

# Boris Leonardo Almonacid Gutiérrez

## 1 Contact

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## 2 Education

Pontifical Catholic University of Valparaíso, Valparaíso, Chile.

- 2015–2018    **PhD in Computer Engineering**  
Emphasis in combinatorial optimisation, evolutionary algorithms, metaheuristics, heuristics, simulation, evolutionary algorithms, swarm intelligent, local-search, exploration-exploitation, industrial problems.  
  
Thesis: Andean Condor Algorithm: A new metaheuristic inspired by nature to solve cell formation problems.  
  
Internship: Research Internship in MiniZinc Group, University of Melbourne, Melbourne, Australia, September to December 2017.
- 2015–2016    **Master in Computer Science**
- 2011–2013    **Master in Engineering Informatics**  
Emphasis in open-pit mining, planning, constraint programming, optimisation.  
  
Thesis: Resolve long-term mining planning problems in open-pit mines with constraint programming.
- 2013    **Diploma in Management Control**
- 2006-2010    **Degree in Engineering Informatics**

## 3 Scientific Activities

### 3.1 Voluntary Activities

- 2020 - 2021    **Voluntary Research for Covid-19** CoronaWhy  
I have worked as a volunteer researcher at the CoronaWhy group ([www.coronawhy.org](http://www.coronawhy.org)), which is a globally distributed research organisation that attempts to answer key questions related to COVID-19. List of contributions currently made:  
  
- Hackaton EUvsVirus: Control panel to show bed indicators at the country level. Case study: Switzerland.  
Project description:  
<https://devpost.com/software/dashboard-for-displaying-bed-indicators-at-the-country-level>.  
Available online: <https://switzerlandbedsdashboard.herokuapp.com/>

- Show Covid-19 research on Twitter.  
 Project description:  
<https://devpost.com/software/show-covid19-research-on-twitter>.  
 Available online: <https://twitter.com/covid19articles>

### 3.2 Research Awards

2016 **Developing Nations Research Awards** Animal Behavior Society 2016  
 Research: Predict flight patterns of the Andean Condor (*Vultur gryphus*).  
 Url: [www.animalbehaviorsociety.org/NEWSLETTERS/61-2/awardees.php](http://www.animalbehaviorsociety.org/NEWSLETTERS/61-2/awardees.php).

### 3.3 Memberships

2014 - current **Animal Behavior Society** Glenview, Illinois, 60025 USA  
<https://www.animalbehaviorsociety.org/web/index.php>

2018 - current **Figshare**  
[https://figshare.com/authors/Boris\\_Almonacid/4110337](https://figshare.com/authors/Boris_Almonacid/4110337)

2018 **eLife** Cambridge CB4 1YG, United Kingdom  
<https://elifesciences.org/inside-elifesciences/912b0679/early-career-advisory-group-elifesciences-welcomes-150-ambassadors-of-good-practice-in-science>

2017 - current **National Association of Postgraduate Researchers** Chile  
<https://anip.cl/>

2018 - current **Association for Constraint Programming** Australia  
<http://cp2014.a4cp.org/about/members>

### 3.4 Research projects

2020-2021 **Principal investigator**  
 Project name: AutoMH - Automatically Create Evolutionary Metaheuristic Algorithms Using Reinforcement Learning.

2016-2018 **Principal investigator**  
 Project name: Selection of a biodiversity conservation area. One published scientific article.

2017-2018 **Principal investigator**  
 Project name: Metaheuristic algorithms with cellular automaton in discrete worlds. One published scientific article, and one published scientific conference.

2016-2018 **Responsible researcher**  
 Project name: Behaviour patterns of the Andean Condor. One published scientific article.

### 3.5 Fields of Interest

- Artificial Intelligence, Machine Learning, Cellular Automaton, Agent systems, Prey-Predator Models.
- Metaheuristic Generation, Evolutionary Algorithms, Metaheuristics, Swarm Intelligent, Stochastic Algorithms, Constraint programming.
- Biodiversity Conservation Problems, Global Change problems, Sustainable Development Goals.
- Digital Art, Info-graphics, Scientific communication.
- Optimisation problems, Industrial problems.

