

Safety and Security of Autonomous Vehicles

Deadline for manuscript submissions: 30 October 2022

Many people lose their lives or are seriously injured in accidents on road owing to various reasons such as drivers' fault/negligence (violating the traffic rules), vehicle glitch (e.g., sensor failure, brake failure), environmental conditions (e.g., rainy season, foggy weather, stormy weather, etc.), poor road-conditions, insufficient road-information, poor road-constructions, dearth of safety infrastructure, inefficient security measures, growth of traffic on the road, etc. Therefore, we need Autonomous Vehicles (AVs) to reduce human errors, enhance road safety, reduce driving-related stress, and optimize traffic flow. AVs are vehicles equipped with automated driver systems for performing necessary functions to control the vehicle with better decision making. AVs are capable to sense their surroundings and respond to the external conditions without any human intervention. The report of a study commissioned by Intel predicts that AVs will generate a substantial economic opportunity approximately amounting from \$800 billion in 2035 to \$7 trillion by 2050, considering the services and products offered by AVs. The study also claims that AVs will save more than 580,000 lives between 2035 and 2045 due to their inherent safety and security mechanism. Hence, we need a properly coordinated system that communicates with the AV domain (Within Same AV), V2I domain (Roadside Unit/Vehicle to Infrastructure), V2V domain (Vehicle to Vehicle), and V2P domain (Vehicle to Pedestrian).

AVs are being foreseen to play a crucial role in providing the safety and security to modern transportation/traffic systems. Safety and security together ensure the normal use of AVs. Consequently, there are some essential security and safety challenges related to AVs. For example, if any part of AV fails (safety issue), is assaulted (security issue) by some adversary, then AVs may issue wrong commands, and they may circulate incorrect information in the network. Therefore, any failures or attacks may cause severe safety-losses and can worsen the traffic control. Hence, AVs should follow safety concerns (Software failure, Vehicle Mechanical Failure, Communication System Failure, Interaction system Failure, Weather Impact, Traffic Light & Signals, Road Conditions, and Construction Zones, etc.) and security concerns (Authentication/Identification, Availability, Data Integrity & Data Trust, Confidentiality/Privacy).

This special issue invites original and novel contributions to ensure AV safety and security from an academic and industry point of view. All submitted papers focus on state-of-the-art algorithms/protocols/schemes that enhance the safety and security of AVs. The topics of interest include, but are not limited to, the following work on AVs:

- Novel secure architecture and networks for autonomous vehicles integrating Internet of vehicles
- Machine learning-based object detection algorithms to enhance the safety of AVs
- Mathematical models of weather prediction for the safety of AVs
- Image processing approaches to strengthen the safety of AVs

- IoT based system for alerts for poor roads/construction/accidents to enhance the safety of AVs
- Real-time traffic estimation for the safety of AVs.
- Security and privacy challenges in the V2V, V2I, and V2P
- Secure cloud/edge computing architecture for AVs
- Secure location verifications.
- Blockchain-based secure solutions for AVs
- Recognition of malicious vehicles using deep learning
- Secure data analytics of AVs data
- Path tracking
- 5G/6G enabled security solutions for AVs
- Privacy and identity management for Avs
- Security and privacy of tactile internet for real-time data in Avs
- B5G low latency tactile internet security solutions for autonomous vehicles

Submission guidelines:

Submissions to the special issue should lie strictly in the scope of the special issue, as well as the scope of the journal.

Guest Editors:

- **Saru Kumari**, saryusiirohi@gmail.com
Chaudhary Charan Singh University, India
- **Hu Xiong**, xionghu@uestc.edu.cn
University of Electronic Science and Technology of China
- **Lyes Khoukhi**, Lyes.Khoukhi@ensicaen.fr
ENSICAEN, University of Caen Normandy, France
- **Joel J. P. C. Rodrigues** (IEEE Fellow), joeljr@ieee.org
Federal University of Piauí, Brazil; Senior researcher at the Instituto de Telecomunicações, Portugal

