1.A Comprehensive Review of the COVID-19 Pandemic and the Role of IoT, Drones, AI, Blockchain, and 5G in Managing Its Impact VINAY CHAMOLA 1 , VIKAS HASSIJA 2 , VATSAL GUPTA 2 , AND MOHSEN GUIZANI 3 , (Fellow, IEEE) 1Department of Electrical and Electronics Engineering, Birla Institute of Technology and Science (BITS), Pilani 333031, India 2Department of CSE and IT, Jaypee Institute of Information Technology, Noida 201309, India 3Department of Computer Science and Engineering, Qatar University, Doha, Qatar Corresponding author: Mohsen Guizani (mguizani@ieee.org) This work was supported by the Qatar National Research Fund (a member of the Qatar Foundation) under Grant NPRP10-1205-160012.

2. Role of Wireless Communications in Digital Economy in the Present Context S.Revathi Assistant Professor department of Computer Science and Engineering Sri Ramakrishna Institute of Technology, Coimbatore revathi.cse@srit.or g Dr. Arpan Shrivastava Assistant Professor Management Devi Ahilya Vishva Vidyalaya Madhya Pradesh arpan.mitm@gmail .com Ardak Yussupova Department of Art Studies, Kazakh National

University of Arts, Nur-Sultan, Kazakhstan, ardak.kz@mail.ru A. Nururrochman Hidayatulloh Leadership and Policy Innovation Program Universitas Gadjah Mada Indonesia anhidayatullah79@ gmail.com Daurbekova Saltanat Department of Construction, International Education Corporation, Almaty, 050042, Kazakhstan, salta.@mail.ru Arpana Mishra Ph.D. Student, Electrical, Electronics and Communication Engineering Sharda University, Greater Noida India Shubhparna20@gm ail.com

3. S. Yan, X. Zhou, N. Yang, B. He, and T. D. Abhayapala, "Artificial-noise-aided secure transmission in wiretap channels with transmitter-side correlation," IEEE Trans. Commun., vol. 15, no. 12, pp. 8286--8297, Dec.2016

4. H. Wang, B. Zhao, and T. Zheng, "Adaptive full-duplex jamming receiver for secure D2D links in random networks;' IEEE Trans. Commun., vol. 67, no. 2, pp. 1254-1267, Feb. 2019

5. T. V. Sobers, B. A. Bash, S. Guha, D. Towsley, and D. Goecke1, "Covert communication in the presence of an uninformed jammer;' IEEE Trans. Wirel. Commun., vol. 16, no. 9, pp. 6193- 6206, Sep. 2017

6. Bash, B.A.; Goeckel, D.; Towsley, D.; Guha, S. Hiding information in noise: Fundamental limits of covert wireless communication.

IEEE Commun. Mag. **2015**, *53*, 26–31

7 .J. Hu et al., “Covert communication achieved by a greedy relay in wireless networks,” IEEE Trans. Wireless Commun., vol. 17, no. 7, pp. 4766–4779, Jul. 2018.

8. J. Hu et al., “Covert communications with a full-duplex receiver over wireless fading channels,” in Proc. IEEE ICC, May 2018, pp. 1–6.

9.Z. Liu, J. Liu, Y. Zeng, J. Ma, and Q. Huang, “On covert communication with interference uncertainty,” in Proc. IEEE ICC, May 2018, pp. 1–6.

10. Delay-Constrained Covert Communications With a Full-Duplex Receiver Feng Shu , Member, IEEE, Tingzhen Xu, Student Member, IEEE, Jinsong Hu , Member, IEEE, and Shihao Yan , Member, IEEE

11. Covert Communication with A Full-Duplex Receiver Based on Channel Distribution Information Tingzhen Xu1 , Ling Xu1 , Xiaoyu Liu1 , Zaoyu Lu1 1School of Electronic and Optical Engineering,

Nanjing University of Science and Technology, Nanjing, Jiangsu, China Emails:{tingzhen.xu, xuling, xiaoyu.liu}@njust.edu.cn, Lu zaoyu@163.com

12. Yang, L.; Yang, W.; Xu, S.; Tang, L.; He, Z. Achieving Covert Wireless Communications Using a Full-Duplex Multi-Antenna
Receiver. In Proceedings of the 2019 IEEE 5th International Conference on Computer and Communications (ICCC), Chengdu,
China, 6–9 December 2019; pp. 912–916.
13. Wang, J.; Li, Y.; Tang, W.; Li, X.; Li, S. Channel State Information Based Optimal Strategy for Covert Communication. In
Proceedings of the 2019 11th International Conference on Wireless Communications and Signal Processing (WCSP), Xi'an, China,
23–25 December 2019; pp. 1–6.

