

# Josue Santana | Curriculum Vitae

+1 (786) 470-4450 • js3359@cornell.edu  
www.linkedin.com/in/santanajosue • twitter.com/\_JosueSantana\_

*"Most people are other people. Their thoughts are someone else's opinions, their lives a mimicry, their passions a quotation." Oscar Wilde*

Accomplished Ph.D. student and biomedical engineering researcher at Cornell University. Mr. Santana is passionate about the study of bone mechanics and its primary applications in the study of osteoarthritis(OA)-related fractures. His research encompasses the study of bone marrow lesions (BMLs) and the complex mechanism by which BMLs enhance the progression of OA. Josue has a proven track record of success as an energetic communicator capable of recognizing the unexplored potential of talented scholars from historically underrepresented and segregated social groups. As a graduate student ambassador, he utilizes his emotional intelligence, civic engagement, and teaching skills to promote scientific literacy and empower students to become the next generation of scientists for a globally engaged US science and engineering workforce.

## Research and Work Experience

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- **Hernandez Research Group - Cornell University** **Ithaca, NY**  
Graduate Student Researcher *August 2016 – Present*
  - Research endeavors encompass exploring the direct effect of microdamage in cancellous and trabecular bone and the contributions of microdamage to bone marrow lesions (BMLs), radiology findings associated with early stage of osteoarthritis (OA). BMLs have been linked to multiple diseases affecting the musculoskeletal system and are thought to have a crucial role in the progression of inflammatory and non-inflammatory rheumatologic conditions, especially in the context of knee OA.
  - Our current research project is targeted to the use of a novel preclinical model to enhance our understanding about the etiology and physiology of fatigue damage-induced BMLs.
  - Currently, advanced methods of three-dimensional dynamic bone histomorphometry are utilized to localize areas of bone remodeling and microdamage within cancellous bone as a response to external mechanical stimulus in the form of repetitive, controlled loading.
- **Graduate School - Cornell University** **Ithaca, NY**  
Graduate Student Ambassador *October 2017 – Present*
  - Utilizing emotional intelligence, civic engagement, and teaching skills to promote scientific literacy and empower students to become the next generation of scientists for a globally engaged US science and engineering workforce.
  - Utilizing previous personal experiences as an immigrant underrepresented first-generation minority student with a proven track record of academic success to strengthen the diversity and admission process at the graduate school level within Cornell University.
- **Hospital for Special Surgery - HSS** **New York, NY**  
Summer Graduate Research Fellow *June 2017 – August 2017*

- Worked under the guidance of Dr. Emily Margaret Stein at The Hospital for Special Surgery.
- Conducted a retrospective study to investigate demographic and skeletal-specific risk factors for periprosthetic fractures in a cohort of patients requiring a surgical revision after total knee arthroplasty (TKA).
- Conducted a pilot study evaluating the feasibility of a novel surgical tool to measure the in vivo force applied to pedicle screws during spine surgical procedures.
- Worked alongside engineers from the Department of Biomechanics at HSS to assess the feasibility of a digital torque wrench to measure the insertional force of pedicle screws in patients with compromised bone material and structural properties.
- Presented results in the form of a poster titled "Risk Factors for Periprosthetic Fractures after a Total Knee Replacement" at the Clinical Summer Immersion Term Symposium at Cornell University.

○ ***Tissue Mechanics Laboratory - University of Notre Dame*** **Notre Dame, IN**  
Summer Research Intern *May 2015– July 2015*

- Researched the effects of *low magnitude mechanical stimulation* in trabecular bone to determine the primary mechanical signal driving bone adaptation under the direct supervision of Glen L. Niebur, Ph.D.
- Constructed Finite Element (FE) models to conduct Computational Fluid Dynamics & Solid Mechanics simulations in order to explore the effect of shear stress and acceleration as the two proposed mechanostimulatory signals in trabecular bone.
- Wrote a scientific manuscript for the Florida International University McNair Journal presenting the research findings of the Graduate School Summer Research Opportunity Program (SROP).
- Presented results at multiple national and local conferences such as the Annual Biomedical Research Conference for Minority Students (ABRCMS) and the FIU McNair Scholars Research Conference.

