Pedro L. Fernández-Cabán, Ph.D.

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ACADEMIC APPOINTMENTS

Clarkson University — **Potsdam, NY**
Assistant Professor — *July 2019–Present*

University of Maryland — **College Park, MD**
Postdoctoral Research Associate — *August 2017–June 2019*
Advisor: Dr. Brian M. Phillips

EDUCATION

University of Florida — **Gainesville, FL**
Ph.D. Civil Engineering (*Structures*) — *August 2017*
Advisor: Dr. Forrest J. Masters

University of Florida — **Gainesville, FL**
M.E. Civil Engineering (*Structures*) — *May 2017*

University of Puerto Rico at Mayagüez — **Mayagüez, PR**
B.S. Civil Engineering — *June 2013*

RESEARCH INTERESTS

- Cyber-physical modeling of civil infrastructure performance under wind and other natural hazards
- Stochastic optimization of structural efficiency and performance of civil infrastructure
- Characterization of wind-induced loads on building structures through boundary layer wind tunnel modeling
- Behavior of extreme near-surface winds in the tropical cyclone atmospheric boundary layer

RESEARCH EXPERIENCE

University of Maryland — **College Park, MD**
Postdoctoral Research Associate — *August 2017–June 2019*

- Developed numerical and experimental tools to support cyber-physical systems (CPS) approaches to wind hazards engineering (NSF Award: CMMI-ENH 1636039).
- Lead wind engineering experimental studies at the University of Maryland (UMD) and University of Florida (UF).
- Assisted in the preparation of research grant proposals, peer-reviewed journal papers, and conference papers.
- Collaborated with UF's hurricane research team in the deployment of portable weather stations, equipped with high-resolution anemometry, during Hurricane's Harvey, Irma, and Florence.

RESEARCH EXPERIENCE (CONTINUED)

University of Florida **Gainesville, FL**
Graduate Research Assistant *August 2013–July 2017*

- Developed of numerical metaheuristic optimization algorithms for discrete sizing optimization of large-scale civil structures.
- Compiled a large database of field observations from anemometric records obtained from 72 deployments of portable weather stations in 24 storms during the 1999–2014 Atlantic hurricane seasons as part of the Florida Coastal Monitoring Program (NSF Award: CMMI-1055744).
- Performed baseline flow measurement validation of the new automated low-speed boundary layer wind tunnel (BLWT) at the UF's Natural Hazard Engineering Research Infrastructure (NHERI) Experimental Facility (NSF Award: CMMI-1520843) (http://multihazard.eng.ufl.edu/).
- Conducted BLWT tests using advanced data-acquisition systems (DAQ) including high-frequency force balance (HFFB) and synchronous multi-pressure sensing systems (SM-PSS).

University of Puerto Rico-Mayagüez **Mayagüez, PR**
Undergraduate Research Assistant *January 2011–December 2012*

- Assessed the validation of three wind-forecasting models provided by the National Weather Service (WRF-NWS, GFS, and NAM) with local measurements from the Caribbean Coastal Ocean Observing System Hurricane Mesonet (http://www.caricoos.org/).
- Collaborated in the installation of a meteorological weather station in Rincón, Puerto Rico as part of the Caribbean Coastal Ocean Observing System Hurricane Mesonet (http://www.caricoos.org/).

TEACHING AND MENTORING EXPERIENCE

University of Florida **Gainesville, FL**
Instructor, Mechanics of Engineering Structures *Fall 2016*

- Course evaluation: 4.53/5.00 (Dept. mean: 4.37, College mean: 4.15)
- Class of 90 students (response rate > 65%)

University of Florida **Gainesville, FL**
Guest Lecturer, Advanced Structural Analysis *Fall 2015*

- Presented supplemental lecture on structural optimization for the class's final project

University of Florida **Gainesville, FL**
Instructor, MATLAB Workshop, *Spring 2015–2017*
Instructor, Mathcad Workshop, *Fall 2015–2017*
Instructor, FE/EIT Review (Structural Analysis) *Fall 2016 and Spring 2017*

