

# Boris Leonardo Almonacid Gutiérrez

## Contact

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## Education

Pontifical Catholic University of Valparaíso, Valparaíso, Chile.

2015–2018

### **PhD in Computer Engineering**

Emphasis in metaheuristics, heuristics, simulation, evolutionary algorithms, combinatorial optimisation, swarm intelligent, local-search, 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**

2012–2013

### **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**

2006-2011

### **Degree in Engineering Informatics**

## Scientific Activities

### 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).

### Research projects

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.

## Fields of Interest

- Optimization problems, Industrial problems.
- Evolutionary Algorithms, Metaheuristics, Swarm Intelligent, Stochastic Algorithms, Constraint programming.
- Machine Learning.
- Digital Art, Info-graphics, Scientific communication.

## 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.

## 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 Olgún. "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 Olgún. "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 Sotoy, 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.

#### In Peer-Review

- [1] Boris Almonacid. "Resolving the optimal selection of a natural reserve using the particle swarm optimisation by applying transfer functions". 2019.

#### Preprints - Preliminary Results

- [1] 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>.
- [2] Boris L 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. 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>.

## Awards

2011-2018

#### Honors

Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile

- Summa Cum Laude, PhD in Computer Science, 2018.
- Summa Cum Laude, Master in Computer Science, 2016.
- Summa Cum Laude, Master in Engineering Informatics, 2013.
- Third place in ranking of graduates, Master in Engineering Informatics, 2013.
- 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.

## Professional Experience

2012–2014

### Software Engineer South America, in Maptek

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

Maptek is an Australian software 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 website of the School of Computer Engineering (Url: <http://inf.ucv.cl>), Pontifical Catholic University of Valparaíso, Chile, 2010.
- Development of a spatial-geographic system of sports routes in Google Maps, 2009.
- Development of a system of entry of crimes into geo-referential maps, 2009.

## Courses and Certifications

University of the Arts London.

Apr. - May, 2018

### Information Design and Data

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.

January 2013      **C++ Language**  
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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

## Skills

- 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)

## References

- **Juan Carlos Reyes Hagemann**
  - Marine biologist. MSc. Water and Coastal Management (Candidate), Universität Oldenburg, Germany +4915770900816. Email: juancreyesh@gmail.com
- **Juan Campos Nazer**
  - Research in Atacama University, Chile, Geologist. Email: juan.campos@uda.cl
- **Fabián Aspée Encinau**
  - Postgraduate Student, University of Bologna, Italy. Informatics Engineer. Email: fabian.aspeeencina@studio.unibo.it
- **Cristian Rusu**
  - Research in Pontifical Catholic University of Valparaíso, Chile. Doctor of Science Engineering. Email: cristian.rusu@pucv.cl
- **Jorge Ramos Aguilar**
  - Biologist, Mention Natural Resources and Environment, Santiago, Chile. Email: jsramos@uc.cl