○ ***Neuronal Mass Dynamics Laboratory - Florida International University*** **Miami, FL**  
Undergraduate Research Intern *September 2014 – June 2015*

- Wrote an undergraduate departmental thesis as part of The Advanced Research and Creativity in Honors (ARCH) program where research findings were presented in the form of a publishable scientific manuscript.
- Conducted undergraduate research as part of the Neuronal Mass Dynamics Laboratory under the direct supervision of Jorge Riera Diaz, Ph.D.
- Research interests were aimed toward the developing of computational models in order to obtain a profound understanding of the light-activated calcium signaling in astrocytes.
- Presented research findings at multiple national and local conferences such as The National Conference on Undergraduate Research (NCUR) and FIU Undergraduate Research Conference.

○ ***Ortho Pro Associates, Inc.*** **Miami, FL**  
Intern *January 2013 – July 2014*

- Collaborated on the implantation of Ottobock lower & upper limb prosthetic limbs in multiple patients with variable gender, age, and mobility.
- Performed supervised computational guided scans on infants requiring a STARband Cranial Remolding Orthoses.

- **STEM OASIS - Miami Dade College - InterAmerican Campus** **Miami, FL**  
*Science Tutor* *June 2013 – August 2013*
  - Tutored an average of fifteen college level students twice a week on Physics I and maintained a confidential record of the progress, participation, and attendance for each student.
  - Received weekly directed updates from an academic supervisor about each of the students' performance in the course.

## Education

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### Academic Qualifications.....

- **Cornell University | NSF GRFP & Colman Foundation Research Fellow** **Ithaca, NY**  
*Doctor of Philosophy (Ph.D.) in Biomedical Engineering,* *August 2016–August 2021 (Expected)*
- **Florida International University | The Honors College | Cum Laude** **Miami, FL**  
*Bachelors of Science in Biomedical Engineering, Cumulative GPA: 3.64/4.00* *August 2013–December 2015*
- **Miami Dade College | The Honors College | Highest Honors with Distinction** **Miami, FL**  
*Associate in Arts - Biomedical/Medical Engineering, Cumulative GPA: 3.89/4.00* *June 2011–August 2013*
- **G. Holmes Braddock Senior High School** **Miami, FL**  
*Graduated on the 15th percentile of the class of 2011, Cumulative GPA: 3.7/4.0* *August 2008–June 2011*

### Notable Projects.....

- **BME Senior Design Project: 'Pressure Map Sensor Device for Syntheon Knot-Tyer Mechanism'**  
 The project goal was aimed towards delivering a reusable pressure sensing device that can demonstrate that the Syntheon Knot Tyer Mechanism approach can reliably and consistently suture a heart valve to the annulus of the latter one, heart valve, without damaging tissues due to incorrect and/or inconsistent pressure application.
- **Medical Instrumentation Final Project: 'Finger Pulse Transducer/Photoplethysmograph'**  
 This challenging project consisted of designing and building an operational amplifier employing electronic components, an oscilloscope, digital multi-meter, and integrated circuits. The goal of the project was to accurately measure the heart beats of the patient and output the former ones in the form of a digital signal.

## Distinctions and Awards

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- **Diversity Programs In Engineering First Year Graduate Student of the Year** **May 2017**  
*In recognition of hard work, commitment and dedication to diversity programs* *Cornell University*
- **Cornell Graduate School Dean's Scholar** **July 2016**  
*Designed to develop a well-established and maintained community across all graduate fields* *Cornell University*
- **National Science Foundation Graduate Research Fellowship** **April 2016**  
*Designed to support outstanding graduate students pursuing advanced degrees in the US* *Cornell University*
- **Cornell Colman Diversity Fellowship Program** **March 2016**  
*Designed to increase the diversity of Cornell's graduate student population* *Cornell University*

