

Abhishal M. Kochhal

3D Printing, Mechanical Design & Robotics — Builder of the Boaz CoreXY printer & author of *Building Boaz*

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Summary

High-school senior who **designed, built and rebuilt a CoreXY 3D printer to machine-tool practice**, tested it against eight preset criteria, and published the results, including those that went against the machine, in a book and a research paper.

Education

Leland High School, San Jose, CA — GPA 3.8 / 4.0

Expected Jun 2027

Engineering Project

Boaz: a CoreXY 3D Printer, Designed and Built Twice, *independent project*

Oct 2023 – 2026

- Designed a CoreXY filament printer on a 20×40 extrusion frame with a triple-belted Z axis in sheet metal and standoffs and a three-point kinematic bed; funded it at about \$100 a month.
- Ran the first build in production, traced its defects to causes (pins 0.04 mm undersize, a bed warped by 1.6 mm), and rebuilt it to machine-tool practice: dowel pins in hand-reamed holes at 0.05 mm interference, runout under 0.001 in on all twenty pressed idlers, rails aligned by dial indicator against granite, and a cast bed sized by finite-element analysis.
- Met seven of eight criteria fixed before the build: bed mesh flattened from 1.6 mm to 0.2 mm, a 16-minute Speed Benchy (target 20), and about 100 plates in a row with no first-layer help. Y-axis acceleration fell short (9,500 of 20,000 mm/s²).
- Printed about 1,000 PETG medicine boxes for a medical organization in Iraq, holding 0.2 mm on threaded lids, and about 200 toys for a charity drive. Sponsored by Duet3D with \$150 of electronics.

Experience and Leadership

Design Lead, Loading Subsystem

Jun 2023 – Apr 2025

Leland FRC Robotics Team 604, San Jose, CA

- Led design of the loading subsystem and built robots with the team for regional and national competitions.
- Designed subsystems in laser-cut sheet metal and CNC-milled parts; used CAD and 3D printing for rapid prototyping.

Freelance 3D Printing Specialist, MRCAT-51 Drone Parts (eBay, Etsy), San Jose, CA

Feb 2022 – Present

Designs and sells custom 3D-printed drone parts and printer components online, with positive customer feedback.

Intern, Computer Technology, St. Basil the Great Greek Orthodox Church, San Jose, CA

Aug 2024 – 2025

Digitized and organized the organization's records, and did web development on its site (part-time).

Team Member, Bret Harte FLL Robotics Team, San Jose, CA

Sep 2020 – Jan 2023

Designed and built competition robots; used CAD and 3D printing for prototyping.

Publications and Presentations

- Book.** *Building Boaz: An Engineering Guide to the Effective DIY 3D Printer*. 29 chapters, 2026. Available on Amazon.
- Exhibit.** "Boaz: A DIY 3D Printer, Built Twice." Accepted exhibit with poster and live demonstration, [Maker Faire Rocklin 2026](#), Sierra College, Rocklin, CA, October 2026.
- Research paper.** "Machine-Tool Construction Practice Applied to a DIY Filament 3D Printer: Design, Failure Analysis, and Rebuild of 'Boaz'." *Preprint*, Sept. 2026; submitted for review to IEEE ISEC '27.
- Article.** "Boaz: A DIY Printer Built Like a Machine Tool." Feature article for makers, 2026.

Honors and Activities

- Multiple awards in regional and national robotics competitions, including FRC; recognized for innovation in robotics design; competitive performance leading up to the world championships (5th place).
- Honorable Mention, National Spanish Exam; above grade-level CAASPP and NWEA scores.
- Certified drone pilot (Pilot Institute); Leland Robotics, Habitable World and RC Plane clubs; local maker faires.

Technical Skills

3D Printing: Prusa and Ender 3 machines; PETG, ABS, ASA; component design and troubleshooting; Klipper, input shaping

Mechanical Design: Onshape, Fusion 360; CoreXY and Cartesian motion systems; robotics; design for sheet metal

Precision Assembly: reamed press fits, kinematic couplings, dial-indicator metrology against granite