University of Florida **Gainesville, FL**
Advisor/Mentor, ASCE Steel Bridge Team *Fall 2014–2016*

- Collaborated with the team captains to develop optimization algorithms for improving structural efficiency and performance

University of Maryland **College Park, MD**
Mentor, Two Ph.D. Students *Fall 2017–Spring 2019*

- Closely work with them in data analysis and modeling, interpreting results, identifying key findings, and preparing manuscripts for peer-reviewed journals and conference papers

TEACHING AND MENTORING EXPERIENCE (CONTINUED)

Clarkson University **Potsdam, NY**
Instructor, Reinforced Concrete Design *Fall 2019-Present*
Faculty Advisor, ASCE Steel Bridge Team

PEER-REVIEWED JOURNAL PUBLICATIONS

[J1] **Fernández-Cabán, P.L.**, Alford, A., Bell, M., Biggerstaff, M.I., Carrie, G.D., B. H., Kosiba, K., Phillips, B.M., Schroeder, J.L., Waugh, S.M., Williford, C.E., Wurman, J., Masters, F.J. (2018) "Observing Hurricane Harvey's Eyewall at Landfall." *Bulletin of the American Meteorological Society (BAMS)*.

[J2] **Fernández-Cabán, P.L.,** and Masters, F.J. (2018). "Effects of Freestream Turbulence on the Pressure Acting on a Low-Rise Building Roof in the Separated Flow Region." *Frontiers in Built Environment* 4:17.

[J3] **Fernández-Cabán, P.L.,** and Masters, F.J. (2017). "Near surface wind longitudinal velocity positively skews with increasing aerodynamic roughness length." *Journal of Wind Engineering and Industrial Aerodynamics* 169:94-105.

[J4] **Fernández-Cabán, P.L.,** and Masters, F.J. (2018). "Hybridizing particle swarm and big bang-big crunch optimization methods to explore then exploit the design domain of large planar frame structures." *Computers & Structures* 202:1-14.

[J5] **Fernández-Cabán, P.L.**, Masters, F.J., Phillips, B.M. (2018) "Predicting roof pressures on a low-rise structure from freestream turbulence using artificial neural networks." *Frontiers in Built Environment* 4:68.

[J6] Whiteman, M.L., Phillips, B.M., **Fernández-Cabán, P.L.**, Masters, F.J., Bridge, J.A., and Davis, J.R. (2018). "Optimal design of structures using cyber-physical wind tunnel experiments with mechatronic models." *Journal of Wind Engineering and Industrial Aerodynamics* 172:441-452.

[J7] Whiteman, M.L., **Fernández-Cabán, P.L.**, Phillips, B.M., Masters, F.J., Bridge, J.A., and Davis, J.R. (2018). "Multi-Objective Optimal Design of a Building Envelope and Structural System Using Cyber-Physical Modeling in a Wind Tunnel." *Frontiers in Built Environment* 4:13.

[J8] Zhang, R., Phillips, B.M., **Fernández-Cabán, P.L.**, Masters, F. J. (2019) "Cyber-physical optimization using real-time hybrid simulation." *Engineering Structures* 195:113-124.

[J9] Catarelli, R.A., **Fernández-Cabán, P.L.**, Masters, F.J., Bridge, J.A., Matyas, C.J., Gurley, K.R. "Automated Terrain Generation for Precise Atmospheric Boundary Layer Simulation in the Wind Tunnel". *Journal of Wind Engineering and Industrial Aerodynamics*. *(Under Review)*.

[J10] Tian, J., Diaz, M.T., **Fernández-Cabán, P.L.**, Gurley, K.R., Masters, F.J., Fang, R. "Low-Rise Gable Roof Pressure Prediction using Deep Neural Networks". *Journal of Wind Engineering and Industrial Aerodynamics*. *(In Press)*.

[J11] **Fernández-Cabán, P.L.**, Whiteman, M.L., Phillips, B.M., Masters, F.J., Bridge, J.A., and Davis, J.R. "Cyber-physical design and optimization of tall building dynamics using aeroelastic wind tunnel modeling." *Journal of Wind Engineering and Industrial Aerodynamics. (Under Review)*.

