◊ **ABSTRACT (**max 2,400 characters**):**

Cutting methane emissions is now widely recognized as one of the most effective ways to slow down climate change. It can also improve public health and climate justice. As the climate continues to change and greenhouse gas levels continue to rise, there is an ever increasing need to mitigate the effects of these changes. To create effective change, the targeting reduction of methane gas is crucial. There are many different sources to attribute to this methane problem, such as, the oil & gas industry, dairy & agriculture, landfills, and even natural systems (e.g. wetlands etc.). Methane production may be dependent on the ambient temperature and climate warming creates a positive feedback loop. It is important to adopt a closed loop thinking to manage/mitigate the methane emissions dynamics through improving measurement accuracy, speed, and inevitably cost.

The proposed Center for Methane Emission Research and Innovation (CMERI) takes the closed-loop thinking (sensing/actuation) for taking climate actions against methane emissions due to both environmental and anthropogenic emissions. CMERI addresses all 6 CA Climate Adaptation Priorities. CMERI aims to develop actionable information from methane emission sensing and quantification for emission reduction and mitigation actions, and to contribute to education, outreach and workforce development for disadvantaged communities by partnering with federal agencies (e.g. USGS, NASA JPL), state agencies (e.g. CARB, CDFA etc.), California Dairy Research Foundation, local dairy farms and industries. The proposed CMERI will develop and mature technologies for both methane emission measurement workflows and mitigation suggestions. These technologies will create jobs for disadvantaged communities for methane auditing and mapping services after CMERI training.

Over the past 9 years, the leading PI has been developing new sensing and big data processing technologies to measure methane emissions of various sources, with different modes of sensing (e.g. drones, unmanned ground vehicles). The PIs had past grants in biomass gasification (NSF) as well as mobile biochar for methane reduction (CA SGC). CMERI innovations include XAIoT (explainable AI empowered IoT) devices, digital twins and closed-loop thinking etc. that will lead to spin off companies. Our methane emission mitigation actions are two folds: 1) use of biochar manure mixture for soil health and methane emission reduction; 2) use of biogas production for methane reduction. For nature sources, we focus on UC Merced's Experimental Smart Farm where the discharge pond will be instrumented to monitor the methane dynamics with several artificial leak sources for research purposes. The goal is to establish the California Methane Emission Research and Innovation Center).