

# Marcos Goycoolea

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## Bibliographical Information

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Complete Name	Marcos Goycoolea Guzman
Date of Birth	November 27, 1975
City of Birth	St. Paul, MN. USA
Country of Citizenship	Chile / USA

## Education

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- PHD, INDUSTRIAL ENGINEER December, 2006.  
School of Industrial and Systems Engineering  
Georgia Institute of Technology. Atlanta, GA.
- MATHEMATICAL ENGINEER 10/30/01  
Department of Mathematical Engineering.  
Universidad de Chile. Santiago, Chile.

## Areas of Interest

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- Applied research:
  - Forestry - Harvest scheduling and environmental considerations.
  - Mining - Scheduling open-pit mining operations.
  - Computational methodologies and software for large-scale optimization problems.
- Theory and Methodology:
  - Mixed Integer Programming (Theory and computational frameworks).
  - Combinatorial Optimization (Traveling Salesman Problem, Knapsack Problems, and others).

## Academic Experience

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ASSISTANT PROFESSOR, UNIVERSIDAD ADOLFO IBAÑEZ 2006 - Present.

Has been teaching courses related to Operations Research and Operations Management at the undergraduate, masters, MBA and PhD levels. Has been conducting research on different topics, such as Harvest Scheduling, Open-Pit Mining, and Mixed Integer Programming methodologies.

GRADUATE RESEARCH ASSISTANT, GEORGIA INSTITUTE OF TECHNOLOGY 2001 - 2006.

Participated in applied and theoretical research projects together with Dr. William Cook, Dr. George Nemhauser, and Dr. Martin Savelsbergh at the School of Industrial and Systems Engineering. On the

applied side, worked developing an offline air-taxi scheduling system for the DayJet company. On the theoretical side, worked on the traveling salesman problem, the mixed integer knapsack problem, and cutting plane methods for general mixed integer programming problems.

LECTURER, UNIVERSIDAD DE LOS ANDES 2000 - 2001.

DISSERTATION RESEARCH, UNIVERSIDAD DE CHILE 1999 - 2001.

Conducted research with Andres Weintraub, PhD, of the Industrial Engineering Department of Universidad de Chile, on Integer Programming applications to Forest Harvest Scheduling subject to adjacency constraints. During the project also worked with Alan Murray, PhD, of the Geography Department, at Ohio State University, and Francisco Barahona, PhD, of IBM TJ Watson Research Center.

UNDERGRADUATE TEACHING ASSISTANT, UNIVERSIDAD DE CHILE 1996 - 2000.

## Extended Visits

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VISITING ACADEMIC, GEORGIA TECH (W. Cook) June, 2007 - July, 2007.

VISITING STUDENT, IBM RESEARCH (S. Dash and O. Gunluk) June, 2004 - July, 2004.

STUDENT INTERN, AMERICAN AIRLINES (E. Gelman) June, 2002 - July 2002.

VISITING STUDENT, IBM RESEARCH (F. Barahona) April, 2001.

VISITING STUDENT, OHIO STATE UNIVERSITY (A.T. Murray) March, 2001.

## Publications

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“*On the exact separation of mixed integer knapsack cuts*” (Full version). R. Fukasawa and Marcos Goycoolea. Forthcoming. Mathematical Programming.

“*Two step MIR inequalities for mixed-integer programs*” S. Dash, Marcos Goycoolea, and O. Gunluk. Forthcoming. INFORMS Journal of Computing.

“*Numerically accurate gomory mixed-integer cuts.*” W. Cook, S. Dash, R. Fukasawa and Marcos Goycoolea. Forthcoming. INFORMS Journal of Computing.

“*Evaluating alternative approaches to solving the ARM problem.*” Marcos Goycoolea, J. Vielma, A. Murray, and A. Weintraub. Forest Science. Vol. 55, No 2. April, 2009. pp.149–165 (17).

“*Certification of an optimal TSP tour through 85,900 cities*” D. Applegate, R. Bixby, V. Chvatal, W. Cook, D. Espinoza, Marcos Goycoolea and K. Helsgaun. Operations Research Letters. Vol. 37, No. 1. January, 2009. pp 11 – 15.

“*Per-Seat, On-Demand Air Transportation Part II: Problem Description and an Integer Multi-Commodity Flow Model.*” Daniel Espinoza, Renan Garcia, Marcos Goycoolea, George Nemhauser, and Martin Savelsbergh. Transportation Science. Vol. 42, No.3, August 2008, pp279–291.

“*Per-Seat, On-Demand Air Transportation Part I: Problem Description and an Integer Multi-Commodity Flow Model.*” Daniel Espinoza, Renan Garcia, Marcos Goycoolea, George Nemhauser, and Martin Savelsbergh. Transportation Science. Vol. 42, No.3, August 2008, pp263–278.

“*On the Exact Separation of Mixed Integer Knapsack Cuts*” Ricardo Fukasawa and Marcos Goycoolea.

