

Faculty of Engineering

Summer Research Program 2024-2025

Project Title: HybridMate: Intelligent Selection and Design of Hybrid Materials Using LLMs

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Objective

The objective of this project is to leverage Large Language Models (LLMs) to support the selection and design of hybrid materials that meet specific functional requirements for various engineering applications. This will involve developing an intelligent system that can analyze and synthesize information from diverse sources, providing recommendations for material combinations and design strategies that optimize performance, cost, and sustainability.

Project Details

This project aims to address this challenge by utilizing existing Large Language Models (LLMs) to assist engineers in the selection and design of hybrid materials. The project will involve the following key activities:

Data Collection and Analysis: Gather extensive data on hybrid materials, including properties, performance metrics, manufacturing processes, and application case studies. This data will be sourced from scientific literature, industry reports, and material databases.

Leveraging Existing LLMs: Utilize existing, pre-trained LLMs to process and analyze the collected data. These models, with their advanced natural language understanding and processing capabilities, will identify patterns, relationships, and insights relevant to hybrid material selection and design.

Functional Requirement Matching: Develop algorithms that enable the LLM to match specific functional requirements of engineering cases with the most suitable hybrid material combinations. This includes considerations of mechanical properties, thermal stability, chemical resistance, and other relevant factors.

Validation and Testing: Conduct rigorous validation and testing of the LLM-based system using real-world engineering cases. This will involve collaboration with industry partners to ensure the system's recommendations are practical and effective.

Prerequisites

Students with material, mechanical and AI background are preferred.

Additional Information