Adjustable Mechanically Driven Kitchen Ladder/Stool

The Technology and Innovation
• Adjustable, mechanically driven kitchen ladder/stool with push-button open/close feature to minimize the physical interaction needed to open and close the ladder

• Android Smartphone App to control kitchen ladder open/close and height adjustment, interfacing with an Arduino microcontroller via an Arduino Bluetooth module

• Optimized design of the step bracket that connects the top step to the vertical sliders using topology optimization software Altair SolidThinking Inspire v. 9.5, then simplified the optimized geometry for manufacturability

• Focused on design for manufacturing within the capabilities of the team members and the student machine shop

• Adopted industry tools and practices for data management, borrowing primarily from the Toyota parts list and part number systems

Community/Industry Impact and Value
• Leveraged smartphone technology for a user-friendly experience while minimizing the physical interaction needed for ladder operation

Community/Industry Engagement
• Fabricated in WSU Engineering Technology Department Student Machine Shop
• Sponsored by Nexteer

Team Composition
• Kathryn della Porta, ME
• Sean LaForest, ME
• Ao Yu, ME
• Tangyue Wu, ME
• Dr. Ali Ozbecki (Faculty Advisor)

Learning Experiences
• Product Design
• Design for Manufacturing
• Design for Assembly
• Topology Optimization
• Prototype Fabrication
• Testing

• Computer Aided Engineering
• Finite Element Analysis
• Mobile App Development
• Circuit Design
• Controls
• Data Management

Further Research and Development
• Redesign for more lightweight components
• Reduce size of assembly, particularly in folded state
• Address stability issue for top-step-only load