## 4 Academic Experience

2015–2017

### **Co-Advisor**

Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile

Duties and responsibilities: Support in the supervision of undergraduate students in the projects of evolutionary algorithms, both in the conceptual part, as in the technical part.

List of thesis projects:

- Research: Using African Buffalo Optimization for solving cell formation problems.  
Student: Alberto Felipe Cabrera Morales.
- Research: Using Wolf Search Algorithm for solving cell formation problems.  
Student: Patricio Antonio Fonseca López.
- Research: Using Egyptian Vulture for solving cell formation problems.  
Student: Fabian Andrés Aspée Encina.
- Research: Using Flower Pollination Algorithm for solving cell formation problems.  
Students: Michele Marco De Conti Rivara and Ronald Andrés Rubio Hurtado.
- Research: Using Cuckoo Search for solving cell formation problems.  
Students: Ana Elizabeth Jaime Bernal and Maykol Andrés Ramírez González.
- Research: Using Artificial Bee Colony for solving cell formation problems.  
Students: Leandro Alexander Vásquez Mora and Roberto Zulantay Arias.
- Research: Using Big Bang–Big Crunch for solving cell formation problems.  
Student: Edgardo Andres Zelada Segovia.

Achievements:

- It has been possible to carry out a scientific article and four conference articles based on the results of the research projects

2008

### **Teaching Assistant**

Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile

Carry out activities to support undergraduate teachers for the different activities that take place in the courses.

Duties and responsibilities:

- Teaching Assistant of Logic Programming course, 2008.
- Teaching Assistant of Logic Programming course, Students exchange program, 2008.
- Teaching Assistant of Computer Architecture course, 2008.

## 5 Publications

### Article in Peer-Reviewed Journal

- [1] Boris Almonacid, Fabián Aspée and Francisco Yimes. "Autonomous Population Regulation Using a Multi-Agent System in a Prey–Predator Model That Integrates Cellular Automata and the African Buffalo Optimization Metaheuristic". In: *Algorithms* 12.3 (2019), p. 59.
- [2] Boris Almonacid and Ricardo Soto. "Andean Condor Algorithm for cell formation problems". In: *Natural Computing* (2018), pp. 1–31.
- [3] Boris Almonacid, Juan Reyes-Hagemann, Juan Campos-Nazer and Jorge Ramos-Aguilar. "Selecting a biodiversity conservation area with a limited budget using the binary African buffalo optimisation algorithm". In: *IET Software* 12.2 (2017), pp. 96–111.
- [4] Boris Almonacid, Fabián Aspée, Ricardo Soto, Broderick Crawford and Jacqueline Lama. "Solving the manufacturing cell design problem using the modified binary firefly algorithm and the egyptian vulture optimisation algorithm". In: *IET Software* 11.3 (2016), pp. 105–115.
- [5] Ricardo Soto, Broderick Crawford, Boris Almonacid and Fernando Paredes. "Efficient parallel sorting for migrating birds optimization when solving machine-part cell formation problems". In: *Scientific Programming* 2016 (2016), p. 21.

