

## **Overview**

This three-year, Level II, Design and Development DRK-12 project in the Learning Strand aims to broaden access to microelectronics and AI education using the frameworks of altruistic engineering design and engineering identity negotiation, and leveraging edge AI technologies and low-cost embedded systems in diverse Florida, Kansas, and Texas high schools. Our goal is to engage students and teacher from under-resourced communities in the design and creative application of smart, embedded technologies while scaffolding their engineering identity development to prepare them for the STEM jobs of tomorrow. We will employ Tiny Machine Learning (TinyML) as a “proto-engineering” approach to teaching microelectronics and AI as it runs on stand-alone, low-cost microcontroller boards with extensive hardware abstraction, minimizing the barrier of integrating ML applications with hardware. Important to our approach, TinyML applications are robust enough to be used to solve real-world problems such as a remote monitoring of air quality, tragic safety, or physiology and health. Designing, deploying, and managing TinyML applications on microcontrollers exposes students to full-stack development skills that will be important both in college and their future jobs because these skills apply to working with large-scale ML technologies and applications. Because TinyML does not require large amounts of data and model training employs straightforward procedures, this approach is accessible to students with low prior knowledge of ML, will expand their conceptions of AI to include hardware and sensor-based applications, help dispel important misconceptions (e.g., AI is ChatGPT, AI is expensive), and illustrate responsible and ethical uses of AI.