

Google Inc.  
1600 Amphitheater Pkwy  
(duenez)  
Mountain View, CA 94043  
USA  
+1 (650) 214-4445

EDGAR A. DUÉÑEZ-GUZMÁN

eaduenez@gmail.com



## WORK EXPERIENCE

### Software Engineer

2013–present

**Google Inc.**; Search Infrastructure team; Lead of team responsible for selecting the Image Search index.

- Developing in-house machine intelligence algorithms for document and image utility prediction.
- Large-scale data processing pipelines for data acquisition and scoring of documents and images.
- Novel algorithms for efficient index retrieval, towards a 10X capacity improvement.
- Core engineering member of confidential legal and policy-decision team.
- Performed in internal and public interview training videos with over 100K views:
  - [https://youtu.be/XKu\\_SEDAykw](https://youtu.be/XKu_SEDAykw)
  - <https://youtu.be/P67uecluw1s>
  - <https://youtu.be/55aEVvITNJO>

### Postdoctoral fellow

2012–2013

**University of Leuven**; Socio-evolutionary theory for microorganisms, insects and robots.

- Modelled competition and cooperation dynamics in arbitrary networks; and infection dynamics.
- Developed evolutionary algorithm for automatic programming of robotic controllers for swarms.

### Postdoctoral fellow

2010–2012

**Harvard University**; Effects of population structure and dispersal on social evolution and imprinting.

- Developed novel models for social evolution to study cooperation, punishment and corruption.
- Used Bayesian and maximum-likelihood algorithms to reconstruct the phylogeny of *NLRP* genes.

### Graduate Research Assistant

2006–2010

**University of Tennessee**; Biological simulations and biologically inspired adaptive systems.

- Modeled intra-group conflict dynamics to study transition from hierarchical to egalitarian societies.
- Used hierarchical clustering and maximal-clique for coalition detection in data from primates.

## EDUCATION

### PhD

2005–2009

**University of Tennessee**, Electrical Engineering and Computer Science.

- Created parallel, individual-based models. Ran on the *Kraken* supercomputer (100K+ cores).
- Developed efficient numerical integration algorithm. 10X better than GSL, Maple and Mathematica.
- Extended metaheuristic theory (*No free lunch*) to arbitrary benchmarks and stochastic algorithms.

### MsSc

2004–2005

**Centre for Mathematical Research**, Computer Science and Industrial Mathematics.

- Developed a local/global search hybrid evolutionary algorithm for constrained optimization.

### BsSc

1999–2004

**University of Guanajuato**, Mathematics.

## SKILLS

- C/C++ (7 years), Java (4 years)
- Machine learning
- Metaheuristic optimization
- Parallel/multi-threaded computing
- Numerical and mathematical modeling
- Game theory
- Evolutionary theory
- Theory of computation

## OTHER ACTIVITIES

### KarelArena

<http://duenez.evolicious.net/karel.html>

Open-source development environment written in Java for the *Karel* programming language. Features syntax highlighting, XML-based world editor, unit test evaluation, and debugger.

### Instil-Lang

<http://instil-lang.sourceforge.net/>

Open-source universal grammar generator written in Java based on *Parsing Expression Grammars*. Combines lexical and syntactical analysis. Focuses on parsing (rather than producing) strings.

### Scientific presentations

30+ talks, including invited talks at Gothenburg University (Sweden), Trinity University (USA), CIMAT (Mexico) and international conferences CUG (USA), ICAMC (Bulgaria), SEEDs (Belgium).

### Math and Informatics Olympiads

Trained state teams (8 years). The team I led, previously ranked 7th, consistently came 1st nationally.

## SELECTED AWARDS AND GRANTS

### Awards

3 *SPOT* bonuses and 4 *Peer* bonuses for contributions to policy-team and diversity efforts. 2015

### Research grants

KULeuven (2012), €80 000 EUR. NIMBioS (2009), \$20 000 USD. Monash Uni., (2008), \$9 000 AUD.

### Math and programming contests

- **World finalist**, ACM International Collegiate Programming Contest, USA 2003
- **World finalist**, International Mathematics Olympiad, Romania. 1999
- **Silver medal**, Iberoamerican Mathematics Olympiad, Dominican Republic. 1998

## PUBLICATIONS

<http://duenez.evolicious.net/index.php?page=pub>

**13 peer-reviewed journal papers** totalling 160+ citations (*h-index* 8): 1 in image processing, 2 in optimization theory, 2 in swarm robotics, 3 in evolutionary game theory, 1 in phylogenetics, 1 in evolutionary medicine, and 3 in individual-based models of biology.

**1 book** on problem solving for the Informatics Olympiad, now adopted by most states in Mexico.

**1 book chapter**, a survey of technological applications of collective intelligence.

**2 peer-reviewed conference papers** on automatic controller programming for swarm robotics.