

DAFTAR PUSTAKA

- [1] Suhardi, "Journal of Computer Networks , Architecture and High Performance Computing Use of QRCode and Digital Signature Using The DSA Method to Authenticate Student Academic Documents Journal of Computer Networks , Architecture and High Performance Computing," vol. 6, no. 4, pp. 1913–1921, 2024.
- [2] A. Dwinggo Samala and B. Ramadhani Fajri, "Rancang Bangun Aplikasi E Sertifikat Berbasis Web Menggunakan Metode Pengembangan Waterfall," *J. Tek. Inform.*, vol. 13, no. 2, pp. 147–156, 2020.
- [3] S. Boonkrong, "Design of an academic document forgery detection system," *Int. J. Inf. Technol.*, no. 0123456789, 2024, doi: 10.1007/s41870-024-02006-6.
- [4] A. Meepaganithage, S. Rath, M. Nicolescu, M. Nicolescu, and S. Sengupta, "Image Forgery Detection Using Convolutional Neural Networks," *12th Int. Symp. Digit. Forensics Secur. ISDFS 2024*, no. May, 2024, doi: 10.1109/ISDFS60797.2024.10527268.
- [5] A. Djajadi, K. S. Lestari, L. E. Englista, and A. Destaryana, "Blockchain-Based E-Certificate Verification and Validation Automation Architecture to Avoid Counterfeiting of Digital Assets in Order to Accelerate Digital Transformation," *CCIT J.*, vol. 16, no. 1, pp. 68–85, 2023, doi: 10.33050/ccit.v16i1.2367.
- [6] M. Afandi, R. Amrulloh, K. N. Isnaini, and D. Suhartono, "Analisis Forensik Pemalsuan Dokumen PDF Menggunakan Metode National Institute of Justice (NIJ)," *J. Resist.*, vol. 7, no. 3, pp. 162–170, 2024, doi: <https://doi.org/10.31598>.
- [7] G. Szyjewski, "Implementation of a hybrid certificate approach: enhancing efficiency and credibility in ICDL certification process," *Procedia Comput. Sci.*, vol. 225, pp. 4713–4721, 2023, doi: 10.1016/j.procs.2023.10.470.
- [8] Yus Sholva, Morteza Muthahhari, and Krismon, "JEPIN (Jurnal Edukasi dan Penelitian Informatika) Sistem Pembangkitan E-Sertifikat Otomatis berbasis Qr Code untuk Verifikasi E-Sertifikat secara Online," *Jepin*, vol. 8, no. 2, pp. 337–347, 2022.
- [9] U. Enoima Essien, "Using QR Code and a Smartphone to Provide University of Cross River State (UNICROSS) Certificate Authentication," *Br. J. Comput. Netw. Inf. Technol.*, vol. 7, no. 2, pp. 35–42, 2024, doi: 10.52589/bjcnit-wad9e7ie.
- [10] A. S. Rafsanjani, N. B. Kamaruddin, H. M. Rusli, and M. Dabbagh, "QsecR: Secure QR Code Scanner According to a Novel Malicious URL Detection Framework," *IEEE Access*, vol. 11, no. June, pp. 92523–92539, 2023, doi: 10.1109/ACCESS.2023.3291811.
- [11] C. Gunawan, "Waspada, Penipuan Sertifikat Tanah Digital Menjerat Ratusan Warga," gokepri.com. Accessed: May 10, 2026. [Online]. Available: <https://gokepri.com/waspada-penipuan-sertifikat-tanah-digital-menjerat-ratusan-warga/>
- [12] D. E. Sintyaningrum, Muladi, and M. Ashar, "Implementasi Digital Signature dan QR Code Pada Sertifikat Profesi Digital untuk Mengatasi Kasus Pemalsuan Sertifikat," *J. Teknol. Elektro dan Kejuru.*, vol. 32, no. 1, pp. 185–194, 2022.
- [13] B. Siswanto and D. Surgawiwaha, "Implementation of Digital Signature for Research Paper Legalization, Authentication and Ratification Case Study: Training Center for National Cyber and Crypto Agency," *PEOPLE Int. J. Soc. Sci.*, vol. 5, no. 2, pp. 1003–1012, 2019, doi: 10.20319/pijss.2019.52.10031012.
- [14] Y. A. Winanda, T. Fatimah, and A. A. A. Ushud, "Improving Invoice Security with QR-Code Encryption and Digital Signature Based on RSA and SHA-256," *Bit (Fakultas Teknol. Inf. Univ. Budi Luhur)*, vol. 22, no. 1, pp. 62–69, 2025, doi: 10.36080/bit.v22i1.3947.

