

**CAROLINA VIVAS-VALENCIA**  
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## EDUCATION

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- Ph.D., Weldon School of Biomedical Engineering** 08/2015 - Current  
*Purdue University, West Lafayette, IN*  
*Biomedical Analytics Systems Optimization Lab (BASO)*  
*Advisor: Dr. Nan Kong*
- Master of Science in Biomedical Engineering** 08/2013 -07/2015  
*Purdue University, West Lafayette, IN*  
*Thesis: Cost-effectiveness on Age-and Gender-Specific CRC Screening.*  
*Advisor: Dr. Nan Kong*
- Bachelor of Science in Biomedical Engineering** 08/2006 – 12/2011  
*Universidad EIA – Universidad CES, Medellín, Colombia*  
*Thesis: Development of a Technical Protocol for Positron Emission Tomography/Computed Tomography (PET/CT) Exam for Patients with Cancer.*  
*Advisor: Dr. Luis Colmener*
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## RESEARCH EXPERIENCE

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- Graduate Research Assistant** 08/2013 - Current  
*Purdue University, Biomedical Analytics Systems Optimization Lab (BASO)*

### **Current Projects:**

- Longitudinal healthcare behavior analysis for opioid use disorder utilization
  - Claim data preparation for Indiana Family & Social Services Administration (FSSA) database
  - Medical claims data translation into meaningful information for medical decision making
- Improving retention of the medication assisted treatment program by integrating empirical prediction with resource optimization
- Learning outcomes research for empathic innovation in healthcare engineering

### **Previous Projects:**

- Simulation modeling of the natural history of colorectal cancer
- Model-based cost-effectiveness analysis of colorectal cancer screening strategies
- Analysis of patient-physician communication for shared decision making
- Multi-objective simulation optimization

**Junior Research Assistant in Clinical Engineering** 01/2009-11/2011  
*Universidad EIA - GIBEC Group*

**Undergraduate Research – Tissue Engineering Lab** 09/2008-12/2008  
*Universidad EIA - GIBEC Group*

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## **GRADUATE & TEACHING EXPERIENCE**

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**Teaching Assistant- Smart Healthcare Engineering** 6/2020-08/2020  
*Purdue University, Weldon School of Biomedical Engineering*

**Teaching Assistant- Preclinical & Clinical Study Design** 08/2019-12/2019  
*Purdue University, Weldon School of Biomedical Engineering*

**Teaching Assistant- Quality Systems for Regulatory Compliance** 06/2019-08/2019  
*Purdue University, Weldon School of Biomedical Engineering*

**Teaching Assistant- Regulatory Approval of Medical Devices** 01/2018-05/2018  
*Purdue University, Weldon School of Biomedical Engineering*

**Graduate Assistant- Academic Success Center** 08/2017 – 12/2017  
*Purdue University, Student Success Center*

**Teaching Assistant- Quality Systems for Regulatory Compliance** 06/2017-08/2017  
*Purdue University, Weldon School of Biomedical Engineering*

**Graduate Assistant- BME Graduate Program** 08/2016 – 05/2017  
*Purdue University, Weldon School of Biomedical Engineering*

**Teaching Assistant- Healthcare Systems Engineering** 08/2016-12/2016  
*Purdue University, Weldon School of Biomedical Engineering*

**Teaching Assistant- Regulatory Approval of Medical Devices** 01/2016 – 05/2016  
*Purdue University, Weldon School of Biomedical Engineering*

**Teaching Assistant- Preclinical & Clinical Study Design** 08/2015 – 012/2015  
*Purdue University, Weldon School of Biomedical Engineering*

**Teaching Assistant- Regulatory Approval of Medical Devices** 01/2015 – 05/2015  
*Purdue University, Weldon School of Biomedical Engineering*

**Teaching Assistant- Preclinical & Clinical Study Design** 08/2014 – 012/2014  
*Purdue University, Weldon School of Biomedical Engineering*

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## PUBLICATIONS & CONFERENCE PROCEEDINGS

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### PUBLICATIONS

**An introduction to multi-objective simulation optimization**, Hunter, S. R.; Applegate, E. A.; Arora, V.; Chong, B.; Cooper, K.; Rincón-Guevara, O.; and Vivas-Valencia, C. *ACM Transactions on Modeling and Computer Simulation*, 29(1): 7:1–7:36. January 2019.

**Multiobjective calibration of disease simulation models using gaussian processes**, Sai, Aditya, Carolina Vivas-Valencia, Thomas F. Imperiale, and Nan Kong. *Medical Decision Making* 39, no. 5 (2019): 540-552.

