

John E. Fontecha

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Education

Doctor of Philosophy, Industrial and Systems Engineering

Expected: Summer 2021

Advisors: Dr. Jose L. Walteros and Dr. Alexander Nikolaev
University at Buffalo, State University of New York, Buffalo, NY

Master of Science, Industrial Engineering

October 2015

Advisor: Dr. Andrés L. Medaglia
Universidad de los Andes, Bogotá, Colombia

Bachelor of Science, Chemical Engineering

September 2008

Universidad de los Andes, Bogotá, Colombia

Research Interests

Statistical Modeling

Machine Learning Applications

Data Science

Operations Research for Sustainable Cities

Large-scale Optimization

Network Optimization

Integer Programming Applications

Logistics

Math-programming-based Heuristics

Publications

Peer-reviewed journal articles

1. Torres, M. N., **Fontecha, J. E.**, Zhu, Z., Walteros, J. L., & Rodríguez, J. P. (2020). A participatory approach based on stochastic optimization for the spatial allocation of Sustainable Urban Drainage Systems for rainwater harvesting. *Environmental Modelling & Software*. 123, 104532. Impact factor: 4.807; SJR (2019): 1.9.
2. **Fontecha, J. E.**, Guaje, O., Duque, D., Akhavan-Tabatabaei, R., Rodríguez, J. P., & Medaglia A. L. (2020). Combined maintenance and routing optimization for large-scale sewage cleaning. *Annals of Operations Research*. 286, 441–474. Impact factor: 2.583; SJR (2019): 1.12.
3. **Fontecha, J. E.**, Akhavan-Tabatabaei, R., Duque, D., Medaglia A. L., Torres, M. N., & Rodríguez, J. P. (2016). On the preventive management of sediment-related sewer blockages: A combined maintenance and routing optimization approach. *Water Science & Technology*. 74 (2), 302-308. Impact factor: 1.638; SJR (2019): 0.47.
4. **Fontecha, J. E.**, Cano, N. A., Velasco, N., & Muñoz, F. (2016). Optimal sectioning of hydrocarbon transport pipeline by volume minimization, environmental and social vulnerability assessment. *Journal of Loss Prevention in the Process Industries*. 44, 681-689. Impact factor: 2.795; SJR (2019): 0.9.

5. Cano, N. A., **Fontecha, J. E.**, Velasco, N., & Muñoz, F. (2016). Shortest path algorithm for optimal sectioning of hydrocarbon transport pipeline. *IFAC-PapersOnLine*. 49 (12), 532-537. Impact factor: 0.96; SJR (2019): 0.33.
6. Hernández-Lozano, D. C., **Fontecha, J. E.**, Peralta-Bohórquez, A. F., Quijano-Celis, C. E., Morales, G., & Pino, J. A. (2010). Composition of the essential oil from leaves of *Tagetes zipaquinensis* Hump. et Bonpl. grown in Colombia. *Journal of Essential Oil Research*. 22 (4), 371-372. Impact factor: 1.148; SJR (2019): 0.34.
7. García-Rojas, A., **Fontecha-García, J.**, Peralta-Bohórquez, A. F., Quijano-Celis, C. E., Morales, G., & Pino, J. A. (2010). Composition of the essential oil from leaves and fruits of *Salvia palaefolia* Kunth grown in Colombia. *Journal of Essential Oil Research*. 22 (4), 369-370. Impact factor: 1.148; SJR (2019): 0.34.

Recently submitted papers

1. **Fontecha, J. E.**, Agarwal, P., Torres, M. N., Mukherjee, S., Walteros, J. L., & Rodríguez, J. P. (2020). A two-stage data-driven spatiotemporal analysis to predict failure-risk of urban sewer systems leveraging machine learning algorithms. *Risk Analysis*.
2. **Fontecha, J. E.**, Walteros, J. L., & Nikolaev, A. (2020). Reach maximization for social lotteries. *Omega*.
3. **Fontecha, J. E.**, Walteros, J. L., Nikolaev, A., & Zhu, Z. (2021). Scientists wanted? A literature review on incentive programs that promote pro-environmental consumer behavior: Energy, waste, and stormwater management. *Socio-Economic Planning Sciences*.
4. Torres, M. N., **Fontecha, J. E.**, Zhu, Z., Walteros, J. L., Ahmed, Z., & Rodríguez, J. P. (2021). Optimal location planning of Green Infrastructure using piece-wise linear interpolation and exact optimization methods. *Journal of Hydrology*.

