43(3): A1754–A1779, 2021. [10.1137/20M1316755](https://doi.org/10.1137/20M1316755).

LÁLC, E. M. Novoa-del-Toro, E. A. Vega-Dueñas, Ma. R. Montes-Álvarez, and T. Santamaría-Preciado. **Neural model for predicting volcanic events.** *2008 Jalisco's Sci. and Tech. Award*, 2009.

Neural net model for predicting volcanic events of “El Colima”. *2008 Int. Cong. of Comput. Sci. and Inf. Tech.*, 2008 (Poster).

Processing vulnerability maps’ data with neural networks. *2008 Int. Cong. of Comput. Sci. and Inf. Tech.*, 2008 (Poster).

Professional Experience

Software engineer. VideoAmp. Backend programmer and data analyst. Optimized Snowflake queries for household ratings computation, improving performance by four to nine times (Dec 2022 – Present).

Graduate student researcher. CASL at UCSB. Superhydrophobic surface researcher, developing numerical experiment setups to support emergent turbulent and laminar fluid dynamics theories (winter – fall 2022). Scientific machine learning and computational science researcher, devising the first application of neural networks in the estimation of geometrical properties in advected surfaces (summer 2019, summer 2020).

Teaching associate. UCSB. Introduction to Computational Science (Winter 2021)

Teaching assistant. UCSB. Leading sessions and preparing course materials for Found. of DB Syst. (fall 2019), Prob. Solving with Comput. I (winter 2020, summer 2021), Intro. to Comput. Sci. (spring 2020), Intro. to Computational Sci. (fall 2020, fall 2021), and Math. of Eng. (spring 2021).

Software engineer and researcher. Inpixon. Front-end developer of *ZoneAware/ZoneDefense* and full-stack developer and project lead of *Visual Workbench*. Software engineer and researcher of an AI-based device positioning engine (Jun 2016 – Sep 2018).

Teaching assistant. UCLA. Leading sessions and preparing course materials for Math. Models and Methods for Comput. Sci. (fall 2014, winter 2016), Web Apps. (winter 2015), and Intro. to Comput. Sci. I (spring 2015).

Full-stack developer consultant. Villas Camino del Mar Resorts. (2008 – 2016).

Full-stack developer and graphic designer. Municipal Government of Tecalitlán, Jalisco, *2012-2015 and 2010-2012 administrations* (2012 – 2013, Jan – Aug 2010).

Lecturer. ITCG. Simulation and Artificial Neural Networks (Fall 2012).

Fellowships

- ◆ Elings Wells Dissertation Fellowship, UCSB (Fall 2022).
- ◆ Hispanic Scholarship Foundation scholar (2020 – 2021).
- ◆ UC Regents Fellowship for PhD students, UCSB (2018 – 2022).
- ◆ CONACyT “Bicentennial” Fellowship for graduate students abroad (2010 – 2012).
- ◆ PRONABES Fellowship for undergraduate students (2003 – 2008).

Featured Projects

NED: Collective named entity disambiguation via personalized Page Rank and context embeddings. A solution to the disambiguation task combining traditional candidate mapping entity generation and local evaluation with word embeddings and personalized PageRank. The final mapping entities for a surface form is obtained by performing a maximal discriminant selection.

Reflective shadow maps. A reflective shadow maps implementation with percentage-closer soft shadows and screen-space ambient occlusion. Our approach works with blurred textures and diffuse 3D objects shaded with the Blinn-Phong model. We have also resorted to deferred rendering to achieve interactive rates.

Precomputed radiance transfer. We render a scene with a 3D object model and a cube-map as lighting source. Our system supports precomputed radiance transfer on shadowed diffuse objects

Arthropoda. A physics-based simulation of an *Araneus Diadematus* biomechanical model using the ODE framework and OpenGL.

Lisa. A physics-based simulation of a salamander for walking and swimming. The system uses the ODE framework and OpenGL.

Disambiguation of named entities in web lists. A system that yields the correct mapping for mentioned entities in a list by using simulated annealing. Our application utilizes Wikipedia as the knowledge base.

