

# Elderson Mercado Rivera

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## OBJECTIVE

Seek opportunities in academia or industry to gain valuable experience and amplify my expertise in the field of mechanical engineering.

## EDUCATION

**University of Puerto Rico – Mayagüez, Puerto Rico**

*Bachelor of Science in Mechanical Engineering; Minor in Project Management*

Expected Graduation Date: **May 2024**

General GPA: **4.00/4.00** Major GPA: **4.00/4.00**

## PROFESSIONAL & RESEARCH EXPERIENCE

**Medtronic Villalba, P.R. Operation Company – Capstone Intern**

**Aug '23 – Present**

- **Incorporated** statistical methodology (Full Factorial Design) to assess the influence of various factors on adhesive curing times, which are causing bottlenecks in the production of medical devices.
- **Created** and **implemented** an experimental design (DOE) to analyze key parameters affecting the adhesive drying process and identify optimal adhesive conditions.
- **Enhanced** production line efficiency by improving process capacity, flow, and time management.

**Boeing Satellite Systems Summer Internship – Mechanisms Engineering Intern at El Segundo, CA**

**May '23 – Aug '23**

- **Supported** the development of mechanism assemblies and component designs using 3-D Computer Aided Design tools and GD&T standards.
- **Enhanced** the design of the tooling system that will be employed in upcoming spring preload tests of the Direct Drive Team's units.
- **Analyzed** and **processed** data from previous tests to minimize computational variance and discover critical tendencies that will improve the Mechanisms Engineering team's understanding of the units being tested.

**Thermal Cycling Rig Design for High Heat-Flux Environment in Ox-rich Turbopump [M.I.T. Summer Research Program (MSRP) 2022] – Research Assistant at the Cordero Lab**

**June '22 – Dec '22**

- **Designed** and **manufactured** a thermal cycling rig system that simulates the drastic temperature gradients inside ox-rich turbopumps of reusable rocket engines.
- In partnership with Dr. Zachary Cordero and Dr. Isha Gupta, I **characterized** the delamination and crack propagation behavior of ignition-resistant environmental barrier coatings (EBC) for particle impact testing with the aid of image analysis.
- **Identified** and **implemented** a preferential etching method to further understand the percolating nature of the environmental barrier coating (EBC).

**NASA Rotorcraft Aeromechanics Spring Internship – Aeromechanics Intern at NASA Ames Research Center**

**Jan '22 – May '22**

- **Enabled** the development of vertical flight vehicles to provide unlimited mobility in 3 dimensions for terrestrial and planetary science applications.
- **Collaborated** in the manufacturing process of the RAPTOR.
- **Designed** and **optimized** novel airfoils for the rotor blades of the ROAMX and the Mars Science Helicopter (MSH) projects.

**Remaining Useful Life (RUL) Prediction of Turbofan Engines Through Machine Learning [Stanford University REU (SURF 2021)] – Assistant Researcher of the Zheng Research Group**

**June '21 – Aug '21**

- As a participant of the Summer Undergraduate Research Fellowship (SURF) at Stanford School of Engineering, I **implemented** machine learning classification models in the prediction of Remaining Useful Life (RUL) of turbofan engines under the mentorship of Dr. Xiaolin Zheng and Dr. Juyoung Leem.
- **Gathered** and **analyzed** raw data from various repositories, ensuring the acquisition of comprehensive datasets that encompassed the performance history of multiple families of turbofan engines.
- **Discovered** data trends and critical features within the datasets, which were extracted from 21 sensors located throughout each engine, to determine their relevance in predicting the Remaining Useful Life (RUL) of turbofan engines; a crucial indicator of model accuracy.
- **Conducted** extensive data preprocessing, which involved cleaning, normalization, and transformation of the data to ensure its quality and compatibility with machine learning algorithms.

**Low Melting Point Metallic Suspension Nano-composite PCM as a Thermal Management Solution for More Electric Systems (sponsored by NASA Marshall Space Flight Center) [University of Puerto Rico: Mayagüez Campus] – Assistant Researcher**

**Aug '20 – Present**

- Mentored by Dr. Pedro Quintero, I **created** a matrix of nano-fillers and composites used in the development of a thermal management model.
- **Collaborated** with the research group to **develop** a comprehensive thermal management model that incorporated the newly synthesized nano-fillers and composites.
- **Worked** closely with Dr. Pedro Quintero to develop a robust experimental framework for the synthesis and characterization of nano-fillers and composites. This encompassed the meticulous selection of materials, equipment, and methodologies.
- **Engaged** in interdisciplinary collaborative efforts with fellow researchers and engineers at NASA's Marshall Space Flight Center to seamlessly incorporate the newly developed thermal management solution into advanced electric systems, guaranteeing both compatibility and optimal functionality.