Papers in preparation

1. **Fontecha, J. E.**, Walteros, J. L., & Nikolaev, A. An incentive-based mathematical model to promote vaccination.
2. Gao, C., **Fontecha, J. E.**, & Walteros, J. L. A Lin-Kernighan heuristic for risk & reward asset routing problem (R²ARP).
3. Quiroga, E. C., Otero-Leon, D. F., **Fontecha, J. E.**, Medaglia A. L. A stochastic optimization model for aircraft scheduling under uncertainty during operational times.
4. Guerrero-Suarez, R., **Fontecha, J. E.**, Lara-Acosta, F. C. Prediction of power outages due to atmospheric discharges: A cluster-based spatiotemporal approach.

Editorial experience

Journal referee

Ad hoc referee for articles in: *Networks, Optimization and Engineering*.

Conference presentations and posters

**Presenting author*

1. **Fontecha***, **J. E.**, Walteros, J. L., & Nikolaev, A. (2020). Fostering energy-conscious behavior through reach-impact maximization. *Inform's Annual Meeting*. Virtual.
2. **Fontecha, J. E.**, Agarwal*, P., Torres, M. N., Mukherjee, S., Walteros, J. L., & Rodríguez, J. P. (2020). A two-stage data-driven risk prediction framework leveraging machine learning and 2D space-time analysis: A case study for sewer system failures in Bogotá. *Inform's Annual Meeting*. Virtual.
3. **Fontecha***, **J. E.**, Agarwal, P., Torres, M. N., Mukherjee, S., Walteros, J. L., & Rodríguez, J. P. (2020). A two-stage data-driven spatiotemporal analysis to predict failure-risk of urban sewer systems. *I Simposio Industria 4.0*. Universidad del Sinú, Cartagena, Colombia.

4. **Fontecha, J. E.**, Agarwal*, P., Torres, M. N., Rodríguez, J. P., & Mukherjee, S. (2019). Prediction and evaluation of sediment and infrastructure-related failure risks on Bogotá's sewer system: A spatiotemporal analysis. *Society for Risk Analysis Annual Meeting*. Arlington, VA.
5. **Fontecha***, **J. E.**, Jois, M. H. N., Walteros, J. L., & Nikolaev, A. (2018). Pro-environmental social influence via randomized incentive programs. *International Mechanical Engineering Congress & Exposition*. Pittsburgh, PA.
6. **Fontecha***, **J. E.**, Jois, M. H. N., Walteros, J. L., & Nikolaev, A. (2018). On Incentivized-social-influence-based programs to promote behavioral changes: A case study for incentivizing households to save energy. *Inform's Annual Meeting*. Phoenix, AZ.
7. **Fontecha***, **J. E.**, Jois, M. H. N., Walteros, J. L., & Nikolaev, A. (2018). Boosting social influence via randomized incentive programs. *YinzOR Student Conference*. Pittsburgh, PA.
8. Soriano-Pulido, E., **Fontecha, J. E.**, Rodríguez*, J. P., Medaglia, A. L., & Valencia, C. (2017). Study of the space-time correlation among sediment-related blockage events in Bogotá's sewer system. *Coloquio Aguas Urbanas ACODAL*. Cartagena, Colombia.
9. Quiroga*, E. C., Otero, D., **Fontecha, J. E.**, & Medaglia, A. L. (2017). Modelo de optimización estocástica para la programación de aviones bajo incertidumbre durante los tiempos operacionales. *II Congreso Colombiano de Investigación Operativa ASOCIO*. Medellín, Colombia.
10. Soriano-Pulido*, E., **Fontecha, J. E.**, Rodríguez, J. P., Medaglia, A. L., & Valencia, C. (2017). Estudio de la correlación espacio-temporal entre eventos de bloqueo por sedimentos en el sistema de alcantarillado de Bogotá. *II Congreso Colombiano de Investigación Operativa ASOCIO*. Medellín, Colombia.
11. **Fontecha***, **J. E.**, Duque, D., Akhavan-Tabatabaei, R., Rodríguez, J. P., & Medaglia, A. L. (2016). Combined maintenance and routing optimization for large-scale problems. *Inform's Annual Meeting*. Nashville, TN.
12. **Fontecha***, **J. E.**, Duque, D., Akhavan-Tabatabaei, R., Rodríguez, J. P., Medaglia, A. L. (2015). Extending the combined maintenance and routing optimization approach. *I Congreso Colombiano de Investigación Operativa ASOCIO*. Bogotá, Colombia.
13. **Fontecha, J. E.**, Duque, D., Akhavan-Tabatabaei, R., Rodríguez, J. P., Medaglia*, A. L. (2015). Combined maintenance-routing optimization: The case of a water utility. *Inform's Annual Meeting*. Philadelphia, PA.
14. **Fontecha, J. E.**, Duque, D., Akhavan-Tabatabaei, R., Medaglia, A. L., Rodríguez*, J. P. (2015). On the preventive management of sediment-related sewer blockages: A combined maintenance and routing optimization approach. *LESAM Biannual Meeting*. Yokohama, Japan.
15. **Fontecha***, **J. E.**, Cano, A., Muñoz, F. (2015). Optimal sectioning of hydrocarbon transport pipeline by volume minimization, and environmental and social vulnerability assessment. *Mary Kay O'Connor Process Safety Center International Symposium*. College Station, TX.
16. **Fontecha, J. E.**, Duque, D., Akhavan-Tabatabaei, R., Medaglia*, A. L., Rodríguez, J. P. (2015). Combined maintenance-routing optimization: The case of a water utility. *Network Optimization Workshop NOW*. La Rochelle, France.
17. **Fontecha, J. E.**, Duque, D., Akhavan-Tabatabaei, R., Rodríguez, J. P., Medaglia*, A. L. (2015). On the combined maintenance and routing. *Del and Beth Kimbler Lecture Series*. Department of Industrial Engineering, University of South Florida, Tampa, FL.
18. Cano*, A., **Fontecha, J. E.**, Muñoz, F. (2014). Sectioning of transport pipelines for liquid hydrocarbons based on the minimization of costs related to environmental degradation as a consequence of accidental releases. *Society for Risk Analysis Annual Meeting*. Denver, CO.
19. **Fontecha, J. E.**, Giraldo, L., Tirano, J., Moreno*, J. C. (2009). Copper catalysts supported on activated carbon cloths. *Annual World Conference on Carbon*. Biarritz, Francia.

