

MICHIGAN STATE
UNIVERSITY

Beta Presentation

LLM 3D Model Interpretation and Decomposition

The Capstone Experience

Team Magna LLM3DMID

Ankit Mudunuri

Achint Nagra

Andrew Nguyen

Saatvik Palli

Noah Patenaude

Jathin Mahendra Sabbineni

Department of Computer Science and Engineering

Michigan State University



*From Students...
...to Professionals*

Fall 2025

Project Overview

- Web app that helps engineers find and compare similar parts via their 3D models
- Supports plain-English search to locate relevant parts fast
- Lets users view and compare parts side-by-side in 3D and by metadata
- Built for Magna's engineering teams to speed up comparisons across part variants

Team Member's Technical Tasks

Technical Tasks Assigned

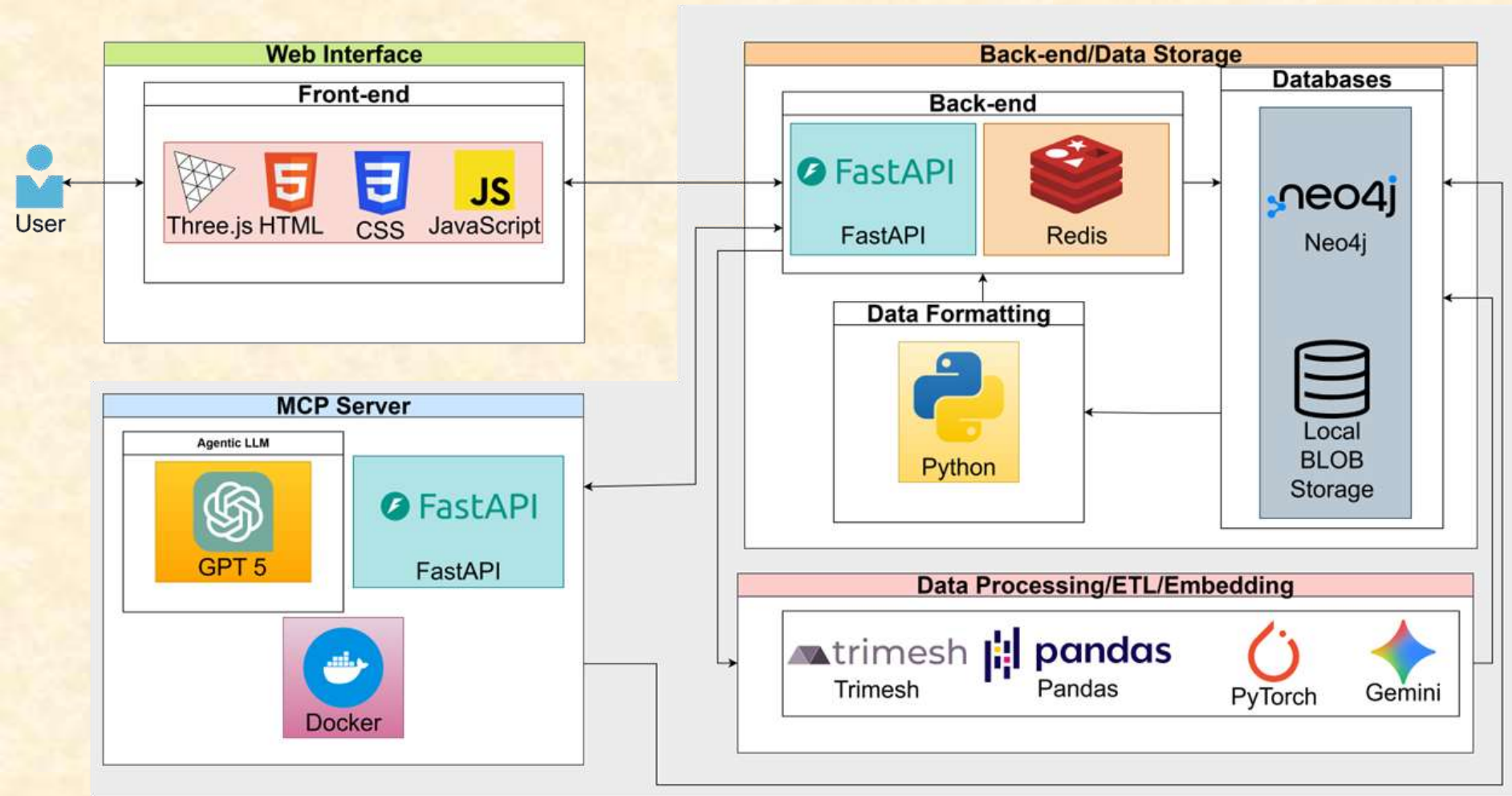
- Ankit Mudunuri
 - Point cloud generation
 - Mesh/PC differential visualization
 - MCP server
- Achint Nagra
 - Extract, Transform, Load pipeline
 - Batch processing system for ETL pipeline
 - Neo4j setup and integration
- Andrew Nguyen
 - Front-end – base website with search bar
 - Semantic search
 - Integration of semantic search into front-end
 - Web scraper
 - CAD viewer functionality
- Saatvik Palli
 - Metadata generation via LLMs
 - 3D model tagging/classification
 - Integrating real parts datasets/databases
- Noah Patenaude
 - 128D vector embeddings for 3D models
 - Training PointNet++ neural network on ShapeNet40 dataset
 - Implementing embedding as a microservice
 - Adding caching to point clouds in back-end
- Jathin Mahendra Sabbineni
 - 3D model view and CAD viewer functionality
 - 3D comparison view
 - Part search, filter options, and history tabs in front-end
 - Website UI
 - Caching in back-end of website