PRESENTATIONS

14th International Conference on Wind Engineering (ICWE14) — **Porto Alegre, Brazil**
- *"Metaheuristic optimization of wind sensitive structures"* — *June 2015*

Federal Alliance for Safe Homes (FLASH) Conference 2016 — **Orlando, FL**
- *"Anemometric observations in the roughness sublayer"* — *January 2016*

4th American Association for Wind Engineering (AAWE) Workshop — **Miami, FL**
- *"Implications of observed non-Gaussian trends in the roughness sublayer on suburban exposure coefficient profiles"* — *August 2016*

13th Americas Conference on Wind Engineering (ACWE13) — **Gainesville, FL**
- *"Influence controlled particle swarm for discrete optimization of wind sensitive steel frames"* — *May 2017*
- *"Near surface wind longitudinal velocity positively skews with increasing aerodynamic roughness length"*
- *"The spatial pressure distribution on low-rise buildings varies with surface roughness"*

American Society of Civil Engineers (ASCE) Structures Congress 2018 — **Dallas, Texas**
- *"Optimal design in wind engineering using cyber-physical systems and non-stochastic search algorithms"* — *April 2018*

Tornado Hazard Wind Assessment and ReducTion Symposium — **Champaign, IL**
- *"Predicting peak wind pressures on a low-rise structure from upstream terrain conditions"* — *September 2018*

ETH-MECHS Workshop (HYSIM19; https://www.hysim19.org/program**)** — **Zurich, Switzerland**
- *"Developing cyber-physical tools to optimize the performance of civil infrastructure under wind hazards"* — *March 2019*

15th International Conference on Wind Engineering (ICWE15) — **Beijing, China**
- *"Predicting roof pressures on a low-rise building from the turbulence characteristics of the freestream"* — *September 2019*

INVITED TALKS

4th American Association for Wind Engineering (AAWE) Workshop — **Miami, FL**
"NHERI Experimental Facility: University of Florida" — *August 16, 2016*

Society of Hispanic Professional Engineers (SHPE) National Conference — **Seattle, WA**
"Metaheuristic optimization in engineering design" — *November 10, 2016*

UF Gator Computing Program (HiPerGator) — **Gainesville, FL**
"Development of a cyber-physical system (CPS) framework for optimization of wind-sensitive civil structures" — *June 6, 2017*

National Institute of Standards and Technology (NIST) — **Gaithersburg, MD**
"Developing cyber-physical tools for performance evaluation and optimization of civil infrastructure under extreme winds" — *May 16, 2018*

Cyber-Physical Approaches to Wind Tunnel Testing Workshop — **Gainesville, FL**
"Boundary Layer Wind Tunnel Testing Overview" — *April 23, 2019*

FELLOWSHIPS AND AWARDS

- National Science Foundation (NSF); *Bridge to the Doctorate Fellow*; 2013–2015
- *International Code Council (ICC) Scholarship*; Federal Alliance for Safe Homes (FLASH); 2016
- *Graduate Outstanding Student Award*; Engineering School of Sustainable Infrastructure and Environment (ESSIE); University of Florida; Civil Engineering; 2017

PROFESSIONAL ORGANIZATIONS

- Accreditation Board of Engineering and Technology (ABET) Student Advisory Committee; 2008
- Tau Beta Pi National Engineering Honor Society, Mayagüez Chapter; 2011
- American Society of Civil Engineers (ASCE); *Associate Member*
- American Association for Wind Engineering (AAWE); 2016
- Society of Hispanic Professional Engineers (SHPE); 2016

MEDIA APPEARANCES

CNNTech **Gainesville, FL**
"Extreme weather prep with 230 mph wind tunnel" *Published in*
(https://www.youtube.com/watch?v=1PeZveHTfPI) *February 2017*

NSF Science Nation, Miles O'Brien **Gainesville, FL**
"Terraformer wind tunnel takes hazards engineering research to a new level" *Published in*
(https://www.youtube.com/watch?v=_VKqqrQkc5k) *February 2017*