**Analyzing patient-physician interaction in consultation for shared decision making**, Mdluli, Thembi, Joyatee Sarker, Carolina Vivas-Valencia, Nan Kong, and Cleveland G. Shields. *Healthcare Analytics: From Data to Knowledge to Healthcare Improvement* (2016): 503-522.

**Artificial intelligence powered physician-patient communication: does patient-physician conversation data accurately infer patient satisfaction?**, Zhouyang Lou, Carolina Vivas-Valencia, Nan Kong, and Cleveland Shields – *Submitted to IEEE Transactions on Automation Science and Engineering*.

**Longitudinal healthcare behavior analysis for opioid use disorder utilization**, Carolina Vivas-Valencia, Paul Griffin, Nan Kong – *In preparation*

**A Two-Phase Approach to Characterizing Age- and Gender-Specific Precancerous Adenoma Progression via Discrete-Event Simulation**, Carolina Vivas-Valencia, Aditya Sai, Thomas Imperiale and Nan Kong - *In Preparation*

### CONFERENCE PROCEEDINGS

**An assessment instrument for user-centered innovation potential among biomedical engineers**, Vivas-Valencia, C., Kim, E., Kong, N., Payne, L., & Purzer, S. (2020). American Society of Engineering Education

**Best Paper of the Design in Engineering Education Division**

**Problem reframing and empathy manifestation in the innovation process**, Kim, E., Purzer, S., Vivas-Valencia, C, L., Kong, N., & Payne L (2020). American Society of Engineering Education

**Research Initiation: enhancing the learning outcomes of empathic innovation in biomedical engineering senior design projects**, Kong, N., Purzer S., Payne L., Kim, E., and Vivas-Valencia, C (2020). American Society of Engineering Education

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### ORAL PRESENTATIONS

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*INFORMS Annual Meeting*

10/2019

**Improving retention of the medication assisted treatment program by integrating empirical prediction with resource optimization.** Carolina Vivas-Valencia<sup>1</sup>, Nan Kong<sup>1</sup>, Yunan Liu<sup>2</sup>, Paul Griffin<sup>1</sup>. (1) Purdue University, West Lafayette, IN, (2) North Carolina State University, Raleigh, NC

*CSAP Academic Presentations*

02/2018

**Model-Based parameter estimation in colorectal cancer disease progression.** Carolina Vivas-Valencia, PhD Student.<sup>1</sup>, Aditya Sai, PhD Student.<sup>1</sup>, Thomas Imperiale, MD<sup>4</sup> and Nan Kong, Ph.D.<sup>1</sup>, (1) Weldon School of Biomedical Engineering, Purdue

University, West Lafayette, IN, (2) Medical Decision Modeling, Inc., Indianapolis, IN, (3) Indiana University, Department of Medicine, Indianapolis, IN

*Weldon School of Biomedical Engineering – Summer Seminar*

7/2017

**Model-based parameter estimation for colorectal cancer disease progression.** Carolina Vivas-Valencia, PhD Student<sup>1</sup>, Nan Kong, Ph.D.<sup>1</sup>, Robert Klein, MS<sup>2</sup>, and Thomas Imperiale, MD<sup>3</sup>, (1) Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, (2) Medical Decision Modeling, Inc., Indianapolis, IN, (3) Indiana University, Department of Medicine, Indianapolis, IN

*INFORMS Healthcare Meeting*

06/2016

**Sequential quadratic programming for model-based parameter estimation in colorectal cancer disease progression.** Carolina Vivas-Valencia, PhD Student<sup>1</sup>, Nan Kong, Ph.D.<sup>1</sup>, Robert Klein, MS<sup>2</sup>, and Thomas Imperiale, MD<sup>3</sup>, (1) Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, (2) Medical Decision Modeling, Inc., Indianapolis, IN, (3) Indiana University, Department of Medicine, Indianapolis, IN

*INFORMS Annual Meeting*

11/2015

**Tailoring CRC screening strategy. what is good for men? what is good for women?** Carolina Vivas-Valencia, PhD Student<sup>1</sup>, Nan Kong, Ph.D.<sup>1</sup>, Robert Klein, MS<sup>2</sup>, and Thomas Imperiale, MD<sup>3</sup>, (1) Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, (2) Medical Decision Modeling, Inc., Indianapolis, IN, (3) Indiana University, Department of Medicine, Indianapolis, IN

*INFORMS Annual Meeting*

11/2014

**A simulation-based cost-effectiveness study on age gender-specific CRC screening strategies.** Nan Kong, Ph.D.<sup>1</sup>, Carolina Vivas-Valencia, MSc Student<sup>1</sup>, Robert Klein, MS<sup>3</sup>, Weng-Kian Tham, MS<sup>3</sup> and Thomas Imperiale, MD<sup>4</sup>, (1)Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, (2)Medical Decision Modeling, Inc., Indianapolis, IN, (3)Indiana University, Department of Medicine, Indianapolis, IN