### International Peer-Reviewed Conferences-Proceedings

- [1] Boris Almonacid. "Simulation of a Dynamic Prey-Predator Spatial Model Based on Cellular Automata Using the Behavior of the Metaheuristic African Buffalo Optimization". In: *International Work-Conference on the Interplay Between Natural and Artificial Computation*. Springer, Cham. 2017, pp. 170–180.
- [2] Boris Almonacid, Ricardo Soto and Broderick Crawford. "Comparing three simple ways of generating neighboring solutions when solving the cell formation problem using two versions of migrating birds optimization". In: *2017 17th International Conference on Computational Science and Its Applications (ICCSA)*. IEEE. 2017, pp. 1–9.
- [3] Ricardo Soto, Broderick Crawford, Rodrigo Olivares, Héctor Ortega and Boris Almonacid. "An Imperialist Competitive Algorithm to Solve the Manufacturing Cell Design Problem". In: *Proceedings of the Computational Methods in Systems and Software*. Springer, Cham. 2017, pp. 102–113.
- [4] Ricardo Soto, Broderick Crawford, Leandro Vásquez, Roberto Zulantay, Ana Jaime, Maykol Ramirez and Boris Almonacid. "Solving the Manufacturing Cell Design Problem using Artificial Bee Colony with Adaptive Population". In: *Rus, Vasile and Markov, Zdravko – FLAIRS-30 Poster Abstracts – The Thirtieth International Flairs Conference*. 2017, p. 1.
- [5] Ricardo Soto, Broderick Crawford, Leandro Vásquez, Roberto Zulantay, Ana Jaime, Maykol Ramírez and Boris Almonacid. "Solving the Manufacturing Cell Design Problem Using the Artificial Bee Colony Algorithm". In: *International Workshop on Multi-disciplinary Trends in Artificial Intelligence*. Springer, Cham. 2017, pp. 473–484.
- [6] Ricardo Soto, Broderick Crawford and Boris Almonacid. "Efficient leader exchange for migrating birds optimization when solving machine-part cell formation problems". In: *2016 11th Iberian Conference on Information Systems and Technologies (CISTI)*. IEEE. 2016, pp. 1–7.
- [7] Ricardo Soto, Broderick Crawford, Boris Almonacid, Stefanie Niklander and Eduardo Olguín. "Optimization for UI Design via Metaheuristics". In: *International Conference on Human-Computer Interaction*. Springer, Cham. 2016, pp. 150–154.
- [8] Ricardo Soto, Broderick Crawford, César Carrasco, Boris Almonacid, Victor Reyes, Ignacio Araya, Sanjay Misra and Eduardo Olguín. "Solving manufacturing cell design problems by using a dolphin echolocation algorithm". In: *international conference on computational science and its applications*. Springer, Cham. 2016, pp. 77–86.
- [9] Ricardo Soto, Broderick Crawford, Ana Jaime, Maykol Ramírez, Boris Almonacid, Leandro Vásquez and Roberto Zulantay. "Solving the Manufacturing Cell Design Problem Using the Cuckoo Search". In: *2016 Fifteenth Mexican International Conference on Artificial Intelligence (MICAI)*. IEEE. 2016, pp. 123–129.
- [10] Ricardo Soto, Broderick Crawford, Jacqueline Lama and Boris Almonacid. "A firefly algorithm to solve the manufacturing cell design problem". In: *2016 11th Iberian Conference on Information Systems and Technologies (CISTI)*. IEEE. 2016, pp. 1–7.

- [11] Ricardo Soto, Broderick Crawford, Rodrigo Olivares, Michele De Conti, Ronald Rubio, Boris Almonacid and Stefanie Niklander. "Resolving the manufacturing cell design problem using the flower pollination algorithm". In: International Workshop on Multi-disciplinary Trends in Artificial Intelligence. Springer, Cham. 2016, pp. 184–195.
- [12] Ricardo Soto, Broderick Crawford, Carolina Zec, Andrés Alarcón and Boris Almonacid. "A bat algorithm to solve the manufacturing cell design problem". In: 2016 11th Iberian Conference on Information Systems and Technologies (CISTI). IEEE. 2016, pp. 1–7.
- [13] Ricardo Soto, Broderick Crawford, Boris Almonacid and Fernando Paredes. "A migrating birds optimization algorithm for machine-part cell formation problems". In: Mexican International Conference on Artificial Intelligence. Springer, Cham. 2015, pp. 270–281.
- [14] Ricardo Sotoyz, Broderick Crawford, Boris Almonacid, Fernando Paredes and Ernesto Loyola. "Machine-part cell formation problems with constraint programming". In: 2015 34th International Conference of the Chilean Computer Science Society (SCCC). IEEE. 2015, pp. 1–4.
- [15] Ricardo Soto, Broderick Crawford, Boris Almonacid, Franklin Johnson and Eduardo Olguín. "Solving Open-Pit Long-Term Production Planning Problems with constraint programming a performance evaluation". In: 2014 9th International Conference on Software Engineering and Applications (ICSOFT-EA). IEEE. 2014, pp. 70–77.

