**5g – Nền tảng công nghệ di động mới**

 (Cập nhật đến ngày 23/8/2022)

Với cuộc sống ngày càng hiện đại, công nghệ cũng được nâng cấp phù hợp với nhu cầu ngày càng cao của con người. Kể từ khi hệ thống 1G được Nordic Mobile Telephone giới thiệu lần đầu tiên vào năm 1981, cứ khoảng 10 năm lại xuất hiện một thế hệ điện thoại di động mới. Các hệ thống 2G đầu tiên bắt đầu tung ra vào năm 1991, các hệ thống 3G đầu tiên xuất hiện lần đầu vào năm 2001 và hệ thống 4G hoàn toàn tuân thủ các tiêu chuẩn "IMT nâng cao" đã được chuẩn hóa vào năm 2012. Sự phát triển các hệ thống tiêu chuẩn của các mạng 2G (GSM) và 3G (IMT-2000 và UMTS) mất khoảng 10 năm kể từ khi các dự án R & D chính thức bắt đầu, và quá trình phát triển hệ thống 4G đã được bắt đầu từ năm 2001 hoặc 2002.[2][3] Các công nghệ làm tiền đề cho một thế hệ mới thường được giới thiệu trên thị trường từ một vài năm trước đó, ví dụ như hệ thống CdmaOne/IS95 tại Mỹ vào năm 1995 được xem là tiền đề cho 3G, hệ thống Mobile WiMAX ở Hàn Quốc năm 2006 được xem là tiền đề cho 4G, và hệ thống thử nghiệm đầu tiên cho LTE là ở Scandinavia năm 2009. Từ tháng 4 năm 2008, Machine-to-Machine Intelligence (M2Mi) Corp - một tổ hợp trong NASA Research Park - dưới sự lãnh đạo của Geoff Brown - bắt đầu phát triển công nghệ thông tin liên lạc 5G.

Để hiểu rõ hơn Cục Thông tin KH&CN quốc gia xin giới thiệu một số bài nghiên cứu đã được xuất bản chính thức và các bài viết được chấp nhận đăng trên những cơ sở dữ liệu học thuật chính thống.



**1. Sciencedirect**

1. Compressive spectrum sensing for 5G cognitive radio networks – LASSO approach
Heliyon 1 June 2022 Volume 8, Issue 6 (Cover date: June 2022) Article e09621
R. S. Koteeshwari, B. Malarkodi
<https://www.sciencedirect.com/science/article/pii/S2405844022009094/pdfft?md5=04fac19be28e77d27ce06c41417823dc&pid=1-s2.0-S2405844022009094-main.pdf>

2. An efficient packet parser architecture for software-defined 5G networks
Physical Communication 8 March 2022 Volume 53 (Cover date: August 2022) Article 101677
Abbas Yazdinejad, Ali Dehghantanham, Reza M. Parizi
<https://www.sciencedirect.com/science/article/pii/S1874490722000453/pdfft?md5=f12d8301afe40c291c514417c1381845&pid=1-s2.0-S1874490722000453-main.pdf>

3. Artificial intelligence-aided privacy preserving trustworthy computation and communication in 5G-based IoT networks
Ad Hoc Networks 27 November 2021 Volume 126 (Cover date: 1 March 2022) Article 102752
Tan Le, Sachin Shetty
<https://www.sciencedirect.com/science/article/pii/S1570870521002341/pdfft?md5=9b20a43a5cea0675054e2d5c53fa6387&pid=1-s2.0-S1570870521002341-main.pdf>

4. Potential friendship discovery in social networks based on hybrid ensemble multiple collaborative filtering models in a 5G network environment
Digital Communications and Networks Available online 7 April 2022 In press, journal pre-proof
Hexuan Hu, Zhenzhou Lin, Ye Zhang
<https://www.sciencedirect.com/science/article/pii/S2352864822000463/pdfft?md5=14c93ffade658cc648e2facdd0b1e5ec&pid=1-s2.0-S2352864822000463-main.pdf>
5. 5G network deployment and the associated energy consumption in the UK: A complex systems’ exploration
Technological Forecasting and Social Change 21 April 2022 Volume 180 (Cover date: July 2022) Article 121672
Xiaoyuan Cheng, Yukun Hu, Liz Varga
<https://www.sciencedirect.com/science/article/pii/S0040162522002049/pdfft?md5=8a1587296f2d8ad53605310c8d65c10c&pid=1-s2.0-S0040162522002049-main.pdf>