Proceedings of the 12th Conference on Integer Programming and Combinatorial Optimization (IPCO 2007). Lecture Notes in Computer Science. Volume 4513, 2007. pp 225 – 239. Springer Berlin / Heidelberg. [Non-ISI].

“*Computing with Domino-Parity Inequalities for the TSP*”. William Cook, Daniel Espinoza, Marcos Goycoolea. Informs Journal of Computing. Volume 19, Number 3, Summer 2007, pp 356 – 365.

“*Comparing Alternative Formulations for the ARM*.” J. Vielma, Marcos Goycoolea, A. Murray and A. Weintraub. Forthcoming. Proceedings of the 12th Symposium for Systems Analysis in Forest Resources 2006 (SSAFR’06). [Non-ISI].

“*Harvest scheduling subject to maximum area restrictions : exploring exact approaches*.” Marcos Goycoolea, Alan T. Murray, Francisco Barahona, Rafael Epstein, Andres Weintraub. Operations Research. Volume 53, Number 3, 2005. pp 490–500.

“*A Study of the Domino Parity and k-Parity Constraints for the TSP*.” William Cook, Daniel Espinoza, Marcos Goycoolea. Proceedings of the 11th Conference on Integer Programming and Combinatorial Optimization (IPCO 2005). Lecture Notes in Computer Science. Volume 3509, 2005. pp 452 – 467. Springer Berlin / Heidelberg.

“*Incorporating average and maximum area restrictions in harvest scheduling models*.” A.T. Murray, M. Goycoolea, and A. Weintraub. Canadian Journal of Forest Research, 34, 2004, 456-464.

“*An adjacency-modeling problem based on constructing harvesting areas*.” R. Epstein, M. Goycoolea, A.T. Murray and A. Weintraub, In Systems Analysis in Forest Resources, edited by G.J. Arthaud and T.M. Barrett, 2003, 279-289 (Dordrecht: Kluwer Scientific). [Non-ISI].

## Submitted Publications

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“*A scalable approach to optimal block scheduling* ” J. Amaya, D. Espinoza, Marcos Goycoolea, E. Moreno, T. Prevost and E. Rubio.

“*Generalized domino-parity inequalities for the TSP*. ” W. Cook, D. Espinoza, and Marcos Goycoolea.

## Grants

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“*Methodologies for Mixed Integer Linear Programming Models*.” 2007 - 2010. Principal Investigator. FONDECYT (Iniciacion) 11075028.

“*Sistemas complejos, computacion evolutiva y aplicaciones a la planificacion minera*.” 2007 - 2010. Principal Investigator. FONDEF D06I1031.

## Honors

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FORESTRY BEST PAPER IN 2005 AWARD

NOVEMBER, 2007.

Awarded by the Energy and Natural Resources Section of the INFORMS Society for the paper “Harvest scheduling subject to maximum area restrictions : exploring exact approaches.”

GOIZUETA FOUNDATION FELLOW

FALL, 2005 - JULY, 2006.

PRESIDENTIAL FELLOW, GEORGIA INSTITUTE OF TECHNOLOGY

FALL, 2001 - MAY, 2006.

## Presentations

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“*A scalable approach to optimal block scheduling*” J. Amaya, D. Espinoza, Marcos Goycoolea, E. Moreno, T. Prevost and E. Rubio. Submitted to APCOM. Vancouver. October, 2009.

“*Imposing Old-growth Patch Constraints in Forest Harvest Scheduling Models*” R. Carvajal, M. Constantino, Marcos Goycoolea, J.P. Vielma and A. Weintraub. INFORMS annual meeting. San Diego. October, 2009.

“*Generating Multiple Rounds of Rank-1 GMI Cuts*” S. Dash and Marcos Goycoolea. INFORMS annual meeting. San Diego. October, 2009.

“*Scheduling a Large Open-pit Mining Operation*” J. Amaya, D. Espinoza, Marcos Goycoolea, E. Moreno, T. Prevost and E. Rubio. IBM Research Center (TJ Watson, NY). August, 2009.

“*Imposing connectivity of old-growth patches and nature reserves in forest harvest scheduling models*” R. Carvajal, M. Constantino, Marcos Goycoolea, J.P. Vielma and A. Weintraub. Symposium on Systems Analysis in Forest Resources (SSAFR). Charleston, 2009.

“*Strategic mine planning: A scalable approach to optimal block scheduling*” J. Amaya, D. Espinoza, Marcos Goycoolea, E. Moreno, E. Rubio and T. Prevost. Operations Research in Mining (ORM) Workshop. Vina del Mar, Chile. December, 2008.

“*Imposing old-growth patch constraints in forest harvest scheduling models*” R. Carvajal, M. Constantino, Marcos Goycoolea, J.P. Vielma and A. Weintraub. INFORMS annual meeting. Washington D.C. November, 2008.

“*Scheduling the excavation of an open pit mine: An integer programming approach*” Marcos Goycoolea, D. Espinoza, E. Moreno and E. Rubio. INFORMS annual meeting. Washington D.C. November, 2008.