Snow simulation. 2D OpenGL physics-based snow simulation using the material point method. We emulate the snow mechanics, viscosity, and composition under the effects of external and internal forces.

Face classification and generation. Matlab application with SVD and image-processing machinery to classify human faces. Further statistical analysis allows to generate random faces given the intensity and geometry features extracted from the training set.

Antarctica: exploring the MAXSON architecture. [Master's degree project.](#) Simulation of an artificial ecosystem where virtual creatures learn to survive by eating food and avoiding poison, and to reproduce to maintain the continuity of their species. The agents emulate natural phenomena such as nuptial feeding and male brooding by resorting to a neural-based reinforcement learning.

A symmetry-seeking model for 3D object reconstruction using a mesh of particles. Three-dimensional object reconstruction from 2D input images using a mesh of particles connected by springs. The particle mesh deforms into a target shape as internal forces (elasticity) react to external forces (image, symmetry, and expansion/contraction).

Auction web service. Web application implementing an auction website with Java, MySQL, Apache (Lucene, Tomcat, and Axis2), JavaScript, and AJAX.

Multi-agent simulation using continuum crowds. Crowd simulation where agent behavior resembles fluid motion. The displacement of agents depends on crowd densities at different locations in a discrete environment that represents a potential/velocity field.

Darwinism, Lamarckism, and knowledge exchange among animats. Simulation of an artificial ecosystem where animat creatures learn to survive from two evolutionary perspectives: Darwinism and Lamarckism. Agents have egocentric maps that allow them to acquire and share knowledge about the environment they live in.

Neural model for predicting volcanic events. [Bachelor's degree thesis.](#) Development of a neural network that predicts volcanic eruptions based on current input data and historical information.

Presentations and Academic Events

Machine-learning tools for curvature computation in the level-set method. Multidisciplinary University Research Initiatives (MURI) Program. UCSB/UMN (winter 2022).

A talk about computer science. Regional High School of Ciudad

Guzmán at Tecalitlán, UDG (spring 2013).

A symmetry-seeking model for 3D object reconstruction using a mesh of particles. Inf. Tech. Natl. Cong. ITCG (fall 2012).

A talk about artificial intelligence. 19th Science and Technology State Week. Jalisco's Sci. and Tech. State Council (fall 2012).

Neural net model for predicting volcanic events of "El Colima". 2008 Int. Cong. of Comput. Sci. and Inf. Tech. ITCG (2008).

Processing vulnerability maps data with neural nets. 2008 Int. Cong. of Comput. Sci. and Inf. Tech. ITCG (2008).

Participant. ITESO 8th Local Programming Contest. ITESO (2007).

Access system based on phone cards. 21st Natl. Creativity Event, Regional Stage, 3rd Reg. Technological Institute of La Laguna (2006).

Access system based on phone cards. 4th Regional Exhibition and Tech. Innovation Award. Technological Institute of Morelia (2006).

Awards and Distinctions

First place graduating student from the Computer Systems Engineering program at his institution in 2008, by the Mex. Natl. Assoc. of Eng. Schools (Jun 2009).

Science and technology award, early research category, by Jalisco's Sci. and Tech. State Council (Feb 2009).

Excellence medal to the engineering student, by ITCG (Sep 2008).

Highest GPA (99.5) in the 2003 – 2008 class of the Comput. Syst. Eng. program, by ITCG (Sep 2008).

Graduating with honors, (GPA of 99.5), from the 2003 – 2008 class of the Comput. Syst. Eng. program, by ITCG (Sep 2008).

Satisfactory conclusion of the networking and distributed systems field requirements in the 2003 – 2008 class of the Comput. Syst. Eng. program, by ITCG (Sep 2008).

Lead participant in the university program "Peer Tutoring", by UDG (Jul 2003 and Jul 2002).

First place in high school academic performance in the 2000 – 2003 class, by UDG (Jul 2003).

First place in academic performance of the 4th, 3rd, 2nd, and 1st high school semesters, by UDG (Jul 2002, Feb 2002, Jul 2001, and Jan 2001).