6. Analysis of Intelligent Energy Saving Strategy of 4G/5G Network Based on FP-Tree
Procedia Computer Science 26 January 2022 Volume 198 (Cover date: 2022) Pages 486-492
Ruili Qi, Xuetao Guo
<https://www.sciencedirect.com/science/article/pii/S1877050921025138/pdfft?md5=818b05ac0abff97a5b6293f3baf2cc93&pid=1-s2.0-S1877050921025138-main.pdf>

7. Multi-objective optimisation of human exposure for various 5G network topologies in Switzerland
Computer Networks 8 August 2022 Volume 216 (Cover date: 24 October 2022) Article 109255
German Castellanos, Simon De Gheselle, Sven Kuehn
<https://www.sciencedirect.com/science/article/pii/S1389128622003231/pdfft?md5=8cca13032f28cc7cdcec8ce4e71b2ed7&pid=1-s2.0-S1389128622003231-main.pdf>
8. ML-SLD: A message-level stateless design for cloud-native 5G core network
Digital Communications and Networks Available online 4 May 2022 In press, journal pre-proof
Keliang Du, Luhan Wang, Shaoxin Huang
<https://www.sciencedirect.com/science/article/pii/S2352864822000815/pdfft?md5=7d41a87f8eb148798f8e67677a682d3d&pid=1-s2.0-S2352864822000815-main.pdf>

9. An energy efficient scheme by exploiting multi-hop D2D communications for 5G networks
Physical Communication 21 December 2021 Volume 51 (Cover date: April 2022) Article 101576
Rishav Dubey, Pavan Kumar Mishram , Sudhakar Pandey
<https://www.sciencedirect.com/science/article/pii/S1874490721002780/pdfft?md5=89058f766fb0715354838534156e088c&pid=1-s2.0-S1874490721002780-main.pdf>

10. Powering green digitalization: Evidence from 5G network infrastructure in China
Resources, Conservation and Recycling 18 March 2022 Volume 182 (Cover date: July 2022) Article 106286
Jin Guo, Lei Wang, Chu Wei
<https://www.sciencedirect.com/science/article/pii/S0921344922001343/pdfft?md5=21e4dc1f1912ff024f9a95d8fca4b2ed&pid=1-s2.0-S0921344922001343-main.pdf>
11. Quality of Service based resource allocation in D2D enabled 5G-CNs with network slicing
Physical Communication 31 March 2022 Volume 52 (Cover date: June 2022) Article 101703
Lubna Nadeem, Yasar Amin, Kok Keong Chai
<https://www.sciencedirect.com/science/article/pii/S1874490722000581/pdfft?md5=0f2e6d5e1881ed6ccccd1c722e014264&pid=1-s2.0-S1874490722000581-main.pdf>

12. Security Concerns for 5G/6G Mobile Network Technology and Quantum Communication
Procedia Computer Science 12 August 2022 Volume 203 (Cover date: 2022) Pages 32-40
Fadi Muheidat, Khalil Dajani, Lo'ai A. Tawalbeh
<https://www.sciencedirect.com/science/article/pii/S1877050922006123/pdfft?md5=2bc9fb372b60aca6c66db2c0930f0cc2&pid=1-s2.0-S1877050922006123-main.pdf>

13. Artificial Intelligence for network function autoscaling in a cloud-native 5G network
Computers and Electrical Engineering 31 August 2022 Volume 103 (Cover date: October 2022) Article 108327
Virgilios Passas, Nikos Makris, Dimitrios Tzovaras
<https://www.sciencedirect.com/science/article/pii/S0045790622005481/pdfft?md5=91018bcbfac5a7f05866e49d8bedc871&pid=1-s2.0-S0045790622005481-main.pdf>

14. Efficient and reliable hybrid deep learning-enabled model for congestion control in 5G/6G networks
Computer Communications 4 November 2021 Volume 182 (Cover date: 15 January 2022) Pages 31-40
Sulaiman Khan, Anwar Hussain, Mohammad Dahman Alshehri
<https://www.sciencedirect.com/science/article/pii/S0140366421004217/pdfft?md5=304ef6f10b99171a9ea14e88b4bb5442&pid=1-s2.0-S0140366421004217-main.pdf>

