

UMTRI: Cybersecurity

As passenger vehicles equipped with brake assist and lane keeping assistance capabilities, they also increasingly become connected to the internet. Cybersecurity concerns must be tested and analyzed in order to keep passengers safe.

Project Description

Passenger vehicles are increasingly connected to the Internet and become part of the Internet-of-Things. Modern vehicles are equipped with Bluetooth, WiFi, cellular modems, advanced infotainment systems, more than 50 electronic control units (ECU), and millions of lines of code. Many modern cars also come with radar and cameras that enable control applications such as brake assist and lane keeping assist. It seems obvious that the increased connectivity and software in vehicles introduces cybersecurity vulnerabilities that endanger passengers' safety. Such concerns have been proven about 5 years ago, and by now it has been demonstrated that every wireless and wired interface is a potential threat, including Bluetooth, cellular connection, WiFi, USB, SD-Card, GPS, digital radio, etc. Recently such concerns have reached a new dimension with the first car maker initiating a recall due to a cybersecurity vulnerability. These cybersecurity concerns will become even more important for automated vehicles.

The Michigan Mobility Transformation Center (MTC)

MTC was launched in 2013 to develop Ann Arbor and Southeast Michigan as a living laboratory for advanced mobility systems. MTC will design and evaluate specific technologies and envision an attractive mobility system directly engaging users. Cybersecurity is an essential research aspect of MTC in order to design and build secure and safe connected and automated vehicles.

Expected Outcomes

The objective of this project is to design and implement an automotive intrusion detection and prevention system (IDPS). Such an IDPS is one of the most promising automotive cybersecurity solutions and one can expect to see first solutions in passenger vehicles soon. However, very little is currently publicly available and this project wants to introduce significant innovation in this space, publish results, and educate the automotive cybersecurity community. This project also develops and implements attacks to a vehicle in order to test and eventually improve the IDPS solution. The outcome of this project is an automotive IDPS running on a test platform that is connected to a passenger vehicle and that detects and eventually prevents attacks. The project will use a test vehicle and MTC's test track facility for real-world testing of the IDPS solution. The results are highly relevant to industry and it is expected that there will be large interest by car makers and automotive suppliers.

Ideally this project will be run by students with little organizational input from the mentor to give the students an opportunity to gain management and engineering experience. Depending on the number and experience of students, the mentor and staff engineers will provide all necessary support to get started.

Faculty Sponsor



Di Ma

Dr Ma is an Associate Professor at the CIS department of University of Michigan-Dearborn, where she leads the Security and Forensics Research Laboratory (SAFE Lab). She obtained her Ph.D degree from the University of California, Irvine in 2009. She has worked with IBM at the Almaden Research Center (Summer 2008) and the Institute for Infocomm Research in Singapore (2000~2005). Research-wise, Dr. Ma is broadly interested in the general area of security, privacy, and applied cryptography. Her work spans a wide range of topics, including computation over authenticated/encrypted data, fine-grained access control, secure storage systems, wireless network security, smartphone security and privacy, and more. Her research is supported by NSF, AFOSR, and Intel.

Student Responsibilities

VIP faculty research projects are both a professional and academic learning experience for students. By participating in this program, students are actively preparing for graduate school and a professional career. As part of the experience, MDP expects professional behavior. To best prepare you for future professional opportunities, your experiences on this MDP team will be very broad. In addition to key technical skills that you will bring to the team, you will engage deeply in the self-directed learning of new and important concepts, demonstrate flexibility, collaboration, and cooperation, and develop strong professional communication skills. This also means that you will need to be able to work outside of your traditional area of study in the true multidisciplinary nature of our projects. You won't always be able to anticipate how your skills and expertise will be used, so joining a VIP faculty research team will challenge you to grow and develop as a professional.

Internship

The Multidisciplinary Design Program offers summer research stipends to continue research over the summer. Applications for funding will open in February 2017. Research stipends will not exceed \$3,000.

Legal

All students must sign a standard MDP Faculty Research IP Agreement.

The Fine Print

- Application for all projects is open from September 6th, 2016 until 11:59pm on Sunday, October 16th.
- Please schedule an appointment with your home department's academic advisor before November and make sure you will have time in your schedule to complete a project if offered a position.
- All projects will start in January 2017 and end in December 2017. Summer participation is not required unless otherwise specified in the project description. Project Teams labeled VIP (Faculty Research) will extend for multiple semesters, and long-term participation is highly encouraged.

- Increase your chances of matching to a project by applying for all of the teams that interest you and attend the Project Opportunity Fair on October 5th.
- Successful students will receive one offer to join one project only. Offers will be sent to students starting in November and will continue until all teams are filled (early December).