Alfonso Ruiz

US Citizen | aruiz-engr@outlook.com | aruiz-engr.github.io/portfolio.pdf

EDUCATION

The University of Texas at El Paso

Master of Science in Mechanical Engineering, **GPA:** 4.00/4.00 **Expected Dec 2026**

- Graduate Certificate in 3D Engineering and Additive Manufacturing

Bachelor of Science in Mechanical Engineering, **GPA:** 3.97/4.00 **Dec 2024**

EXPERIENCE

W.M. Keck Center for 3D Innovation – El Paso, TX **Feb 2025 – Present**

Graduate Research Assistant

- Developed a hybrid manufacturing system for rapid tooling repair by integrating a custom 3-axis CNC gantry into an RPMI 222XR directed energy deposition (DED) machine
- Quantified end mill wear progression via digital microscopy per ISO 8688-2, correlating flank wear with surface finish, machine vibrations, and thermal data to optimize tool replacement intervals
- Refined H13 steel and Aluminum 6061 toolpath strategies by validating critical machining parameters in NX CAM including feeds, speeds, and axial/radial depths of cut, reducing machining time by 45%
- Automated HMI/MCP control sequences to drive the full subtractive-additive repair cycle, achieving required geometric tolerances within ± 0.003 in for H13 steel components
- Led a GR&R surface roughness study on 9 Aluminum 6061 artifacts, analyzing 63 discrete measurement zones to quantify operator variability, validating a 97% compliance rate with the 3.2 µm commercial standard

PROJECTS

Engine Bracket Topology Optimization for Laser Powder Bed Fusion

- Optimized an AlSi10Mg engine bracket for a defense system via Autodesk Fusion Generative Design, achieving an 86% mass reduction while maintaining a predicted safety factor of 6.5 under a 1600 N load
- Validated structural integrity via tensile testing where the component withstood the 9018 N machine limit without fracture, confirming a safety factor greater than 5.6
- Corroborated experimental data via stress-load ratio calculations, confirming the peak stress of $\sim$209 MPa at the limit load remained safely below the 460 MPa ultimate tensile strength

BAJA SAE Vehicle Frame Redesign

Senior Frame Lead

- Resolved non-compliant frame geometry in Autodesk Fusion by integrating 5 in, 30 degree angled steel reinforcements to correct bent tubes and achieve 100% SAE safety adherence
- Applied FEA using ANSYS to validate frame integrity against multi-axis crash loads reaching 33 kN, confirming structural durability while maintaining a 127 kg system weight
- Led manual tube notching and bending of frame components to integrate powertrain within a $1,430 budget

Transportation via Ultrasonic Levitation System

- Developed a material handling vehicle for non-contact transportation via acoustic levitation of low-density payloads less than 5 mg by synchronizing 60 opposed ultrasonic transducers
- Synthesized 40 kHz acoustic standing waves by configuring Arduino Timer 1 interrupts to drive signals without main-loop blocking for levitation stability
- Designed a custom 3D printed chassis in Autodesk Fusion to package the complete mechatronic assembly, integrating power distribution, motor control, and logic modules into a compact mobile platform

SKILLS

CAD and Analysis: Autodesk Fusion, SolidWorks, AutoCAD, MATLAB, ANSYS, Minitab, NX (CAD/CAM)
Metrology and Electronics: GR&R, GD&T, Profilometry, Digital Microscopy, Arduino, Circuit Prototyping
Manufacturing: CNC, 3D Printing (FDM/LPBF/DED), 5S, Machine Tools, Run MyVirtual Machine