15. A dual-factor access authentication scheme for IoT terminal in 5G environments with network slice selection
Journal of Information Security and Applications 25 June 2022 Volume 68 (Cover date: August 2022) Article 103247
Zigang Chen, Jin Ao, Long Chen
<https://www.sciencedirect.com/science/article/pii/S2214212622001156/pdfft?md5=246698d009b1ebc5a02f1a5050c3c516&pid=1-s2.0-S2214212622001156-main.pdf>
16. A survey of deep reinforcement learning application in 5G and beyond network slicing and virtualization
Array 4 April 2022 Volume 14 (Cover date: July 2022) Article 100142
Charles Ssengonzi, Okuthe P. Kogeda, Thomas O. Olwal
<https://www.sciencedirect.com/science/article/pii/S2590005622000133/pdfft?md5=4bac57514fbaf43215e4b578eee3be6b&pid=1-s2.0-S2590005622000133-main.pdf>
17. Random access optimization for initial access and seamless handover for 5G-satellite network
Computer Networks 16 July 2022 Volume 214 (Cover date: 4 September 2022) Article 109176
Zhifei Wang, Xiangming Wen, Yujing Zhang
<https://www.sciencedirect.com/science/article/pii/S1389128622002791/pdfft?md5=8ca046587915e195b5930ca9d7c951eb&pid=1-s2.0-S1389128622002791-main.pdf>

18. Power consumption analysis of access network in 5G mobile communication infrastructures — An analytical quantification model
Pervasive and Mobile Computing 19 January 2022 Volume 80 (Cover date: February 2022) Article 101544
Adil Israr, Qiang Yang, Ali Israr
<https://www.sciencedirect.com/science/article/pii/S1574119222000049/pdfft?md5=b110b60a07463571a2c083e0e0baaa85&pid=1-s2.0-S1574119222000049-main.pdf>

19. Context-oriented performance evaluation of network selection algorithms in 5G heterogeneous networks
Journal of Network and Computer Applications 12 March 2022 Volume 202 (Cover date: June 2022) Article 103358
Reza Honarvar, Alireza Zolghadrasli, Mehdi Monemi
<https://www.sciencedirect.com/science/article/pii/S1084804522000261/pdfft?md5=1de07190ccfc14c6d7416b5ddc4055e7&pid=1-s2.0-S1084804522000261-main.pdf>

20. Remote Registration and Group Authentication of IoT Devices in 5G Cellular Network
Computers & Security 17 June 2022 Volume 120 (Cover date: September 2022) Article 102806
Hemangi Goswami, Hiten Choudhury
<https://www.sciencedirect.com/science/article/pii/S0167404822002000/pdfft?md5=d107dde46a2f70deefffaaa1f10e5bab&pid=1-s2.0-S0167404822002000-main.pdf>

21. A CR-5G network based on multi-user for various waveforms detection
Egyptian Informatics Journal Available online 31 May 2022 In press, corrected proof
Waleed Algriree, Nasri Sulaiman, Mokhalad Alghrairi
<https://www.sciencedirect.com/science/article/pii/S1110866522000329/pdfft?md5=11a5c93c83a9149bb9cc63d8841990d1&pid=1-s2.0-S1110866522000329-main.pdf>

22. Physical layer security for beyond 5G/6G networks: Emerging technologies and future directions
Journal of Network and Computer Applications 14 June 2022 Volume 206 (Cover date: October 2022) Article 103431
Fauzia Irram, Mudassar Ali, Shahid Mumtaz
<https://www.sciencedirect.com/science/article/pii/S108480452200087X/pdfft?md5=20ae9b172b538d33a03f7a99021f1ef1&pid=1-s2.0-S108480452200087X-main.pdf>

23. Priority-based load-adaptive preamble separation random access for QoS-differentiated services in 5G networks
Journal of Network and Computer Applications 21 April 2022 Volume 203 (Cover date: July 2022) Article 103396
Huda Althumali, Mohamed Othman, Zurina Mohd Hanapi
<https://www.sciencedirect.com/science/article/pii/S1084804522000558/pdfft?md5=09c9643a6b17d55d1e72d8203f9500c2&pid=1-s2.0-S1084804522000558-main.pdf>
24. Cognitive radio based spectrum sharing models for multicasting in 5G cellular networks: A survey
Computer Networks 5 March 2022 Volume 208 (Cover date: 8 May 2022) Article 108870
Sangeeta BhattacharjeeTamaghna AcharyaUma Bhattacharya
<https://www.sciencedirect.com/science/article/pii/S1389128622000779/pdfft?md5=66bcbc324b579dfd587b569f8ef72e3b&pid=1-s2.0-S1389128622000779-main.pdf>