Oral Presentation during the Top Ranked Abstract Session

10/2014

*The 36th Annual Meeting of the Society for Medical Decision Making SMDM*

**A progressive calibration procedure for individualized colorectal cancer screening study.** Carolina Vivas-Valencia, MSc Student<sup>1</sup>, Nan Kong, Ph.D.<sup>1</sup>, Robert Klein, MS<sup>2</sup>, Weng-Kian Tham, MS<sup>2</sup> and Thomas Imperiale, MD<sup>3</sup>, (1) Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, (2) Medical Decision Modeling, Inc., Indianapolis, IN, (3) Indiana University, Department of Medicine, Indianapolis, IN

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## POSTER PRESENTATIONS

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*Clinical and Translational Sciences Institute - Retreat*

1/2020

**Uncovering longitudinal healthcare utilization data for identifying opioid addiction behavioral patterns.** Carolina Vivas-Valencia<sup>1</sup>, Nan Kong<sup>1</sup>, Paul Griffin<sup>2</sup>. (1) Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, (2) Regenstrief Center for Healthcare Engineering, Purdue University, West Lafayette, IN

<p><i>INFORMS Annual Meeting</i></p> <p><b>Optimal design of peer recovery coach program to improve the effectiveness of opioid use disorder treatment</b> Carolina Vivas-Valencia<sup>1</sup>, Nan Kong<sup>1</sup>, Yunan Liu<sup>2</sup>, Paul Griffin<sup>1</sup>, (1) Purdue University, West Lafayette, IN, (2) North Carolina State University, Raleigh, NC</p>	10/2019
<p><i>The 39th Annual Meeting of the Society for Medical Decision Making SMDM</i></p> <p><b>Lee B. Lusted Finalist</b></p> <p><b>An efficient two-phase disease model calibration procedure with a case study in colorectal cancer.</b> Carolina Vivas-Valencia, PhD Student.<sup>1</sup>, Aditya Sai, PhD Student.<sup>1</sup>, Thomas Imperiale, MD<sup>4</sup> and Nan Kong, Ph.D.<sup>1</sup>, (1) Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, (2) Medical Decision Modeling, Inc., Indianapolis, IN, (3) Indiana University, Department of Medicine, Indianapolis, IN</p>	10/2017
<p><i>Weldon School of Biomedical Engineering – RFA Surgery Collaboration</i></p> <p><b>Model-based parameter estimation for colorectal cancer neoplasia progression.</b> Carolina Vivas-Valencia, PhD Student<sup>1</sup>, Nan Kong, Ph.D.<sup>1</sup>, Robert Klein, MS<sup>2</sup>, and Thomas Imperiale, MD<sup>3</sup>, (1) Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, (2) Medical Decision Modeling, Inc., Indianapolis, IN, (3) Indiana University, Department of Medicine, Indianapolis, IN</p>	8/2016
<p><i>Weldon School of Biomedical Engineering – Advisory Board Poster Session</i></p> <p><b>Model-based parameter estimation for colorectal cancer disease progression.</b> Carolina Vivas-Valencia, PhD Student<sup>1</sup>, Nan Kong, Ph.D.<sup>1</sup>, Robert Klein, MS<sup>2</sup>, and Thomas Imperiale, MD<sup>3</sup>, (1) Weldon School of Biomedical Engineering, Purdue University, West Lafayette, IN, (2) Medical Decision Modeling, Inc., Indianapolis, IN, (3) Indiana University, Department of Medicine, Indianapolis, IN</p>	9/2015

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## HONORS & AWARDS

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<p><b>Regenstrief Center for Healthcare Engineering Graduate Student Scholarship</b></p> <p><i>Regenstrief Center for Healthcare Engineering at Purdue University</i></p>	07/2020
<p><b>LatinE Fellowship</b></p> <p><i>Purdue University, College of Engineering</i></p>	05/2020
<p><b>2019 Bourland Travel Award</b></p> <p><i>Purdue University, Weldon School of Biomedical Engineering</i></p>	07/2019
<p><b>Best Pitch Award</b></p> <p><i>Purdue University, College of Engineering</i></p>	05/2019
<p><b>2018 Estus H. and Vashti L. Magoon Award for Excellence in Teaching</b></p> <p><i>Purdue University, College of Engineering</i></p> <p><i>Purdue University, Weldon School of Biomedical Engineering</i></p>	04/2018
<p><b>Lee B. Lusted Award Finalist</b></p> <p><i>The 39th Annual Meeting of the Society for Medical Decision Making SMDM</i></p>	10/2017