Technical Tasks Completed

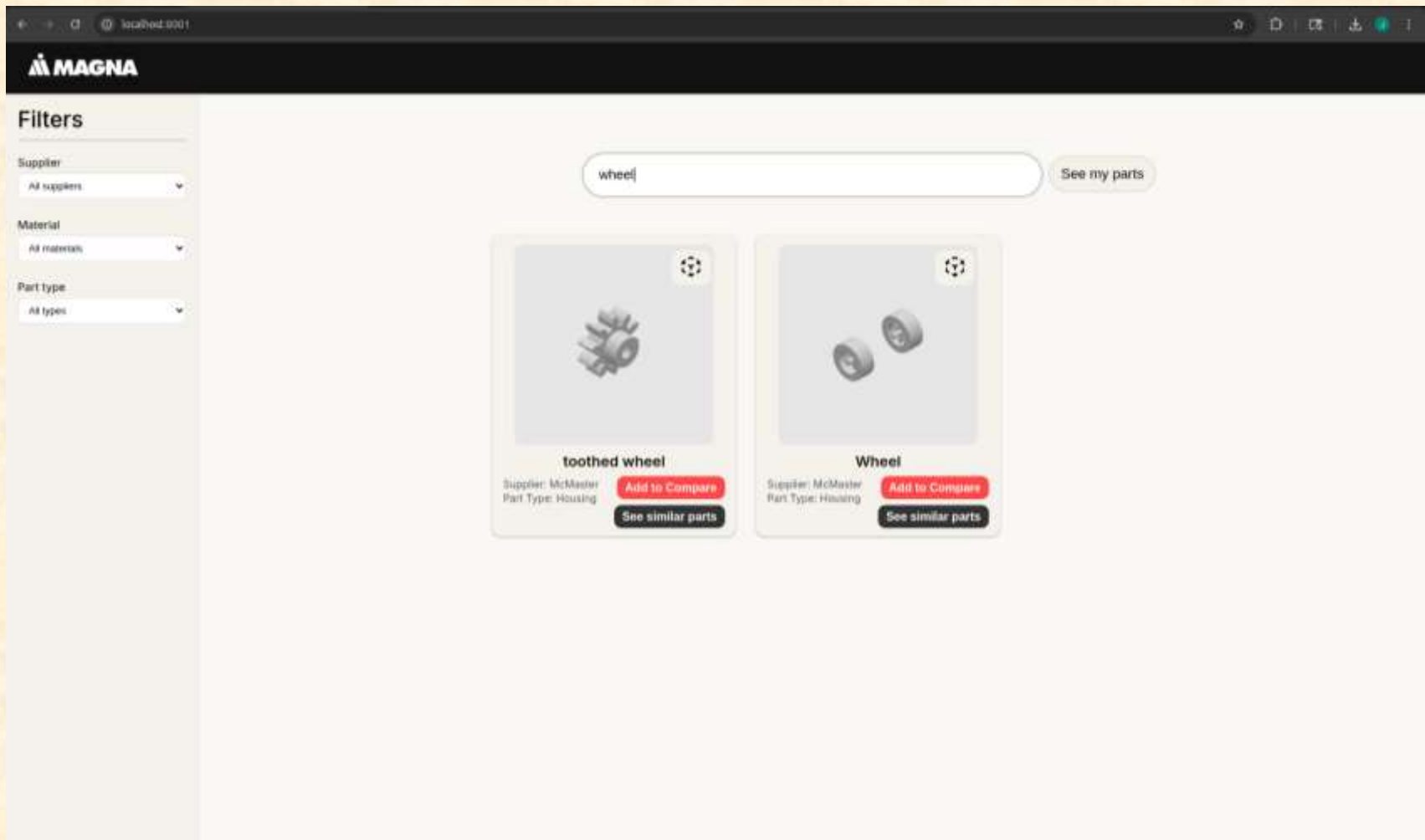
- Ankit Mudunuri
 - Point cloud generation
 - Mesh/PC differential visualization (fine-tuned)
 - MCP server and UI (not implemented by betas)
- Achint Nagra
 - ETL pipeline with all functional integrations
 - Batch processing with user uploads
 - Neo4j setup and integration
- Andrew Nguyen
 - Front-end – base website with search bar
 - Semantic search
 - Integration of semantic search into front-end
 - CAD viewer functionality
 - Real parts web scraping (not implemented by betas)
- Saatvik Palli
 - Metadata generation via LLMs
 - 3D model tagging/classification
 - Integrated ShapeNet dataset
- Noah Patenaude
 - 128D vector embeddings for 3D models
 - Trained PointNet++ neural network on ShapeNet40 dataset
 - Implemented embedding as a microservice
 - Added caching to point clouds in back-end
- Jathin Mahendra Sabbineni
 - 3D model view with CAD viewer tools and functionality
 - 3D comparison view
 - Part search, filter options, and history tabs in front-end
 - Website UI
 - Caching in back-end of website