25. Physical layer security using beamforming techniques for 5G and beyond networks: A systematic review
Physical Communication 25 June 2022 Volume 54 (Cover date: October 2022) Article 101791
Himanshu Sharma, Neeraj Kumar, Rajkumar Tekchandani
<https://www.sciencedirect.com/science/article/pii/S1874490722001094/pdfft?md5=a6662a21f7138c7bd45e6cf3808e1721&pid=1-s2.0-S1874490722001094-main.pdf>
26. China’s 5G networks: A tool for advancing digital authoritarianism abroad?
Orbis 7 April 2022 Volume 66, Issue 2 (Cover date: 2022) Pages 270-288
Michael V. Ceci, Lawrence Rubin
<https://www.sciencedirect.com/science/article/pii/S0030438722000138/pdfft?md5=a86600ea5cb8654c3f7375a0c1d99c9a&pid=1-s2.0-S0030438722000138-main.pdf>

27. SoftDrone: Softwarized 5G assisted drone networks for dynamic resource sharing using machine learning techniques
Computers and Electrical Engineering 30 April 2022 Volume 101 (Cover date: July 2022) Article 107962
Deborsi Basu, Soumyadeep Kal, Raja Datta
<https://www.sciencedirect.com/science/article/pii/S0045790622002385/pdfft?md5=1fdec0cd9b892ca5ea64fdcb79d7b82e&pid=1-s2.0-S0045790622002385-main.pdf>

28. Exploiting radio access information to improve performance of remote-controlled mobile robots in MEC-based 5G networks
Computer Networks 26 May 2022 Volume 212 (Cover date: 20 July 2022) Article 109061
Winnie Nakimuli, Jaime Garcia-Reinoso, Pablo Serrano
<https://www.sciencedirect.com/science/article/pii/S1389128622002067/pdfft?md5=c8ef90ac7aec12b9104c6e7e46e31b8c&pid=1-s2.0-S1389128622002067-main.pdf>

29. Zero-jitter differentiated traffic scheduling algorithm in 5G fronthaul hybrid network
Optik 25 June 2022 Volume 265 (Cover date: September 2022) Article 169558
Lijuan Wu, Chaoqin Gan, Jianqiang Hui
<https://www.sciencedirect.com/science/article/pii/S0030402622008622/pdfft?md5=2deb814c8a4e93fa8effd0b3282b9ee7&pid=1-s2.0-S0030402622008622-main.pdf>

30. Energy-efficient opportunistic multi-carrier NOMA-based resource allocation for beyond 5G (B5G) networks
Simulation Modelling Practice and Theory 15 December 2021 Volume 116 (Cover date: April 2022) Article 102452
Haitham Al-Obiedollah, Haythem Bany Salameh, Yaser Jararweh
<https://www.sciencedirect.com/science/article/pii/S1569190X21001441/pdfft?md5=7803ba47c254d2e64d218783d7bbd494&pid=1-s2.0-S1569190X21001441-main.pdf>

31. A survey on Zero touch network and Service Management (ZSM) for 5G and beyond networks
Journal of Network and Computer Applications 9 April 2022 Volume 203 (Cover date: July 2022) Article 103362
Madhusanka Liyanage, Quoc-Viet Pham, Gokul Yenduri
<https://www.sciencedirect.com/science/article/pii/S1084804522000297/pdfft?md5=a4c0111e426bdde072e398f9fd9d5e11&pid=1-s2.0-S1084804522000297-main.pdf>
32. Optimization over time of reliable 5G-RAN with network function migrations
Computer Networks 28 July 2022 Volume 215 (Cover date: 9 October 2022) Article 109216
Nicola Di Cicco, Federico Tonini, Carla Raffaelli
<https://www.sciencedirect.com/science/article/pii/S1389128622002985/pdfft?md5=093c4edbcd61e1cbbefa8fa8dc80319c&pid=1-s2.0-S1389128622002985-main.pdf>