14. Power Allocation For Full-duplex Two-way Wiretap Channel Navneet Garg and Tharmalingam Ratnarajah, School of Engineering, The University of Edinburgh, Edinburgh, UK

15. Joint Power and Position Optimization for the Full-Duplex Receiver in Covert Communication Yue

Zhao∗, Zan Li∗, Nan Cheng∗, Danyang Wang∗, Wei Quan†, and Xuemin (Sherman) Shen‡ ∗State Key Laboratory of Integrated Services Networks, Xidian University, Xi'an, China † School of Electronic and Information Engineering, Beijing Jiaotong University, Beijing, China ‡Department of Electrical and Computer Engineering, University of Waterloo, Waterloo, Canad

16. Shu, F.; Xu, T.; Hu, J.; Yan, S. Delay-Constrained Covert Communications With a Full-Duplex Receiver. *IEEE Wirel. Commun. Lett.*
2019, *8*, 813–816. [CrossRef]
17. Zhao, Y.; Li, Z.; Cheng, N.; Wang, D.; Quan, W.; Shen, X. Joint Power and Position Optimization for the Full-Duplex Receiver in
Covert Communication. In Proceedings of the ICC 2020-2020 IEEE International Conference on Communications (ICC), Dublin,
Ireland, 7–11 July 2020; pp. 1–6.
18. Xu, R.; Guan, L.; Zhao, Y.; Li, Z.; Wang, D. Robust Power and Position Optimization for the Full-Duplex Receiver in Covert
Communication. In Proceedings of the 2021 IEEE Global Communications Conference (GLOBECOM), Madrid, Spain, 7–11
December 2021; pp. 1–6.

19. Chen, X.; Sun, W.; Xing, C.; Zhao, N.; Chen, Y.; Yu, F.R.; Nallanathan, A. Multi-Antenna Covert Communication via Full-Duplex
Jamming Against a Warden With Uncertain Locations. *IEEE Trans. Wirel. Commun.* **2021**, *20*, 5467–5480.

20. Che, B.; Yang, W.; Lu, X. Covert Communication for Multi-Channel Transmission with A Full-Duplex Receiver. In Proceedings of

the 2021 13th International Conference on Wireless Communications and Signal Processing (WCSP), Changsha, China, 20–22
October 2021; pp. 1–5.

21. **Performance Comparison of Relay-Based Covert Communications: DF, CF and AF**

Jihwan Moon [1]

22. Li, Y.; Zhao, R.; Deng, Y.; Shu, F.; Nie, Z.; Aghvami, A.H. Harvest-and-Opportunistically-Relay: Analyses on Transmission Outage
and Covertness. *IEEE Trans. Wirel. Commun.* **2020**, *19*, 7779–7795. [CrossRef]
Sensors **2023**, *23*, 6515 13 of 13
23. Wu, Z.; Guo, K.; Zhu, S. Covert Communication for Integrated Satellite–Terrestrial Relay Networks with Cooperative Jamming.
Electronics **2023**, *12*, 999

24. E. Bjornson and L. Sanguinetti, “Power scaling laws and near-field behaviors of massive MIMO and intelligent reflecting surfaces,” IEEE Open J. Commun. Soc., vol. 1, pp. 1306–1324, 2020.

25. S. Zhang and R. Zhang, “Capacity characterization for intelligent reflecting surface aided MIMO communication,” IEEE J. Sel. Areas Commun., vol. 38, no. 8, pp. 1823–1838, Aug. 2020.

26. W. Tang et al., “Wireless communications with reconfigurable intelligent surface: Path loss modeling and experimental measurement,” IEEE Trans. Wireless Commun., vol. 20, no. 1, pp. 421–439, Jan. 2021.

27. C. Wu et al., “Intelligent reflecting surface (IRS)-aided covert communication with warden’s statistical CSI,” IEEE Wireless Commun. Lett., vol. 10, no. 7, pp. 1449–1453, Jul. 2021.

28. J. Si, Z. Li, J. Cheng, L. Guan, J. Shi, and N. Al-Dhahir, “Covert transmission assisted by intelligent reflecting surface,” IEEE Trans. Commun., vol. 69, no. 8, pp. 5394–5408, Aug. 2021.

29.C. Wang, Z. Li, J. Shi, and D. W. K. Ng, “Intelligent reflecting surfaceassisted multi-antenna covert communications: Joint active and passive

beamforming optimization," IEEE Trans. Commun., vol. 69, no. 6, pp. 3984–4000, Jun. 2021.

30. Full-Duplex Covert Communications Assisted by Intelligent Reflective Surfaces Slavche Pejoski , Member, IEEE, Zoran Hadzi-Velkov , Senior Member, IEEE, and Nikola Zlatanov , Senior Member, IEEE

31. Wang, C.; Li, Z.; Shi, J.; Ng, D.W.K. Intelligent Reflecting Surface-Assisted Multi-Antenna Covert Communications: Joint Active

and Passive Beamforming Optimization. *IEEE Trans. Commun.* **2021**, *69*, 3984–4000.