Dr. Saru Kumari is currently an Assistant Professor with the Department of Mathematics, Chaudhary Charan Singh University, Meerut, Uttar Pradesh, India. She received her Ph.D. degree in Mathematics in 2012 from Chaudhary Charan Singh University, Meerut, UP, India. She has published more than 230 research papers in reputed International journals and conferences, including more than 210 research papers in various SCI-Indexed Journals such as IEEE TDSC, IEEE TII, IEEE T-ITS, ACM TOIT, IEEE IoTJ etc. She received the best paper award from JNCA, Elsevier in 2020. She is on the editorial board of more than a dozen of International Journals, of high repute, under Elsevier, Springer, Wiley and others including SCI journals such as IEEE Systems Journal, AEÜ - International Journal of Electronics and Communications, Elsevier (SCI); International Journal of Communication Systems, Wiley (SCI-E); Telecommunication Systems, Springer (SCI); Human Centric Computing and Information sciences, Springer (SCI-E); Transactions on Emerging Telecommunications Technologies; Wiley (SCI-E), Information Technology and Control, Kaunas University of Technology, Lithuania (SCI-E); KSII Transactions on Internet and Information Systems (SCI-E), published from Taiwan; Information Security: A Global Perspective, Taylor & Francis (ESCI, Scopus); International Journal of Wireless Information Networks (ESCI, Scopus), Springer; Journal of Reliable Intelligent Environments, Springer (ESCI, Scopus); etc. She has served as the Guest Editor of many special issues in SCI Journals under IEEE, Elsevier, Springer and Wiley. She has been involved in the research community as Technical Program Committee (TPC) member or PC chair for more than a dozen of International conferences of high repute. She is also serving as a reviewer of dozens of reputed Journals including SCI-Indexed of IEEE, Elsevier, Springer, Wiley, Taylor & Francis, etc. Her current research interests include information security and applied cryptography.

Hu Xiong received a PhD degree from the School of Computer Science and Engineering, University of Electronic Science and Technology of China (UESTC) in 2009. He is currently a Full Professor with the School of Information and Software Engineering, UESTC. His research interests include cryptographic protocols and network security. Since 2010, Dr Xiong has participated in 5 R+D projects from both the Chinese government and industries. His research interests include cryptography and cyberspace security. Dr Xiong has published over 10 ACM/IEEE journals and published a book in the CRC press as the 1st author in the field of his research area.

Lyes Khoukhi is Full Professor at ENSICAEN, Normandie University, with GREYC CNRS UMR lab, Caen, France. He received the Ph.D degree in computer engineering from the University of Sherbrooke, Canada, in 2006. Between 2007 and 2008, he was a researcher with the Department of Computer Science and Operations Research, University of Montreal in collaboration with Bell-Canada. In 2008, he also worked for Dialexia Corporation-Montreal, in the development of safe communications solutions. In 2009, he joined University of Technology of Troyes as assistant professor. Since 2020, he is Full Professor at ENSICAEN, Normandie University, with GREYC CNRS UMR 6072 lab/SAFE team, Caen, France.

His research interests include Cybersecurity and networks performance. He has participated as a General chair, program chair, or TPC Member of many conferences. He is the program chair of IEEE LCN 2021, the program co-chair of LCN'20 & CyberWorlds'21, and served as Symposium chair for IEEE LCN in 2019. He is also the Symposium chair of Globecom'21 (track Mobile and Wireless Networks). He served also as co-chair of the IEEE LCN On-move for several years (2013-2018) and QoS/QoE of IWCMC (2017-2019). He was the general chair of NOTERE' 16 (13ème Francophone conference, 2016), and UBIROADS'2012.

He is the Guest Editor of Springer journal of Annals of Telecommunications of the SI (Internet of Vehicles & Smart City)-2020. He is also the Guest Editor of MDPI journal of Information of the SI (New Trends and Challenges in ITS Optimisation and Security)-2020, 2021. He is also the SIG leader of "Machine Learning for IoT and ad hoc networks" of the IoT ASHN ComSoc Committee of *IEEE Communications Society* since 2020.

Joel J. P. C. Rodrigues [S'01, M'06, SM'06, F'20] is a professor at the Federal University of Piauí, Brazil; and senior researcher at the *Instituto de Telecomunicações*, Portugal. Prof. Rodrigues is the leader of the Next Generation Networks and Applications (NetGNA) research group (CNPq), an IEEE Distinguished Lecturer, Member Representative of the IEEE Communications Society on the IEEE Biometrics Council, and the President of the scientific council at ParkUrbis – Covilhã Science and Technology Park. He was Director for Conference Development - IEEE ComSoc Board of Governors, Technical Activities Committee Chair of the IEEE ComSoc Latin America Region Board, a Past-Chair of the IEEE ComSoc Technical Committee (TC) on eHealth and the TC on Communications Software, a Steering Committee member of the IEEE Life Sciences Technical Community and Publications co-Chair. He is the editor-in-chief of the International Journal of E-Health and Medical Communications and editorial board member of several high-reputed journals (mainly, from IEEE). He has been general chair and TPC Chair of many international conferences, including IEEE ICC, IEEE GLOBECOM, IEEE HEALTHCOM, and IEEE LatinCom. He has authored or coauthored about 1000 papers in refereed international journals and conferences, 3 books, 2 patents, and 1 ITU-T Recommendation. His contributions received more than 24000 known citations in the literature with an H-index 77 (Google Scholar). He had been awarded several Outstanding Leadership and Outstanding Service Awards by IEEE Communications Society and several best papers awards. Prof. Rodrigues is a member of the Internet Society, a senior member ACM, and Fellow of IEEE.