Teaching Experience

Instructor at University at Buffalo

1. **IE-306 Statistics for Engineers** (*Required undergraduate course*)

Topics: Principles and methodologies of statistical inference; methods of data analysis; point and interval estimation; hypothesis testing; correlation and regression; design of experiments.

| Semester | Enrollment | Instructor rating |
|-------------|------------|-------------------|
| Spring 2020 | 54 | 4.20/5.00 |

Instructor at Universidad de los Andes

1. **IIND-2103 Optimization Principles** (*Required undergraduate course*)

Topics: Formulating and solving linear programs, the simplex method, basic LP duality, sensitivity analysis, introduction to integer programming.

| Semester | Enrollment | Instructor rating |
|-------------|------------|-------------------|
| Spring 2016 | 27 | 3.56/4.00 |
| Fall 2016 | 63 | 3.53/4.00 |

2. **IIND-2104 Probabilistic Models** (*Required undergraduate course*)

Topics: Discrete Time (DTMC) and Continuous Time Markov Chains (CTMC), Queing Theory, (Stochastic) Dynamic Programming, Markov Decision Processes (MDP).

| Semester | Enrollment | Instructor rating |
|-------------|------------|-------------------|
| Fall 2016 | 45 | 3.67/4.00 |
| Spring 2017 | 89 | 3.59/4.00 |

3. **IIND-2109 Decision Support Systems** (*Required undergraduate course*)

Topics: Design of spreadsheet, functions, graphics, tables and other elements provided by Microsoft Excel. Design algorithms and interfaces in Visual Basic for Applications (VBA). Functions and utilities of Structured Query Language (SQL) on Microsoft Access.

| Semester | Enrollment | Instructor rating |
|-------------|------------|-------------------|
| Fall 2015 | 35 | 3.40/4.00 |
| Spring 2016 | 28 | 3.10/4.00 |
| Spring 2017 | 45 | 3.44/4.00 |

Teaching Assistant at University at Buffalo and Universidad de los Andes

1. Principles of Engineering Management II *Spring 2021*
2. Systems Modeling and Optimization - Operations Research 1 *Fall 2020*
3. Engineering Economy. *Fall 2017*
4. Advanced Optimization. *Spring 2015*
5. Optimization Principles. *Spring 2014, Summer 2014, Fall 2014*
6. Bachelor Final Project 1. *Spring 2013, Summer 2013, Fall 2013*
 - Led other TAs in the development of designated duties.
 - Supported the instructors in the development and grading of content.
 - Designed and lectured recitation classes.