## Posters

- [1] Boris Almonacid. "Conceptualization of hummingbird maneuvers into a bio-inspired algorithm to solve optimization problems". The 58th Annual Conference of the Animal Behavior Society. 2021. URL: [https://www.animalbehaviorsociety.org/virtual/?page=presentation&session\\_id=76&presentation\\_id=803](https://www.animalbehaviorsociety.org/virtual/?page=presentation&session_id=76&presentation_id=803).

## Preprints

- [1] Boris Almonacid. AutoMH: Automatically Create Evolutionary Metaheuristic Algorithms Using Reinforced Learning. Jan. 2021. DOI: [10.20944/preprints202101.0048.v1](https://doi.org/10.20944/preprints202101.0048.v1). URL: <https://www.preprints.org/manuscript/202101.0048/v1>.
- [2] Boris Almonacid. Preliminary experiments with the Andean Condor Algorithm to solve problems of Continuous Domains. Apr. 2019. DOI: [10.7287/peerj.preprints.27678v1](https://doi.org/10.7287/peerj.preprints.27678v1). URL: <https://doi.org/10.7287/peerj.preprints.27678v1>.
- [3] Boris Almonacid. Resolve the cell formation problem in a set of three manufacturing cells. Apr. 2019. DOI: [10.7287/peerj.preprints.27692v1](https://doi.org/10.7287/peerj.preprints.27692v1). URL: <https://doi.org/10.7287/peerj.preprints.27692v1>.
- [4] Boris Almonacid. Resolving the optimal selection of a natural reserve using the particle swarm optimisation by applying transfer functions. May 2018. DOI: [10.7287/peerj.preprints.26941v2](https://doi.org/10.7287/peerj.preprints.26941v2). URL: <https://doi.org/10.7287/peerj.preprints.26941v2>.

## Peer Review Activities

2016-2019

### Scientific Committee

- IWINAC 2019 - International Work-Conference on the Interplay between Natural and Artificial Computation
- CISTI 2020, 2019, 2018, 2017, and 2016 - Iberian Conference on Information Systems and Technologies.

2015-2016

### Research Project Evaluator

- Animal Behavior Society 2020, 2016, and 2015.

2016-2021

### **Journal Referee (Peer Review)**

- Molecules (ISSN 1420-3049) - MDPI, May 2021.
- ISPRS International Journal of Environmental Research and Public Health (ISSN 1660-4601), April 2021.
- Remote Sensing (ISSN 2072-4292), April 2021.
- IJGI International Journal of Geo-Information (ISSN 2220-9964), March 2021.
- Cancers (ISSN 2072-6694), March 2021.
- IJGI International Journal of Geo-Information (ISSN 2220-9964), March 2021.
- Informatics (ISSN 2227-9709), February 2021.
- IJGI International Journal of Geo-Information (ISSN 2220-9964), February 2021.
- IJGI International Journal of Geo-Information (ISSN 2220-9964), January 2021.
- IJGI International Journal of Geo-Information (ISSN 2220-9964), December 2020.
- Diversity (ISSN 1424-2818). November 2020.
- Remote Sensing (ISSN 2072-4292) - MDPI, November 2020.
- Remote Sensing (ISSN 2072-4292) - MDPI, October 2020.
- Sensors - MDPI, September 2020.
- Remote Sensing (ISSN 2072-4292) - MDPI, August 2020.
- Remote Sensing (ISSN 2072-4292) - MDPI, June 2020.
- Sustainability (ISSN 2071-1050), April 2020.
- Information - MDPI, March 2020.
- Energies - MDPI, February 2020.
- IEEE Access, September 2019.
- Journal of Advances in Mathematics and Computer Science, Science Domain International, September 2019.
- Current Science, April 2019.
- Journal of Engineering and Technological Sciences, Institut Teknologi Bandung, 2019.
- Scientific Programming, Hindawi, 2018.
- Current Journal of Applied Science and Technology, Science Domain International, 2018.
- Mathematical Problems in Engineering, Hindawi, 2017.
- British Journal of Mathematics & Computer Science, Science Domain International, 2017.
- Computers & Operations Research, Elsevier, 2017.
- Computational Intelligence, Willey.
- Journal of Scientific Research and Reports, Science Domain International, 2016.