**Identifying the best two-dimensional channel material for the reinstatement of complexity scaling in floating gate FETs [Penn State University REU] – Assistant Researcher at the Materials Research Institute** **June '20 – Aug '20**

- As a participant of the 2020 Scalable Nanomanufacturing of Complex Materials REU at Penn State University, I **assisted** Dr. Saptarshi Das in one of his research projects by **discovering** and **studying** alternative 2D materials that could reinstate the complexity scaling of MOSFETs.
- **Assessed** a variety of 2D materials to pinpoint promising candidates for in-depth investigation, which might entail the execution of preliminary experiments or simulations to evaluate their suitability.
- **Gathered** empirical data and conducted comprehensive data analysis using specialized software tools, leading to valuable insights into the performance and characteristics of the alternative 2D materials.

**Diffusion Soldering and Phase Change Materials for Advanced Packaging of Power Switching Technologies (sponsored by the Army Research Office) [University of Puerto Rico: Mayagüez Campus] – Volunteer Researcher** **Aug '19 – May '20**

- **Analyzed** and **explored**, under the mentorship of Dr. Pedro Quintero, efficient phase change materials (PCM) capable of cooling electronic devices properly through thermal analyses and conductivity parameters.
- **Explored** the adaptability of the newly developed PCMs to various electronic devices and substrates commonly employed in power switching technologies, verifying their alignment with the project's precise specifications.
- **Worked** in tandem with the research team to **enhance** the experimental configuration for thermal analyses, encompassing equipment refinement, calibration, and the establishment of consistent experiment repeatability.
- **Conducted** market research to discern commercially accessible phase change materials (PCMs) and **performed** comparative analyses against the materials investigated within the research, yielding valuable insights into potential practical utility for the developed PCMs.

## EXTRACURRICULAR ACTIVITIES

**UPRM Research Fair – Logistics Team Member** **Aug '21 – Present**

- **Contacted** professors and research groups from my campus to present their research work at the event and **coordinated** their schedules as a member of the logistics team.
- **Hosted** multiple research presentations while actively **encouraging** undergraduate students in attendance to get involved in research.

**NASA's 2022 Aero Fair– Volunteer** **April '22**

- During a week, I **helped** Christina Lim (NASA Ames Research Center's outreach leader) present lessons on the basics of aerodynamics, NASA's history, and future career opportunities to eighth graders from Marina Middle School in San Francisco, CA.
- Likewise, I **coordinated** group activities where students had the opportunity to engage and apply the fundamentals of physics and aerodynamics concepts taught in these lectures through the creation of planes and small replicas of the Ingenuity Mars Helicopter.

**Transformative Vertical Flight 2022: 9<sup>th</sup> Annual Electric VTOL Symposium – Volunteer and Attendee** **Jan '22**

- **Assisted** the TVF's organizers in registering and welcoming speakers and conference attendees throughout the duration of the Transformative Vertical Flight 2022 conference held at San Jose, CA (Jan. 25-27).

**SAE UPRM Collegiate's Chapter RUM-Air Team – Team Member** **May '19 – June '20**

- **Designed** and **manufactured** a lightweight and autonomous CDA (Colonist Delivery Aircraft) for the team's Advanced Class Airplane (*El Padron*), which competed at the 2020 SAE Aero Design West Competition.
- **Improved** the structural stability of the CDA through XFRL analysis and
- Additionally, I **volunteered** in outreach activities where I taught Kindergarten students about fundamentals of physics and acoustics through the creation of musical instruments.
- As a member of the Project Management and Business Department of the team, I actively **organized** and **participated** in multiple fundraisers and sales to cover the travel and manufacturing expenses of the entire team. Also, I **communicated** with different sponsors, **revised** inventory, and **helped** with administrative work.

**NASA RASC-AL UPRM Team – Team Member and Researcher** **Sep '18 – June '19**

- **Collaborated** actively in the design process of a gateway-based lunar vehicle project for the 2019 NASA RASC-AL Contest.
- **Designed** and **optimized** the structure of the landing legs and robotic arm of the lunar lander proposed in the project *Lunar Exploration and Access to Polar Regions (LEAPR)*.
- The final publication of this project can be accessed [here](#).

**Vertical Flight Society (Philadelphia Chapter) – Member** **Jan '22 – Present**

**National Society of Leadership and Success (NSLS) – Member** **Sep '20 – Present**

**National Society of Collegiate Scholars (NSCS) – Member** **July '19 – Present**

**American Society for Engineering Education (ASEE)-UPRM Chapter – Member** **Aug '18 – Present**

- **Offered** mentorship to high schoolers to help them improve their performance on their college admission tests.
- **Volunteered** as a Mechanical Engineering assistant at the third and fourth edition of *Engineering Fun Day*, an activity created by the ASEE-UPRM Chapter in where middle school and high school students from unrepresented communities can interact and learn more about the different engineering fields through conferences and STEM-based group challenges.