33. Intelligent coordinated self-optimizing handover scheme for 4G/5G heterogeneous networks
ICT Express Available online 13 May 2022 In press, corrected proof
Abdulraqeb Alhammadi, Wan Haslina Hassan, Wasan Kadhim Saad
<https://www.sciencedirect.com/science/article/pii/S2405959522000698/pdfft?md5=ebbb5927d56d7f5078a585ba7d5b2fc9&pid=1-s2.0-S2405959522000698-main.pdf>

34. Optimal pricing-based computation offloading and resource allocation for blockchain-enabled beyond 5G networks
Computer Networks 20 December 2021 Volume 203 (Cover date: 11 February 2022) Article 108674
Kaiyuan Zhang, Xiaolin Gui, Xin He
<https://www.sciencedirect.com/science/article/pii/S1389128621005478/pdfft?md5=4a6abaab10b2bf89c8252d98524fb576&pid=1-s2.0-S1389128621005478-main.pdf>

35. Cooperative Communication Resource Allocation Strategies for 5G and Beyond Networks: A Review of Architecture, Challenges and Opportunities
Journal of King Saud University - Computer and Information Sciences Available online 12 August 2022 In press, corrected proof
Wanying Guo, Nawab Muhammad Faseeh Qureshi, Dong Ryeol Shin
<https://www.sciencedirect.com/science/article/pii/S1319157822002567/pdfft?md5=8132eeb7992486140bb490c356ca3eb7&pid=1-s2.0-S1319157822002567-main.pdf>

36. 5G Network: Analysis and Compare 5G NSA /5G SA
Procedia Computer Science 12 August 2022 Volume 203 (Cover date: 2022) Pages 594-598
Hind Fehmi, Meryem Fakhouri Amr, Mohamed Talea
<https://www.sciencedirect.com/science/article/pii/S1877050922006901/pdfft?md5=88778fd0c6855376558b2a549160d8c1&pid=1-s2.0-S1877050922006901-main.pdf>
37. Realtime mobile bandwidth and handoff predictions in 4G/5G networks
Computer Networks 6 January 2022 Volume 204 (Cover date: 26 February 2022) Article 108736
Lifan Mei, Jinrui Gou, Yong Liu
<https://www.sciencedirect.com/science/article/pii/S1389128621005879/pdfft?md5=1524665ca61c1214a2a08a5ee6ff5354&pid=1-s2.0-S1389128621005879-main.pdf>

38. Measurement and comparison of data rate and time delay of end-devices in licensed sub-6 GHz 5G standalone non-public networks
Procedia CIRP 26 May 2022 Volume 107 (Cover date: 2022) Pages 1132-1137
Thorge Lackner, Julian Hermann, Daniel Palm
<https://www.sciencedirect.com/science/article/pii/S2212827122004048/pdfft?md5=a59896ecc7375fa4754cfdbaccc6b22e&pid=1-s2.0-S2212827122004048-main.pdf>

39. NOMA and future 5G & B5G wireless networks: A paradigm
Journal of Network and Computer Applications 14 May 2022 Volume 204 (Cover date: August 2022) Article 103413
Umar Ghafoor, Mudassar Ali, Muhammad Naeem
<https://www.sciencedirect.com/science/article/pii/S1084804522000728/pdfft?md5=b16f810530845c58c305e72fb89af2c4&pid=1-s2.0-S1084804522000728-main.pdf>

40. Internet of things and the economics of 5G-based local industrial networks
Telecommunications Policy 11 October 2021 Volume 46, Issue 4 (Cover date: May 2022) Article 102261
Günter Knieps, Johannes M. Bauer
<https://www.sciencedirect.com/science/article/pii/S0308596121001658/pdfft?md5=8dacce27eded12c514bb3d54b245a459&pid=1-s2.0-S0308596121001658-main.pdf>

41. A robust and distributed architecture for 5G-enabled networks in the smart blockchain era
Computer Communications 26 October 2021 Volume 181 (Cover date: 1 January 2022) Pages 293-308
B. D. Deebak, Fadi AL-Turjman
<https://www.sciencedirect.com/science/article/pii/S0140366421003935/pdfft?md5=dbfb3fd34b9c6b165472438b5b5f87e6&pid=1-s2.0-S0140366421003935-main.pdf>

