Project Plan Presentation
Optimizing Electric Motors Using ML

The Capstone Experience
Team Anthropocene Institute

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Project Sponsor Overview

• Firm based in Palo Alto, exploring solutions for Climate Change
• Connecting investors, policy makers and researchers
• Assess research project claims, maturity and viability
Project Functional Specifications

• Motors are one of the most widely used electronic products
• Reducing the environmental impact of motors
• ML model to find optimal motor design
• Model is tied to web app for ease of use
Project Design Specifications

• Interactive Web application for project managers, engineers, and researchers
• Allows users to create a parameterized electric motor based on user input
• Outlines materials used for each motor component
• Provides an efficiency, carbon emission, and performance analysis
Screen Mockup: Homepage
Screen Mockup: Motor Parameter Page
Screen Mockup: Materials Page

**Winding**

**Aluminum**

Description: Aluminium forms one stable oxide with the chemical formula Al2O3, commonly called alumina. It can be found in nature in the mineral corundum, α-alumina; there is also a γ-alumina phase.

Inquiry: https://ye-fong.com/

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**Rotor**

**Steel**

Description: All steel alloys are primarily iron and 0.002–2.1% carbon by weight. In this range, carbon bonds with iron to create a strong molecular structure.

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Screen Mockup: Performance Analysis

Specifications and Performance

- **Peak Torque:** 498 oz-in (3.5 N-m)
- **Continuous Torque:** 116 oz-in (0.8 N-m)
- **Peak Power:** 920 W (1.23 hp)
- **Continuous Power:** 390 W (0.52 hp)
- **Maximum Speed:** 4850 RPM
- **Peak Efficiency:** 95%

- **Mass:** 1.3 lb
- **Rotor Inertia:** 0.4 oz-in² (0.1 kg-cm²)
- **Maximum Radial Load:** 25 lbf (111.2 N)
- **Maximum Thrust Load:** 5.0 lbf (22.2 N)
- **Ambient Temperature:** 1-40° to +70° C
- **Ambient Humidity:** 0-95%; non-condensing
Project Technical Specifications

- Flask Website
- Python (PyTorch, Sklearn, Pandas)
- Docker
- HTML, Javascript and CSS with Sass preprocessor
Project System Architecture
Project System Components

• Hardware Platforms
  ▪ Google Cloud
  ▪ Virtual Ubuntu Based Server

• Software Platforms / Technologies
  ▪ Flask – Python Based Web Framework
  ▪ Docker – OS virtualization and containerizing
  ▪ PyTorch – ML Model creation, training and testing
  ▪ ScikitLearn – Prepare test and train data
Project Risks

• Risk 1
  ▪ Figuring out what ML architecture to use
  ▪ Test out different configurations on data

• Risk 2
  ▪ Defining motor quality
  ▪ Speaking to sponsor about needs and use-case

• Risk 3
  ▪ Limited access to motor databases
  ▪ Contacting sponsors and requesting data
Questions?