32. Pejoski, S.; Hadzi-Velkov, Z.; Zlatanov, N. Full-Duplex Covert Communications Assisted by Intelligent Reflective Surfaces. *IEEE Commun. Lett.* **2022**, *26*, 2846–2850.

33. Wang, M.; Xu, Z.; Xia, B.; Guo, Y. Active Intelligent Reflecting Surface Assisted Covert Communications. *IEEE Trans. Veh. Technol.* **2023**, *72*, 5401–5406.

34. Wang, C.; Li, Z.; Zheng, T.-X.; Ng, D.W.K.; Al-Dhahir, N. Intelligent Reflecting Surface-Aided Full-Duplex Covert Communications:

Information Freshness Optimization. *IEEE Trans. Wirel. Commun.* **2023**, *22*, 3246–3263.

34. Optimal Location Design for UAV Covert Communications with a Full-Duplex Receiver Zewei Guo∗ , Shuangrui Zhao∗ , Jiandong Wang∗ , Haipeng Li† , and Yulong Shen∗ ∗School of Computer Science and Technology, Xidian University, Xi'an, China †Unary Information Technology Inc., Nanjing, China

35. UAV-IRS Assisted Covert Communication: Introducing Uncertainty via Phase Shifting Xinying Chen , Graduate Student Member, IEEE, Zheng Chang , Senior Member, IEEE, Mingqian Liu , Member, IEEE, Nan Zhao , Senior Member, IEEE, Timo Hämäläinen , Senior Member, IEEE, and Dusit Niyato , Fellow, IEEE

36. UAV Relay Assisted Cooperative Jamming for Covert Communications Over Rician Fading Ran Zhang , Xinying Chen, Mingqian Liu , Member, IEEE, Nan Zhao , Senior Member, IEEE, Xianbin Wang , Fellow, IEEE, and Arumugam Nallanathan , Fellow, IEEE

37. Zhou, X.; Yan, S.; Shu, F.; Chen, R.; Li, J. UAV-Enabled Covert Wireless Data Collection. *IEEE J. Sel. Areas Commun.* **2021**,

39, 3348–3362.

38.Li, M.; Tao, X., Wu, H.; Li, N. Joint Trajectory and Resource Optimization for Covert Communication in UAV-Enabled Relaying
Systems. *IEEE Trans. Veh. Technol.* **2023**, *72*, 5518–5523

39. R. Chen, J. Shi, L. Yang, C. Wang, Z. Li, P. Xiao, and G. Chen, “Performance analysis for user scheduling in covert cognitive radio networks,” in 2020 IEEE 31st Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), 2020, pp. 1–6.

40.X. Liao, J. Si, J. Shi, Z. Li, and H. Ding, “Generative adversarial network assisted power allocation for cooperative cognitive covert communication system,” IEEE Commun. Lett., vol. 24, no. 7, pp. 1463–1467, 2020.

41. W. Xiong, Y. Yao, X. Fu, and S. Li, “Covert communication with cognitive jammer,” IEEE Wireless Commun. Lett., vol. 9, no. 10, pp. 1753–1757, 2020

42. A Covert Jamming Scheme Against an Intelligent Eavesdropper in Cooperative Cognitive Radio Networks Yingkun Wen , Lei Liu , Member, IEEE, Junhuai Li , Xiangwang Hou , Ning Zhang , Senior Member, IEEE, Mianxiong Dong , Member, IEEE, Mohammed Atiquzzaman , Senior Member, IEEE, Kan Wang , and Yan Huo , Senior Member, IEEE

43. Generative Adversarial Network Assisted Power Allocation for Cooperative Cognitive Covert Communication System Xiaomin Liao , Jiangbo Si , Member, IEEE, Jia Shi , Member, IEEE, Zan Li , Senior Member, IEEE, and Haiyang Ding , Member, IEEE

44. Sun, R.; Yang, B.; Shen, Y.; Jiang, X.; Taleb, T. Covertness and Secrecy Study in Untrusted Relay-Assisted D2D Networks. *IEEE Internet Things J.* **2023**, *10*, 17–30.

45. Wang, Y.; Yan, S.; Yang, W.; Zhong, C.; Ng, D.W.K. Probabilistic Accumulate-Then-Transmit in Wireless-Powered Covert Communications. *IEEE Trans. Wirel. Commun.* **2022**, *21*, 10393–10406. [CrossRef]

46. Feng, S.; Lu, X.; Sun, S.; Niyato, D. Mean-Field Artificial Noise Assistance and Uplink Power Control in Covert IoT Systems.

IEEE Trans. Wirel. Commun. **2022**, *21*, 7358–7373. [CrossRef]

47. Liu, J.; Yu, J.; Chen, X.; Zhang, R.; Wang, S.; An, J. Covert Communication in Ambient Backscatter Syst With Uncontrollable

RF Source. *IEEE Trans. Commun.* **2022**, *70*, 1971–1983.