**Graduate Research Plan Statement**

NOTE: This document has been formatted to the format requirements in the solicitation [Times New Roman for all text, Cambria Math font for equations, and Symbol font for non-alphabetic characters (it is recommended that equations and symbols be inserted as an image), no smaller than 11-pt (except text that is part of an image), no less than single-spaced, 1” margins (nothing should be in the margins; no header, footer, name, or page number), required separate sections for Intellectual Merit and Broader Impacts].  Sections can be any length within the 2 pages. Any deviation from this format will render your application non-compliant and it will be returned without review. **Remove all of this instructional text BEFORE you input your statement.**

Present an original research topic that you would like to pursue in graduate school. Describe the research idea, the proposed approach, and resources needed to accomplish the research goal, including access to national facilities or collections, collaborations, overseas work, etc. You may cite references. Address the potential of the research to advance knowledge and understanding within science as well as the potential for broader impacts on society. The research must be in a field listed in the Solicitation (Section X, Fields of Study). **Remove all of this instructional text BEFORE you input your statement.**

I am proposing to work on Edge Computing research with Dr. Zheng Song, assistant professor at the University of Michigan-Dearborn – the current university that I am attending. The school has state-of-the-art research facilities, including the newest addition of the Engineering Lab Building (ELB): it is a fully modernized research facility ready to support leading technological advancements in computer science and engineering. It even includes a computer engineering lab, a game lab, (insert other information here). In other parts of campus, they maintain an advanced robotics lab, and much more. What is edge computing? In short, it is less explored branch of computer science that refocuses the analysis of data (especially using artificial intelligence and machine learning) on the “edge” of the world’s computer network infrastructure. The “edge” refers to devices that are closer to the end-user so that the speed of calculations and delivery of useful data communications can be significantly improved. Advancements of edge computing has very practical and empowering applications in mankind’s toolbox, and what I am proposing to research with Dr. Song helps push the field to its true potential. For example, one research project that Dr. song is working on includes using vision systems of drones to calculate and communicate directly with vehicles on the ground in order to improve safety and reduce traffic congestion on the roads where the environment is so dynamic. Another project is one that we are hoping to be a part of. It is through a company by the name of Live Road Analytics. A team of six highly qualified members with strong backgrounds in computer science has reached out to Dr. Song, including a meteorologist, an artificial intelligence expert, an expert on computer hardware, and expert in telematics, an expert in vehicle networks and vehicle systems engineering, and experts in computer architecture. They would like to utilize Dr. Song’s expertise in edge computing. The project involves using weather sensors on all sorts of vehicles (trains, busses, cars, trucks, etc.) so that we can obtain real-time analysis of road conditions. Meteorologists can use this data in their weather forecasts, vehicles could give real-time warnings and analysis of road surface and environmental conditions, route applications can use it to improve its function, city officials can use it to make their cities smarter and safer, and much more. This is done through vehicle networking, where vehicles use their weather sensor modules to collect, process, and share data with each other, and over a cellular network to nearby servers or other drivers. Obviously, this project demands knowledge on data analytics (AI/Machine Learning), computer architecture, computer networks, and equally critical: it demands research in edge computing. Edge computing does not merely refer to computations by servers closer to the edge of the network, but it also involves P2P (peer-to-peer) networking, as peers (end users that are relatively nearby to each other) can share the load of data transmission and calculation in a network application, such as a fine-grained road weather system. The financial implications of this road meteorological technology would be monumental to weather forecasting, safety, and all sorts of logistics such as in autonomous driving, route planning, supply chain, and much more. This research is a needed and worthy cause to say the least, and one that would be immensely profitable solely off of the credence of improving safety and logistics, which of course in itself brings efficiency, which brings forth gains for everyone!

All of that valuable information we haven't been collecting about the weather and road conditions while millions of cars are on the road at any moment seems like something we should have done a long time ago. But then again, vehicle networks have been taking the steps in the right direction to make such a project as this not only possible, but plausible. This can definitely be done; it is only a matter of doing some heavy lifting with more research and testing to make the first and subsequent versions of this idea an elite tool in mankind's toolbox.

**Intellectual Merit**

State your Intellectual Merit. **Retain heading but remove this instructional text BEFORE you input your statement.**

**Broader Impacts**

State your Broader Impacts. **Retain heading but remove this instructional text BEFORE you input your statement.**

**References**.

Times New Roman, 11-pt., single-spaced. **Remove all of this instructional text BEFORE you input your statement.**