- Come Colegio Program – Volunteer** **Aug '18 – Present**
- **Contributed** dynamically to the recollection and distribution of free food for undergraduates in financial need at campus.
- Society of Hispanic Professional Engineers, SHPE UPRM – Member** **Aug '18 – Present**
- **Volunteered** as a timekeeper and staff member of the 2019 Puerto Rico Regional Science Bowl held at the University of Puerto Rico at Mayagüez.
- American Society of Mechanical Engineers, ASME UPRM - Member** **Aug '18 – May '19**
- Happy Backpack Program of the Food Bank of Puerto Rico – Volunteer** **Aug '17 – May '18**
- **Teamed up** with the Food Bank of Puerto Rico to prepare and provide backpacks full of food and necessities for low-income children.
- M.I.T. Launch Club - President** **Aug '17 – May '18**
- **Launched** an entrepreneurial project based on a self-rechargeable electric generator to provide electricity for natural disasters.
- Drawing the Difference Initiative- Founder and teacher** **June '16**
- **Provided** non-profit art classes for Down Syndrome and disabled adults as a physical and intellectual therapy that could help them ameliorate their motor skills, creativity, and self-expression.

## CONFERENCE ATTENDANCE / PRESENTATIONS

- AAAS S-STEM Symposium at Washington D.C. - Invited scholar** **Sep 29<sup>th</sup> '22 – Oct 1<sup>st</sup> '22**
- Great Minds in STEM (GMiS) Conference at Pasadena, CA - Invited scholar** **Oct 6<sup>th</sup> '22 – Oct 8<sup>th</sup> '22**
- E-PEARLS and IEEE Poster Session at University of Puerto Rico at Mayagüez - Poster presenter and invited scholar** **April 27<sup>th</sup> '23**
- Poster title: *Remaining Useful Life (RUL) Prediction of Turbofan Engines Through Machine Learning*
- AAAS S-STEM Scholars Meeting at Washington D.C. - Poster presenter and invited scholar** **Sep 14<sup>th</sup> '23 – Sep 16<sup>th</sup> '23**
- Poster title: *Thermal Cycling Rig Design for High Heat-Flux Environment in Ox-rich Turbopump*
- SACNAS National Diversity in STEM (NDiSTEM) Conference at Portland, Oregon - Poster presenter** **Oct 26<sup>th</sup> '23 – Oct 28<sup>th</sup> '23**
- Poster title: *Thermal Cycling Rig Design for High Heat-Flux Environment in Ox-rich Turbopump*

## AWARDS / HONORS

- Undergraduate Poster Presentation winner in the Engineering category at SACNAS NDiSTEM Conference [2023] (Click [here](#).)
- Dominion Energy's Hispanic Higher Education Initiative Scholarship Fund Recipient [2023]
- HACE's Dr. Ervin "Vinny" Caraballo Scholarship Recipient [2023]
- Boston Scientific Scholarship Recipient [2022]
- Great Minds in STEM (GMiS) Scholarship [sponsored by Northrop Grumman] Recipient [2022] (Click [here](#).)
- Andrés Calderón Scholarship Recipient [2022]
- The Boeing Company Scholarship ("Boeing Excellence Award") Recipient [2021, 2023]
- Hispanic Scholarship Fund (HSF) Scholar [2021-Present]
- Evertec Scholarship Recipient [2021-Present]
- First Place in the Advanced Class category at the SAE Aero Design West Competition [2020]
- Lockheed Martin Scholarship Recipient [2019]
- First Place (Overall) at the NASA RASC-AL Contest [2019]
- Scholar of the Engineering Program for Engineering Access, Retention, and LIATS Success (E-PEARLS) sponsored by the National Science Foundation (NSF) Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) Program [2018-Present]
- Dean's List and Honor Roll of the Mechanical Engineering Department [2018-Present]
- Recipient of the National Altrusa International Scholarship [2018]
- Banco Popular's Rafael Carrión, Jr. Academic Excellence Award [2018]
- Recipient of the Medal of the Governor of Puerto Rico [2018]
- ASTRA Scholarship Recipient (sponsored by Altrusa International, Inc.) [2018]

## SKILLS / IMPORTANT COURSES

- Notable approved courses: Fluid Mechanics, Heat Transfer, Materials Science, Design of Machine Elements, Thermodynamics (I & II), Algorithms and Computer Programming, Systems Dynamics Control
- Fluent in English and Spanish
- Lean Six Sigma Yellow Belt
- Google Project Management Certification
- Microsoft [Excel, Word, Power Point] (Advanced), Python (Proficient), SolidWorks (Proficient), Siemens NX 12 (Proficient), AutoCAD (Basic), MATLAB (Basic), STAR-CCM+ (Basic), Fusion 360 (Proficient)
- Leadership, teamwork, ability to multitask, excellent communication and interpersonal skills.