- **Georgia Institute of Technology FOCUS Scholar** **January 2016**  
*Designed to increase awareness about the benefits of receiving an advanced degree* FIU
- **Biomedical Engineering Outstanding Bachelors Graduate Award** **December 2015**  
*In recognition of academic achievement, service to the community, and exemplary character* FIU
- **BME Senior Design Projects Expo and Competition | First Place** **December 2015**  
*Awarded to Pressure Map Sensor Device for Syntheon Knot-Tyer Mechanism* FIU
- **FIU McNair Scholars Research Conference | First Place** **October 2015**  
*Poster Presentation - Engineering and Computer Science* Florida International University
- **FIU McNair Scholars Research Conference | Third Place** **October 2015**  
*Oral Presentation - Engineering and Computer Science* Florida International University
- **First Generation Scholarship Fund** **October 2015**  
*Granted to FIU students who are the first generation to receive a college degree* FIU
- **Big Ten+ Graduate School Exposition Travel Award** **September 2015**  
*Granted to students to defray the attendance expenses of the Grad School Expo* FIU
- **McNair Post Baccalaureate Achievement Program** **February 2015**  
*Twelve Cohort Scholar* Florida International University
- **Transfer Academic Achievement Scholarship** **August 2013**  
*The Honors College* Florida International University
- **United Faculty of Miami Dade College Scholarship** **April 2013**  
*The Honors College Dual Language Program* Miami Dade College - InterAmerican Campus
- **Salzburg Global Seminar | Fellow** **February 2013**  
*The Honors College Dual Language Program* Miami Dade College - InterAmerican Campus
- **The Florida Bright Futures Scholarship** **August 2011**  
*The Honors College Dual Language Program* Miami Dade College

## Technical & Language Skills

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- **General Software Skills:** Arduino (Intermediate) |  $\text{\LaTeX}$  (Intermediate) | Adobe Lightroom (Intermediate) | Adobe Acrobat DC Pro (Advanced) | Adobe Photoshop (Intermediate) | Adobe Illustrator (Intermediate) | Microsoft Excel (Advanced) | Microsoft PowerPoint (Advanced) | Microsoft Word (Advanced) | Microsoft Project and Microsoft Access (Basic).
- **Industry Software Skills:** MATLAB (Advanced) | R Programming (Advanced) | Amira (Advanced) | ImageJ (Advanced) | GraphPad Prism (Advanced) | JMP (Intermediate) | SolidWorks (Intermediate) | ANSYS (Basic) | Minitab (Advanced) | Python (Basic) | ADINA CFD (Basic) | NI LabVIEW (Basic)
- **Language Skills:** Spanish (Native Language) | English (Full Professional Proficiency) | Portuguese (Reading Proficiency)

## Scientific Oral & Poster Presentations

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- **Clinical Summer Immersion Term Symposium at Cornell University | Poster Presentation** **Aug. 2017**  
"Risk Factors for Periprosthetic Fractures after a Total Knee Replacement"

- BME Senior Design Projects Expo and Competition | Oral Presentation**  
 ○ *"Pressure Map Sensor Device for Syntheon Knot-Tyer Mechanism"*

Dec. 2015
- Annual Biomedical Research Conference for Minority Students | Poster Presentation**  
 ○ *"Modeling the Mechanical Effects of Low Magnitude Mechanical Stimulation in Trabecular Bone"*

Oct. 2015
- Biomedical Engineering Society Annual Meeting | Poster Presentation**  
 ○ *"Quantitative Evaluation and Modeling of Optogenetically-Induced Calcium Signaling in Astrocytes"*

Oct. 2015
- FIU McNair Scholars Research Conference | Oral Presentation**  
 ○ *"Modeling the Mechanical Effects of Low Magnitude Mechanical Stimulation in Trabecular Bone"*

Oct. 2015
- FIU McNair Scholars Research Conference | Poster Presentation**  
 ○ *"Modeling the Mechanical Effects of Low Magnitude Mechanical Stimulation in Trabecular Bone"*

Oct. 2015
- Notre Dame Summer Undergraduate Research Symposium | Poster Presentation**  
 ○ *"Modeling the Mechanical Effects of Low Magnitude Mechanical Stimulation in Trabecular Bone"*

Jul. 2015
- The National Conference on Undergraduate Research | Poster Presentation**  
 ○ *"Modeling and Simulation of Light-Activated Calcium Signaling in Astrocytes"*