“*Local search for the open-pit-mine scheduling problem*” T. Prevost, J. Amaya, Marcos Goycoolea and E. Moreno. INFORMS annual meeting. Washington D.C. November, 2008.

“*Generating Safe Gomory Mixed Integer Cuts*” W. Cook, S. Dash, R. Fukasawa and Marcos Goycoolea. Bellairs Workshop on Integer Programming. Holetown, Barbados. April, 2008.

“*On the Exact Separation of Mixed Integer Knapsack Cuts*” W. Cook, R. Fukasawa and Marcos Goycoolea. Barbados. Bellairs Workshop on Integer Programming. Holetown, Barbados. April, 2008.

“*Generating Safe Gomory Mixed Integer Cuts*” W. Cook, R. Fukasawa and Marcos Goycoolea. INFORMS annual meeting. Seattle. November, 2007.

“*Economic and Fragmentation Effects of Multiple Adjacencies in the Area Restriction Model*” Marcos Goycoolea, J. Vielma and A. Weintraub. INFORMS annual meeting. Seattle. November, 2007.

*“Scheduling a Large Open-pit Mining Operation”* D. Espinoza, Marcos Goycoolea and E. Moreno. INFORMS annual meeting, Seattle. November, 2007.

*“On the Exact Separation of Mixed Integer Knapsack Cuts”* R. Fukasawa and Marcos Goycoolea. IPCO (Integer Programming and Combinatorial Optimization). Berlin. June, 2007.

*“MIR inequalities, mixed-integer knapsack problems, and the closure of single-row systems, Part II.”* W. Cook, R. Fukasawa, Marcos Goycoolea. INFORMS. Pittsburgh, PA. November 5 - November 8, 2006.

*“MIR inequalities, mixed-integer knapsack problems, and the closure of single-row systems, Part I.”* W. Cook, R. Fukasawa, Marcos Goycoolea. INFORMS. Pittsburgh, PA. November 5 - November 8, 2006.

*“Green up and adjacency issues in forest spacial harvesting.”* J. Vielma, M. Goycoolea, A. Murray, A. Weintraub. INFORMS. Pittsburgh, PA. November 5 - November 8, 2006

*“MIR inequalities, mixed-integer knapsack problems, and the closure of single-row systems.”* W. Cook, R. Fukasawa, Marcos Goycoolea. ISMP. Rio de Janeiro, Brazil. July 30 - August 4, 2006.

*“MIR inequalities, mixed-integer knapsack problems, and the closure of single-row systems.”* W. Cook, R. Fukasawa, Marcos Goycoolea. IBM Research, TJ Watson Division. IP for Lunch seminars. Yorktown Heights, NY. July 7, 2006.

*“Effectiveness of different cut selection rules.”* W. Cook, R. Fukasawa, Marcos Goycoolea. Poster Session. MIP, 2006. Miami, Florida. June 5-8, 2006.

*“Comparison of methodologies for limiting opening sizes in forest harvest scheduling.”* J. Vielma, M. Goycoolea, A. Murray and A. Weintraub, INFORMS Annual Meeting, San Francisco, California, USA, November 13-16, 2005.

*“A Study of Domino-Parity and  $k$ -Parity Constraints for the TSP.”* W. Cook, D. Espinoza, Marcos Goycoolea. IPCO (Integer Programming and Combinatorial Optimization). Berlin. June, 2005.

*“The Dial-a-Flight-Problem”* M.W. Savelsbergh, M. Bazaraa, D. Espinoza, R. Garcia, Marcos Goycoolea, G. Nemhauser, E. Danna, Z. Gu, A. Khmelnitsky and E. Taits. MIP (Mixed Integer Programming) Meeting. Minneapolis, MN. July 25-29, 2005.

*“Implementing Domino-Parity Inequalities for the TSP.”* W. Cook, D. Espinoza, Marcos Goycoolea. INOC (European Network Optimization Group). Lisboa. March, 2005.

*“A Generalization of Domino-Parity Inequalities for the TSP.”* W. Cook, D. Espinoza, Marcos Goycoolea. INOC (European Network Optimization Group). Lisboa. March, 2005.

*“Scheduling an air taxi service.”* M. Bazaara, D. Espinoza, Marcos Goycoolea, A. Khemlnistky, G. Nemhauser, M. Savelsbergh, E. Taits. INFORMS. Denver, CO. Annual Meeting 2004. Session MA05.

*“Modeling average and maximum area restrictions in harvest scheduling”*, M. Goycoolea, A. Murray and A. Weintraub. INFORMS, San Jose, California, USA, November 17-20, 2002.

*“An exact algorithm for the area restriction model”*, M. Goycoolea, A.T. Murray, J. Vielma, F. Barahona, R. Epstein and A. Weintraub. Systems Analysis Forestry Symposium Chile 2002, Punta de Tralca, Chile, March 4-7, 2002.

*“Solving the Adjacency Problem Constructing the Harvesting Units.”* Marcos Goycoolea, Alan T. Murray, Francisco Barahona, Rafael Epstein, Andres Weintraub. INFORMS. Miami, FL. 2001.