<b>CSAP Fall 2017 Travel Grant</b> <i>Colombian Student Association at Purdue</i>	09/2017
<b>Finalist in the Colombia Joven Award granted by the Presidency of Colombia</b> <i>Program - Colombia Joven</i>	08/2016
<b>Top Ranked Abstract Session</b> <i>The 36th Annual Meeting of the Society for Medical Decision Making SMDM</i>	10/2014
<b>HSEA Sponsorship/Travel Grant</b> <i>The Health Systems Engineering Alliance</i>	10/2014
<b>2014 Bourland Travel Award</b> <i>Purdue University, Weldon School of Biomedical Engineering</i>	10/2014
<b>Recognition of Outstanding Leadership Performance</b> <i>CediMed S.A, Medellín, Colombia</i>	07/2011

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## CERTIFICATES & RELATED COURSES

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<b>Certificate - Mental Health First Aid</b> <i>Purdue University and National Council for Behavioral Health</i>	Spring 2020
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<b>Certificate – Foundations in College Teaching</b> <i>Purdue University – Center for Instructional Excellence</i>	Fall 2018
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### Graduate Courses

Systems Simulation (IE580)  
Comparative Healthcare Systems (SOC572)  
Biostatistics (BME595)  
Data Mining in Health Care (BME695)  
Epidemiology (HK567)  
Design of Experiments (STAT514)  
Simulation Design and Analysis (IE581)  
Healthcare Delivery Systems (IE690)  
Multidisciplinary Design Optimization (AAE550)  
Simulation Optimization (IE690)  
Advanced Topics in Eukaryotic Cells (BIOL620)  
Quantitative Systems Biology (BME695)

<b>Diploma on Management and Support of Medical Technologies II</b> <i>University of Vermont, Universidad EIA &amp; Universidad CES</i>	08/2010 – 11/2010
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<b>Diploma on Management and Support of Medical Technologies I</b>	05/2010-08/2010
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## MENTORSHIP

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<b>URSA – Graduate Mentor</b> Madison Gatto Rosen, School of Computer Science, Purdue University <i>Data mining techniques to care event prediction through model-based predictive modeling</i>	2/2020-current
<b>Graduate Mentor</b> Min-Ju Li, School of Computer Science, Purdue University <i>Utilization sequence mining for opioid treatment management</i>	9/2019-current
<b>SURF Graduate Mentor</b> <b><i>Time-Series clustering for medication adherence.</i></b> Ruhana Azam <sup>1</sup> , Carolina Vivas-Valencia <sup>2</sup> , Nan Kong <sup>2</sup> Ph.D. Computer Science, Purdue University <sup>1</sup> Weldon School of Biomedical Engineering, Purdue University <sup>2</sup>	Summer 2018
<b>SURF Graduate Mentor</b> <b><i>Acoustic analysis of vocalizations for detecting separation anxiety in dogs.</i></b> Karina Sequera <sup>1</sup> , Carolina Vivas Valencia <sup>2</sup> , Nan Kong <sup>2</sup> Ph.D., Niwako Ogata <sup>3</sup> BVSc. Ph.D, Biomedical Engineering, Florida International University <sup>1</sup> Weldon School of Biomedical Engineering, Purdue University <sup>2</sup> College of Veterinary Medicine, Purdue University <sup>3</sup>	Summer 2017
<b>Graduate Mentor</b> Madeline Rose Barta, School of Industrial Engineering, Purdue University Discrete-event simulation modeling of colorectal cancer	Summer 2017

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## INDUSTRIAL EXPERIENCE

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<b>Biomedical Engineering Assistant</b> <i>CediMed S.A, Medellín, Colombia</i>	12/2010 – 12/2011
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## OUTREACH & VOLUNTEER EXPERIENCE

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<b>INFORMS - Diversity, Equity and Inclusion Committee</b> <i>Committee Member</i>	02/2019 - Current
<b>Mentoring Uni-Minuto</b> <i>Proposal Leader</i>	08-2017-05-2018
<b>Project Interchange Outreach</b> <i>Student Coordinator</i>	06/2012-Current

<b>Science on Tap</b> <i>Director</i>	08/2016-9/2017
<b>Colombian Student Association at Purdue</b> <i>Treasurer</i>	01/2015 – 02/2016
<b>Toys for Cookies</b> <i>Director</i>	12/2015 -12/2016
<b>Biomedical Engineering Graduated Students Association – Purdue University</b> <i>Master’s student representative</i>	08/2014-06/2015
<b>Women in Engineering Summer Outreach Program – Purdue University</b> <i>Volunteer</i>	06/2014-08/2014

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**COMPUTER SKILLS**

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Python, R, Matlab, Minitab, SAS, Arena, Sketch, MS office word, MS office excel.

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**LANGUAGES**

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**Spanish:** *Native*  
**English:** *Full Professional Proficiency*