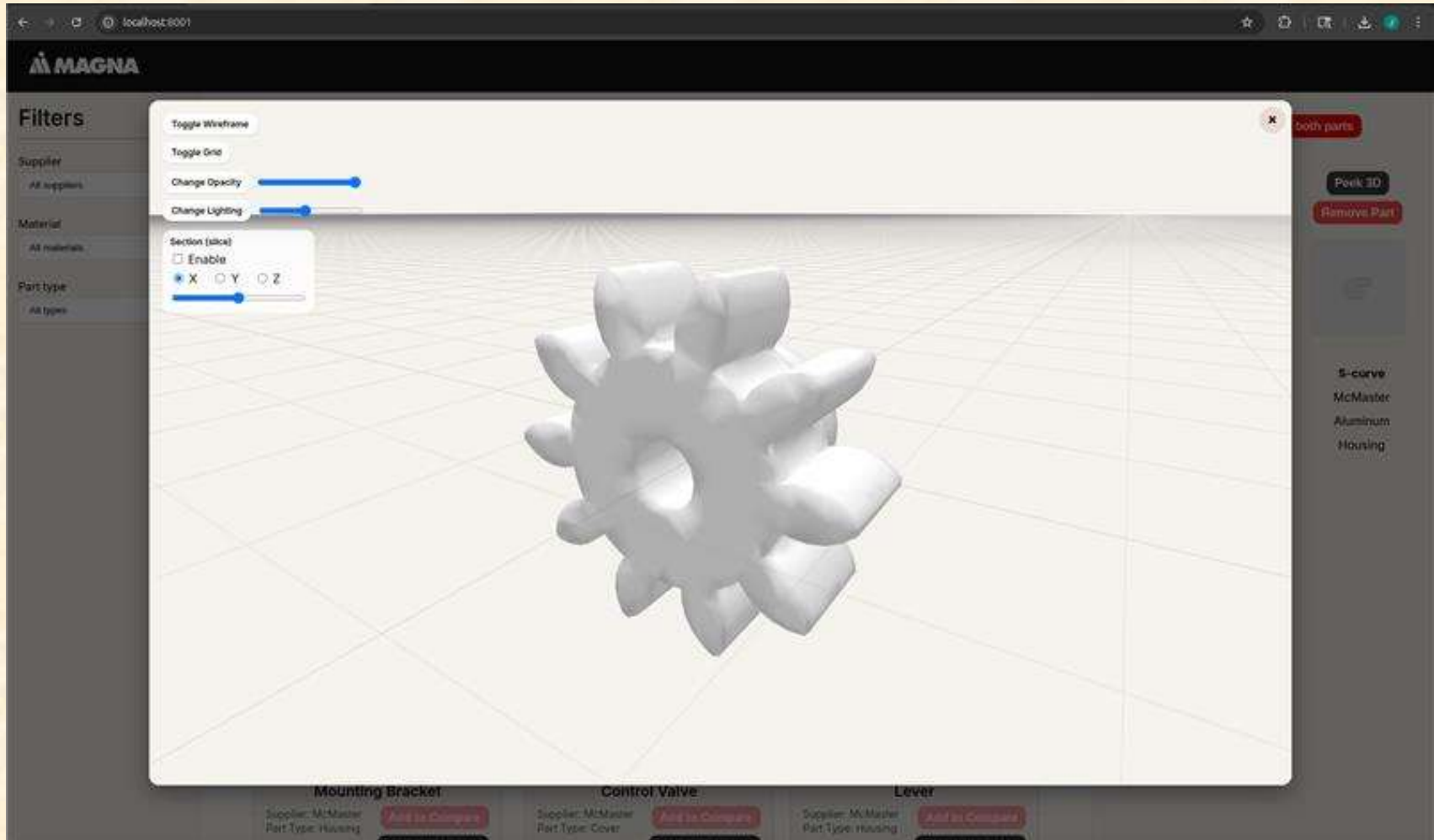
System Architecture



Part Search



Singular Part 3D View



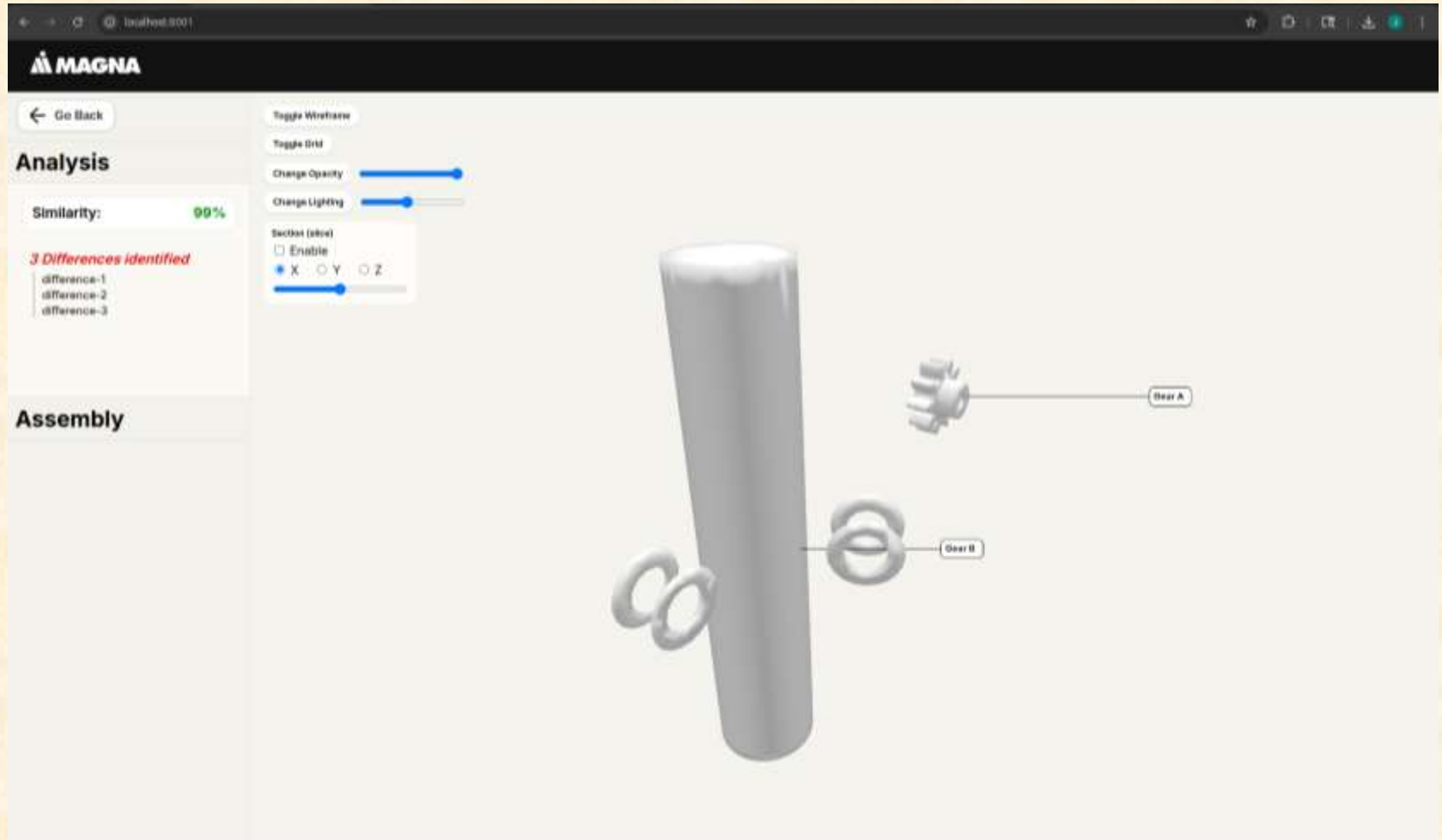
Selecting Parts for Comparison

The screenshot displays the MAGNA website interface for selecting parts for comparison. On the left, a 'Filters' sidebar allows users to filter by Supplier (All suppliers), Material (All materials), and Part type (All types). The main content area shows a grid of six parts, each with a 3D model, name, supplier, and part type. The parts are: 'Bushing with holes' (McMaster, Cover), 'S-curve' (McMaster, Housing), 'case' (McMaster, Housing), 'protective case' (McMaster, Housing), 'Swivel' (McMaster, Housing), and 'base' (McMaster, Cover). Each part card includes a 'See similar parts' button. On the right, a comparison panel shows the selected parts, 'Bushing with holes' and 'S-curve', with buttons for 'Compare both parts', 'Peek 3D', and 'Remove Part'. Below the comparison panel, a table lists the details for the selected parts.

Name	Supplier	Material	Type
Bushing with holes	McMaster	Steel	Cover
S-curve	McMaster	Aluminum	Housing



Comparison 3D View



What's left to do?

- Stretch Goals
 - Further embedding improvements
 - Adding decomposition view to the website
 - Integrating MCP server
 - Integrating web scraper for real parts

Questions?

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