

## **FABIAN RODRIGUEZ BUITRAGO**

**Ph.D. Candidate, Civil Engineering**

Lyles School of Civil Engineering HAMP G230  
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### **RESEARCH INTERESTS**

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Development of cementitious materials for 3D-printing systems for civil infrastructure applications. Effect of supplementary cementitious materials on mixtures for 3D-printing. Evaluation of durability properties of materials for different exposure environments, and corrosion of reinforcement on 3D-printed concrete; development.

### **EDUCATION**

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#### **Ph.D. Candidate Civil Engineering – Expected graduation date: May 2023**

Lyles School of Civil Engineering, Purdue University, West Lafayette, Indiana.

Research Project: *Influence of fresh properties and printing parameters on the durability and mechanical performance of 3D-printed reinforced elements.*

#### **M.Sc. Civil Engineering - 2022**

Lyles School of Civil Engineering, Purdue University, West Lafayette, Indiana.

Research Project: *Fresh properties and mechanical performance of 3D-printed concrete.*

#### **B.Sc., Civil Engineering,**

College of engineering, Universidad Nacional de Colombia, Bogotá, Colombia.

### **EMPLOYMENT AND POSITIONS**

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#### **May 2019-Present** Lyles School of Civil Engineering, Purdue University.

Position: Graduate Research Assistant, Teaching Assistant, Ph.D. Candidate

Research Advisors: Pablo D. Zavattieri, Jan Olek, Jeffrey P. Youngblood.

#### **Feb 2018-Apr 2019** Ingercivil, Bogota, Colombia.

Position: Field Engineer, Coordination, interpretation and analysis of subsoil exploration.

#### **Jan 2017-Jun 2017** Universidad Nacional de Colombia, Bogota, Colombia.

Position: Auxiliary student for the courses of Aqueducts and Sewerages systems for the Civil Engineering program.

### **AWARDS**

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**2022** Bilsland Dissertation Fellowship – Lyles School of Civil Engineering, Purdue University.

**2021** Nellie Munson Graduate Teaching Assistant Award – In Recognition of Excellence in Graduate Instructors and Teaching Assistants in Civil Engineering

**2021** Poster Session Purdue Engineering Virtual Graduate Showcase – Purdue University.

## **PUBLICATIONS**

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### Refereed Journal Articles.

- 1 **Rodriguez, F.B.**, Agrawal, S., Moini, R., Zavattieri, P. D., Youngblood, J. P., Olek, J., Varma, A., Williams, C. S. "Evaluation of Additive Manufactured Steel Plate Alternative for External Reinforcement of 3D-Printed Mortar Beams", *In preparation for submission*.
- 2 **Rodriguez, F. B.**, Garzon, C., Wang, Y., Olek, J., Zavattieri, P. D., Youngblood, J. P., Falzone, G., & Cotrell, J. "Evaluation of Durability of 3D-Printed Cementitious Materials for Potential Applications in Structures Exposed to Marine Environments". Third RILEM International Conference on Concrete and Digital Fabrication – Digital Concrete 2022. – *In Press*.
- 3 **Rodriguez, F. B.**, Olek, J., Moini, R., Zavattieri, P. D., & Youngblood, J. P. "Linking Solids Content and Flow Properties of Mortars to their Three-Dimensional Printing Characteristics". *ACI Materials Journal*, 118(6), 1–12. November 2021. <https://doi.org/10.14359/51733136>
- 4 Moini, R., Baghaie, A., **Rodriguez, F. B.**, Zavattieri, P. D., Youngblood, J. P., & Olek, J. "Quantitative microstructural investigation of 3D-printed and cast cement pastes using micro-computed tomography and image analysis". *Cement and Concrete Research*, V. 147, No. March 2021, p. 106493. <https://doi.org/10.1016/j.cemconres.2021.106493>

## **ORAL PRESENTATIONS**

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- 1 Presentation at the ACI – Spring 2022 Convention in the session: Properties and Performance of Hardened 3D-Printed Cement-Based Materials with the title: "*Fresh state and mechanical properties of mortar mixtures for 3D-printing using traditional and non-traditional supplementary cementitious materials*" March 2022
- 2 Research poster presentation at the Purdue Engineering Virtual Graduate Showcase aimed to disseminate the research to prospective students, connect with potential new collaborators for graduate research with the title: "*3D-printing of cementitious materials*" October 2021
- 3 Research poster presentation at the ACI 123 Student Poster Session, Part 2 of 2 with the title: "*3D-Printing of fiber-reinforced elements using hemp fibers and alternative supplementary cementitious materials*" October 2021

## **PROFESSIONAL AFFILIATIONS**

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### **American Concrete Institute (ACI)**

ACI564 – 3-D Printing with Cementitious Materials

### **International Union of Laboratories and Experts in Construction Materials, Systems and Structures (RILEM)**

Technical Committee Assessment of Additively Manufactured Concrete Materials and Structures

### **American Society of Civil Engineers (ASCE)**

Member since 2020

## **TEACHING EXPERIENCE**

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### **Teaching Assistant – Fall 2020. CE-497 “Civil Engineering Materials”.**

Planning and execution of laboratory sessions on solids mechanics and materials properties.  
Assistance to students on class-related topics during office-hours.  
Mentoring students on the proper preparation of laboratory reports in engineering.

### **Teaching Assistant – Spring 2022 CE-299 “3D-Printing of Concrete”**

Development of syllabus for the 8-week elective class in Civil Engineering program.  
Lecturer for sessions focused on 3D-printing applications, slicing, and printing parameters.  
Development of laboratory sessions including Basics of 3D-printing, 3D-printing of cement, Rheology of cementitious materials and Large-scale 3D-printing.  
Design and grading of assignments and laboratory reports throughout the course.

## **MENTORED STUDENTS**

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During my Ph.D. I have had the opportunity to serve as a mentor for undergraduate students interested in exploring research in the area of Materials at the Lyles School of Civil Engineering

### **Summer 2022 – Alonso Manzueta – SURF Program**

Design of extrusion system for 3D-printing of concrete using a robotic arm.

### **Fall 2021 – Cristian Garzon Lopez – UREP-C Program**

Evaluation of durability and mechanical performance of 3D-printed elements produced with large-scale printing system.

### **Summer 2021 – Joe Romanyk – Undergraduate Research**

Examination of the buildability of mortar mixtures in different size scales, including their formulation and fresh state properties.

### **Fall 2020 – Enrique Eduardo Fabregas – Undergraduate Research**

Examination of the printability of mortar mixtures and exploration of reinforcement alternatives such as fibers and steel wires at small scale.

### **Spring 2020 – Sabrina Matos – Undergraduate Research**

Examination of the extrudability and printability of cement-based inks using a Hyrel Mortar 3D-printing system.

## **LANGUAGE PROFICIENCY**

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Spanish – **Native**

English – **Advanced C1 Level**

German – **Intermediate**