Apr. 2015
- FIU Undergraduate Research Conference | Poster & Oral Presentation**  
 ○ *"Modeling and Simulation of Light-Activated Calcium Signaling in Astrocytes"*

Mar. 2015
- FIU Biomedical Engineering Undergraduate Research Day | Poster Presentation**  
 ○ *"Modeling and Simulation of Light-Activated Calcium Signaling in Astrocytes"*

Mar. 2015

## Informal Presentations & Scholarly and Community Outreach

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- The Graduate School at Cornell University | Panel Discussion**  
 ○ *NSF GRFP Graduate Fellowship Workshops Series*

Sep. 2017
- OADI Ronald E. McNair Post Baccalaureate Achievement Program | Oral Presentation**  
 ○ *"Graduate School for Free? The Tell Me More Story – NSF GRFP"*

Mar. 2017
- OADI Ronald E. McNair Post Baccalaureate Achievement Program | Oral Presentation**  
 ○ *"The Impostor Syndrome: A story narrated by an immigrant underrepresented first-generation student."*

Mar. 2017
- MDC TRIO Student Support Services Department | Oral Presentation**  
 ○ *STEM Talk: "Success is Like an Iceberg"*

Jul. 2016
- MDC IAC Honors College Dual Language Program | Oral Presentation**  
 ○ *Insights About my Journey Within and After MDC Honors College*

Oct. 2015
- G. Holmes Braddock Senior High School | Oral Presentation**  
 ○ *"What is next after graduating from high school? Insights for first-generation low-income students"*

Oct. 2012

## Civic Engagement

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- The Women's Breast & Heart Initiative - Florida Affiliate***  
 ○ *Volunteer*

**Miami, FL**  
*February 2013 – June 2013*

- Volunteered with the distribution of low-cost testing and educational material to educate the female population about Breast Cancer and its prevention in segregated communities in South Florida.

- Served as a translator during community outreach in the neighborhood of Little Havana, a Cuban well-known residential area in Miami.

○ ***The Leukemia & Lymphoma Society*** **Miami, FL**  
*Volunteer* *November 2011*

- Contributed to monetary fundraising for the organization and its patients with the distribution of brochure and free materials for the participants in "Light The Night Walk," an annual marathon.

- Assisted with the logistics of "Light The Night Walk" - a fundraising campaign to benefit the research of cures for blood cancer.

○ ***Teen Trendsetters Reading Mentoring Program*** **Miami, FL**  
*Reading and Math Tutor - G. Holmes Braddock High School* *August 2010 – July 2011*

- Assisted elementary school graders struggling with reading and other disciplines such as math and natural sciences.

- Maintained a record of the student individual progress and attendance to the after-school program.

- Helped elementary school teachers prepare their teaching and tutoring materials while simultaneously encouraging them to spark the interest of the elementary kids for STEM at an early age.

○ ***Church World Service, Inc*** **Miami, FL**  
*Legal Department - Intern* *July 2009 – August 2010*

- Maintained an inventory of the humanitarian assistance given to refugees from Haiti and Cuban upon their arrival to the United States.

- Assisted in the creation and maintenance of legal files of refugees.

- Translated flyers to be distributed among newly arrived refugees from English to Spanish and Creole.

- Helped in the allocation of resources and preparation of homes for refugees.

- Helped manage a monthly fixed budget to buy health kits and educational material for the newly arrived families.

## Honor Societies

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○ **Orthopaedic Research Society (ORS) | Cornell University** **Ithaca, NY**  
*Induction Date* *January 2018*

○ **Society of Hispanic Professional Engineers | Cornell University** **Ithaca, NY**  
*Induction Date* *March 2017*

○ **Society for the Advancement of Chicanos/Hispanics and Native Americans in Science** **Ithaca, NY**  
***Cornell University | Induction Date*** *March 2017*

○ **Biomedical Engineering Society | Florida International University** **Miami, FL**  
*Induction Date* *July 2015*

- **Alpha Eta Mu Beta | Florida International University**  
*Official Membership Period*

**Miami, FL**  
*January - December 2015*

- **Phi Theta Kappa | Miami Dade College**  
*Induction Date*

**Miami, FL**  
*February 2013*

## References

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- UPON REQUEST