Students advised

Undergraduate

1. **Samir Michael Samir Nino**, University at Buffalo, 2020.
2. **Paula Andrea Guerrero Sierra**, Universidad de los Andes, 2017.
3. **Carlos Mario Lara Sefair**, Universidad de los Andes, 2017.
4. **Lorenza Vélez Gutiérrez**, Universidad de los Andes, 2016.
5. **Juliana Sánchez Ramírez**, Universidad de los Andes, 2016.
6. **Juan Felipe Franco Orjuela**, Universidad de los Andes, 2016.

Masters

1. **Edwin Camilo Quiroga**, co-advised with Daniel F. Otero and Andrés L. Medaglia, Universidad de los Andes, 2017.
2. **Eliana María Soriano Pulido**, co-advised with Carlos Valencia, Universidad de los Andes, 2017.

Other professional experience

Norfolk Southern.

PhD Operations Research Scientist Intern.

June 2020 - August 2020

- Designed and coded an algorithm for the identification of non progressive movements in railroad abstract network.

Industrial Engineering Department. Universidad de los Andes.

Academic support specialist.

June 2015 - May 2016

- Conducted and led a six-sigma project for improving administrative processes.
- Designed and coded a user-friendly tool for Academic Coordination's most essential and time-consuming task (academic-requirements evaluation). 95% time reduction.

Eli Lilly Interamerica inc. an affiliated company of Eli Lilly & Co.

S2 sales representative.

June 2010 - January 2013

B2B assistant sales representative.

January 2010 - May 2010

Pharmacy sales representative.

December 2008 - December 2009

- Worked with clients on-site, negotiating and providing insights and strategic advice.
- Identified and brought new clients.
- Got sales revenues superior to 100% of the targeted value consistently.
- Several times recognized as one of the best sales representatives.

Honors & awards

1. Selected to participate in IISE Doctoral Colloquium, Council of Industrial Engineering Academic Department Heads, 2020.
2. Merit-based full tuition scholarship for data science for all (DS4A) - Colombia, Colombian Government, 2020.
3. Graduated with honors: data science for all (DS4A) - Colombia, Colombian Government, 2020.
4. Project selected in the categories Crowd Favorite and Best Project: data science for all (DS4A) - Colombia, Colombian Government, 2020.
5. Graduate Student Service and Leadership Award, University at Buffalo, Industrial and Systems Engineering, 2020.
6. Graduate Student Teaching Award (honorable mention), University at Buffalo, Industrial and Systems Engineering, 2020.
7. First place in poster competition, University at Buffalo, Industrial and Systems Engineering, 2019.

8. Travel award for NSF poster competition at International Mechanical Engineering Congress & Exposition, 2018.
9. Second place in the master's degree cohort, Universidad de los Andes, 2015.
10. Merit-based scholarship for SAS training program in data science, SAS, Bogotá, Colombia, 2014.
11. Merit-based full tuition scholarship for Master of Science in Industrial Engineering, Universidad de los Andes, 2013-2015.
12. Merit-based full tuition scholarship for Bachelor of Science in Chemical Engineering, Universidad de los Andes, 2003-2008.

Volunteer Service & Leadership

- President & co-Founder of the Latin American - Graduate Student Association *2019 - 2020*
 President of Industrial and Systems Engineering - Graduate Student Association *2019 - 2020*
 Vice-president of Industrial and Systems Engineering - Graduate Student Association *2018 - 2019*
 - Directed an advertising strategy to reach out the members of the Latin American community at UB.
 - Managed the paperwork to constitute the Latin American Graduate Student Association.
 - Direct overall clubs' operations and staff activities.
 - Plan and implement clubs' development strategy.
- Event Coordinator of UB Informs chapter *2018 - 2019*
 - Coordinated all logistical aspects of workshops, seminars, and speaker talks held by the club.
- Instructor for Science is Elementary *Fall 2018*
 - Organized materials and led students in performing simple science experiments.
- Project Consultant for Meals on Wheels for WNY (UB-Informs) *Fall 2018*
 - Led a team of 6 members to analyze warehouse utilization.
 - Developed a user-friendly VBA tool with dashboards to support decision-making..
- Fundraising director for "I want to study" program *Summer 2006*
 - Led 12 promoters in the first fundraising for the benefit of the scholarship program "I Want to Study".
- English and Math teacher at "La Giralda" school *Spring 2005 - Fall 2005*
 - Taught on weekend classes for extra academic support to low-income kids.
- Computer teacher in Library Network (Biblored) *Spring 2003 - Fall 2004*
 - Taught on weekend classes for low-income students at public libraries.