2015-2016

### **Conference Referee**

- ICEIS 2016 - 18th International Conference on Enterprise Information Systems.
- CLEI 2016 - 35th International Conference of the Chilean Computer Science Society.
- ICEIS 2016 - 18th International Conference on Enterprise Information Systems.
- ELA-ES 2015 - The Second Latin-American School on Software Engineering.

2019-2020

### **Scientific Newspaper**

- RISTI - Iberian Journal of Information Systems and Technologies, ISSN: 1646-9895. Edition 24, 26, 27, 28, 29, 30, 34, and 35.

## 6 Professional Experience

- 2012–2014 **Software Engineer South America, in Mapttek** Viña del Mar, Chile  
Maptek is a 3D modeling, spatial analysis and design technology software company for the global mining industry.
- Duties and responsibilities:
- Work with Project Team leaders of Australia, USA and Chile in Technical Services to implement product enhancements in geological, spatial design, execution and measurement details of a mining operation and the business outcomes and profitability of our customers.
  - Provide estimates and schedules for the development of improvements and correction of defects.
  - Perform analysis, design, and estimates for various requirements for different International Customers to be included in the Mining Software.
  - Implement new technologies and architecture in C++ language specified by the team.
- Achievements:
- Develop basic documentation to be used by the different technical writers of the Mining Software.
  - More than 20 mid-range improvements and more than 150 defects resolved for the Mining Software Vulcan.
- 2011–2012 **Software Engineer, in Solem S.A** Viña del Mar, Chile  
Solem is company focused on retail, transportation, government and public services, public and private security, banking and financial services.
- Duties and responsibilities:
- Software analyst in the project "Civil Registry and Identification Service SRCel - Identification System, Identity and Travel Documents", Chile-France, 2011.
  - Software analyst in the project "MetroBus - System of mass mobilisation of passengers in the metropolitan area of Panama", Chile-Panama, 2010.
- Achievements:
- Formalisation of software designs in critical delivery times.
  - Formalisation of a procedure to deliver Software components to the Customer.
- 2009–2013 **Other Projects**
- Design, development, migration of data to Wordpress and administration of the School of Computer Engineering website (Url: <http://inf.ucv.cl>), Pontifical Catholic University of Valparaíso, Chile, 2010.
  - Development of a spatial-geographic system for sports routes in Google Maps, 2009.
  - Development of a system for entering crimes in geo-reference maps, 2009.
  - Development of apiaries management system, 2009.

## 7 Skills

- Programming Language: Java SE, Python, C/C++.
- Programming Tools: RStudio, IntelliJ Idea, PyCharm, Source Tree (git).
- Design Tools: Affinity Designer, Affinity Photo, draw.io.
- Editorial Tools: Overleaf, authorea.com.
- Text Processing: MS Word (advanced), L<sup>A</sup>T<sub>E</sub>X (advance)

## 8 Courses and Certifications

University of the Arts London.

Apr. - May, 2018    **Information Design and Data Visualisation**  
A visualisation course for Science Communication

The University of Melbourne & The Chinese University of Hong Kong, Online.