42. Physical layer forwarding for 5G multi-hop Backhaul networks
Computer Networks 12 February 2022 Volume 207 (Cover date: 22 April 2022) Article 108830
Cheng Huang, Aimin Tang, Xudong Wang
<https://www.sciencedirect.com/science/article/pii/S1389128622000482/pdfft?md5=aefd2efdb33534c5bbe732b67f52c265&pid=1-s2.0-S1389128622000482-main.pdf>

43. Group mobility assisted network selection framework in 5G vehicular cognitive radio networks
Physical Communication 21 December 2021 Volume 51 (Cover date: April 2022) Article 101578
Mani Shekhar Gupta, Krishan Kumar
<https://www.sciencedirect.com/science/article/pii/S1874490721002792/pdfft?md5=fcc0f8ed101befef96dc4a8c87b0e1c8&pid=1-s2.0-S1874490721002792-main.pdf>

44. A novel Distributed AI framework with ML for D2D communication in 5G/6G networks
Computer Networks 27 April 2022 Volume 211 (Cover date: 5 July 2022) Article 108987
Iacovos Ioannou, Christophoros Christophorou, Andreas Pitsillides
<https://www.sciencedirect.com/science/article/pii/S138912862200158X/pdfft?md5=33650cc556028ef52e2809e6f3e99e1b&pid=1-s2.0-S138912862200158X-main.pdf>

45. One-bit mMIMO with defective RF chain over Ricean fading in beyond 5G networks
Digital Signal Processing 20 November 2021 Volume 121 (Cover date: March 2022) Article 103321
Meng Wang, Dian-Wu Yue, Si-Nian Jin
<https://www.sciencedirect.com/science/article/pii/S1051200421003602/pdfft?md5=24ec25e2d0d253d393c0030eb1541d4d&pid=1-s2.0-S1051200421003602-main.pdf>
46. Anti-jamming channel access in 5G ultra-dense networks: A game-theoretic learning approach
Digital Communications and Networks Available online 5 May 2022 In press, journal pre-proof
Yunpeng Zhang, Luliang Jia, Meng Wang
<https://www.sciencedirect.com/science/article/pii/S2352864822000876/pdfft?md5=bb9ec074f0c281ad7f1f247c0e791603&pid=1-s2.0-S2352864822000876-main.pdf>

47. Dynamic UPF placement and chaining reconfiguration in 5G networks
Computer Networks 20 July 2022 Volume 215 (Cover date: 9 October 2022) Article 109200
Irian Leyva-Pupo, Cristina Cervelló-Pastor, Dimitrios P. Pezaros
<https://www.sciencedirect.com/science/article/pii/S1389128622002900/pdfft?md5=b7b1f7607e76ced8a0af5e8afa1cf73f&pid=1-s2.0-S1389128622002900-main.pdf>

48. Machine learning-based indoor localization and occupancy estimation using 5G ultra-dense networks
Simulation Modelling Practice and Theory 29 March 2022 Volume 118 (Cover date: July 2022) Article 102543
Ala'a Al-Habashna, Gabriel Wainer, Moayad Aloqaily
<https://www.sciencedirect.com/science/article/pii/S1569190X22000430/pdfft?md5=8d6c2acdf9db9bf180019bfe89b492ea&pid=1-s2.0-S1569190X22000430-main.pdf>

49. Efficient handover protocol for 5G and beyond networks
Computers & Security 16 November 2021 Volume 113 (Cover date: February 2022) Article 102546
Vincent Omollo Nyangaresi, Anthony Joachim Rodrigues
<https://www.sciencedirect.com/science/article/pii/S0167404821003709/pdfft?md5=9e00bc64e01537fa2f18282c292ecbd5&pid=1-s2.0-S0167404821003709-main.pdf>

50. The energy use implications of 5G: Reviewing whole network operational energy, embodied energy, and indirect effects
Renewable and Sustainable Energy Reviews 13 January 2022 Volume 157 (Cover date: April 2022) Article 112033
Laurence Williams, Benjamin K. Sovacool, Timothy J. Foxon
<https://www.sciencedirect.com/science/article/pii/S1364032121012958/pdfft?md5=1159cc5c7ed0d11da9cd699649fbbe5f&pid=1-s2.0-S1364032121012958-main.pdf>