

Research Statement of George Corser, PhD

The purpose of this statement is to highlight significant scientific work, and to outline immediate research plans.

Significant scientific work. My research investigates location privacy and security in continuously connected mobile systems, especially vehicular ad hoc network (VANET) and Internet of Things (IoT) applications.

- **Publications.** I regularly publish highly rated academic papers in top venues. Recent accomplishments:
 - Elected by IEEE peers to serve as lead author of a white paper, *Internet of Things Security Best Practices*, published by the [IEEE Internet Initiative](#) (2017)
 - Published, as lead author, a journal paper, *Evaluating Location Privacy in Vehicular Communications and Applications*, in [IEEE Transactions on Intelligent Transportation Systems](#) (2016), which was **nominated for 2016 Caspar Bowden PET Award**
 - Published dissertation (2016), *Securing Location Privacy in Vehicular Communications and Applications*, was **nominated for Outstanding Dissertation Award**
- **Research Software.** I develop open-source research software to improve simulation and visualization of VANET location privacy protocols under varying vehicle mobility patterns. Examples:
 - Supervised trace data visualizer (VisuTrace: <https://csis.svsu.edu/~gpcorser/visutrace/city.html>)
 - Built VANET privacy protocol analyzer (VPPA: <https://github.com/gpcorser/vanet>)
- **Invited talks.** I present and advise at national academic and industry conferences.
 - Webinar leader for the [IEEE Internet Initiative](#) (September 2017)
 - Invited speaker at IEEE End to End Trust and Security Workshop for the Internet of Things in Washington, DC (February 2016)
 - Invited automotive cybersecurity researcher at Intel Corporation Automotive Security Review Board (ASRB) organizational meeting at Automotive Cyber Security Summit (October 2015)
- **Research Mentoring.** I mentor the research of other researchers, and integrate research into teaching.
 - Currently serve on the doctoral advisory committees of 4 PhD students
 - Published five conference and journal papers with five undergraduate co-authors
 - Include security lessons in my web and mobile app development courses

Immediate research plans. *Problem:* Emerging VANET/IoT systems may violate people's privacy. *Importance:* Studying and developing technical privacy protection techniques may help consumers identify products which preserve privacy, and may help law enforcers understand how surveillance techniques may be thwarted. *Complexity:* Understanding and measuring the relationships between privacy, security, safety, and network performance requires background in both specialized network protocols and privacy/security measurement.

I will continue to build and enhance tools and techniques for simulation, experimentation and research collaboration. Next steps in my research include software enhancements, research test bed development, and new collaborations to establish broader impact of the research.

- **Software enhancements.** The simulation tool I developed, VisuTrace, displays within a Web browser vehicle traffic patterns and privacy protocol metrics. This is a convenient way to visualize research results. But to speed up privacy protocol research, scholars worldwide should be able to upload their own data and algorithms. I intend to establish a game platform, like Axelrod's Prisoner's Dilemma Tournaments, where location privacy algorithms can compete to see which protects privacy most effectively (best anonymization, farthest distance and longest duration) and efficiently (least network overhead and congestion). The new web platform may broadly impact researchers and policy makers, and would certainly benefit my web programming students, as I integrate this research into my undergraduate and graduate web/mobile development courses.
- **Research test bed development.** In addition to simulation tools like VisuTrace, car hacking platforms are required for vulnerability investigation and direct experimentation. I am in the early stages of building a test bed which would include Android Auto compatible dashboards and DSRC transmitter/receivers. Advising me are representatives from University of Michigan Transportation Research Institute ([UMTRI](#)), General Motors Product Cybersecurity and individual members of Intel Corporation's Automotive Security Review Board (ASRB).
- **New collaborations.** [UMTRI](#) collects a great deal of data and their representatives have agreed to let me run my privacy protocols on subsets of that data on their servers. I am working on getting permission to run the protocols on the full data set, or even getting a copy of the data to run on my own servers. I am also contacting all vehicle-related privacy and security researchers in the region to hold tutorial workshops to build the knowledge base and facilitate publication collaboration.