October 2017    **Basic Modelling for Discrete Optimization**  
Url: <https://www.coursera.org/account/accomplishments/certificate/VRWZFJT89462>

The Regional Office of Sciences for Latin America and the Caribbean of UNESCO and the University for International Cooperation.

Oct. - Nov. 2015    **Introduction to Biosphere Reserves**

Federico Santa María Technical University, Valparaíso, Chile.

Jan. 2013    **C++ Language**  
License CC-INF-1205009-1

Work Safety Institute (IST, Instituto de Seguridad del Trabajo), Chile.

April 2013    **First aid course**  
Basic first aid workshop

May 2013    **Fire prevention**  
Fire prevention and use of portable fire extinguishers

March 2012    **Suitable for high altitude labor jobs (ELA)**  
Certifications PRO N° 03.31.009773/2012

## 9 Awards

2011-2018    **Honors**    Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile

- Summa Cum Laude (First Class), PhD in Computer Engineering, 2018.
- Summa Cum Laude (First Class), Master in Computer Science, 2016.
- Summa Cum Laude (First Class), Master in Engineering Informatics, third place in ranking of graduates, 2013.
- First Class, third place in ranking of graduates, Engineering Informatics, 2011.

2006-2017    **Scholarship and Fellowships**

- Research Internship Grant by Phd (h.c) Sonia Alvarez, 2017.
- Partial Research Internship Grant by Computer Engineering School 2017, Pontificia Universidad Católica de Valparaíso, Chile.
- VRIEA Grant 2016-2017, Pontificia Universidad Católica de Valparaíso, Chile.
- PhD Scholarship 2015, Pontificia Universidad Católica de Valparaíso, Chile.
- Master Scholarship 2011-2012, Pontificia Universidad Católica de Valparaíso, Chile.
- Bicentennial Partial Scholarship 2006-2009, Government of Chile.



## 10 Others

2015

### Speaker

- Speaker at the Chilean Computing Conference 2015. Held on November 9, 10, 11, 12, and 13, 2015 in Santiago de Chile. Organizers, SCCC, IEEE and Universidad Mayor.

2006-2017

### Attendee

- Wine Tasting Workshop, Alliance Francaise Cultural Center, Viña del Mar, Chile. Participation in the Wine Tasting Workshop held between June 9 to July 9, 2017, with a total of 18 teaching hours.
- The challenges of management in the coming years. School of Commerce, Pontifical Catholic University of Valparaíso. Activity was given by the rapporteur Mr. Miguel Rivas Roces, in Valparaíso, on January 21, 2014, with a total of 3 chronological hours.
- Multiculturalism and internationalisation seminar. School of Computer Engineering, Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile. Seminar was given on October 12, 13 and 14, 2010, by Dr. César Collazos, Professor at the University of Cauca, Colombia.

## 11 References

- **Juan Carlos Reyes Hagemann**
  - Marine biologist. MSc. Water and Coastal Management (Candidate), Universität Oldenburg, Germany +4915770900816.  
Email: [juan.carlos.reyes.hagemann@uni-oldenburg.de](mailto:juan.carlos.reyes.hagemann@uni-oldenburg.de)
- **Juan Campos Nazer**
  - Research in Atacama University, Chile, Geologist.  
Email: [juan.campos@uda.cl](mailto:juan.campos@uda.cl)
- **Fabián Aspée Encina**
  - Postgraduate Student, University of Bologna, Italy. Informatics Engineer.  
Email: [fabian.aspeencina@studio.unibo.it](mailto:fabian.aspeencina@studio.unibo.it)
- **Jorge Ramos Aguilar**
  - Biologist, Mention Natural Resources and Environment, Santiago, Chile. Email: [jsramos@uc.cl](mailto:jsramos@uc.cl)
- **Cristian Rusu**
  - Research in Pontifical Catholic University of Valparaíso, Chile. Doctor of Science Engineering.  
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