- [15] T. Wellem, Y. Nataliani, and A. Iriani, "INTERNATIONAL JOURNAL ON INFORMATICS VISUALIZATION journal homepage : www.joiv.org/index.php/joiv INTERNATIONAL JOURNAL ON INFORMATICS VISUALIZATION Academic Document Authentication using Elliptic Curve Digital Signature Algorithm and QR Code," vol. 6, no. September, pp. 667–675, 2022, [Online]. Available: www.joiv.org/index.php/joiv
- [16] Rutuja Y. Bochare and Dr. Pradip D. Pansare, "A Comparative Study of RSA and ECC Cryptography," *Int. J. Adv. Res. Sci. Commun. Technol.*, vol. 6, no. 3, pp. 469–473, 2026, doi: 10.48175/ijarsct-30961.
- [17] CNN, "BSrE BSSN Terbitkan 4.000 Sertifikat Elektronik Setiap Bulan," CNN. [Online]. Available: <https://www.cnnindonesia.com/nasional/20211220180506-293-736428/bsre-bssn-terbitkan-4000-sertifikat-elektronik-setiap-bulan>
- [18] J. Guruprakash and S. Koppu, "An Empirical Study to Demonstrate that EdDSA can be used as a Performance Improvement Alternative to ECDSA in Blockchain and IoT," *Inform.*, vol. 46, no. 2, pp. 277–290, 2022, doi: 10.31449/inf.v46i2.3807.
- [19] N. Alexander, B. A. Wijaya, R. W. Dewantoro, and M. Monalisa, "Comparison of ECDSA dan EdDSA Algorithms in Blockchain-Based Health Records Security," *JIKO (Jurnal Inform. dan Komputer)*, vol. 8, no. 3, pp. 220–228, 2025, doi: 10.33387/jiko.v8i3.10709.
- [20] KBBI, "Kamus Besar Bahasa Indonesia," KBBI Daring. Accessed: Feb. 25, 2026. [Online]. Available: <https://kbbi.web.id/sertifikat>
- [21] N. Beegam, A. K. Sangeeth, A. Appukuttan, A. J. Tomy, and A. R. Joseph, "A Survey on Distributed Ledger-Based Certificate Authentication System," *Int. J. Eng. Res. Technol.*, vol. 15, no. 2, pp. 1–11, 2026.
- [22] A. Noor *et al.*, "Electronic Land Certificates as Evidence of Ownership: An Analysis under Indonesian Civil Procedure Law," *J. Ilm. Glob. Educ.*, vol. 6, no. 4, pp. 3172–3181, 2025, doi: 10.55681/jige.v6i4.4589.
- [23] E. R. Ozighor and I. Izegebu, "Information Protection Against Security Threats in an Insecure Environment using Cryptography and Steganography," *Glob. Sci. J. - Comput. Sci. Eng. J.*, vol. 8, no. 5, pp. 1671–1692, 2020.
- [24] A. Bima Setiawan, "Penggunaan Cryptography dalam Keamanan Pesan Digital," *J. Comput. Sci. Inf. Technol.*, vol. 1, no. 2, pp. 60–66, 2025, doi: 10.70716/jocsit.v1i2.261.
- [25] P. Chyan, "Tanda Tangan Digital Dalam Mendukung Keamanan," *Temat. J. Penelit. Tek. Inform. dan Sist. Inf.*, pp. 39–46, 2018, [Online]. Available: <https://doi.org/10.56963/tematika.vi.280>
- [26] S. S. V. Dr. Dhanakoti, and R. Manjupriya, "A study on symmetric and asymmetric key encryption algorithms," *Int. Res. J. Eng. Technol.*, vol. 3, no. 04, pp. 27–31, 2016.
- [27] P. S. Joshi, "Cryptography and Cybersecurity: A Symbiotic Relationship," *Int. J. Res. Appl. Sci. Eng. Technol.*, vol. 13, no. 5, pp. 3058–3062, 2025, doi: 10.22214/ijraset.2025.70789.
- [28] Ayushi, "A Symmetric Key Cryptographic Algorithm," *Int. J. Comput. Appl.*, vol. 1, no. 15, pp. 1–4, 2010.
- [29] A. Jahagirdar, "The Role of Cryptography in Secure Message Transmission over Open Channels," *Int. J. Sci. Res.*, vol. 14, no. 2, pp. 363–366, 2025, doi: 10.21275/sr25205223218.
- [30] "Symmetric vs Asymmetric Encryption: Which Is Better?," Encryption Consulting. [Online]. Available: <https://www.encryptionconsulting.com/education-center/symmetric-vs-asymmetric-encryption/>

- [31] Y. Fathima, M. Samsudeen, and M. S. Cybersecurity, "Cryptography in Cybersecurity," 2025. [Online]. Available: <https://www.researchgate.net/publication/387765892>
- [32] N. Asaithambi, "A Study on Asymmetric Key Cryptography Algorithms," *Int. J. Comput. Sci. Mob. Appl.*, vol. 3, pp. 8–13, 2015.
- [33] S. Sharma, "A Comprehensive Study of Cryptographic Hash Functions," in *Defence Materials and Stores Research and Development Establishment*, Kanpur, 2024.
- [34] "Cryptographic hash functions," Wikipedia. [Online]. Available: https://en.wikipedia.org/wiki/Cryptographic_hash_function
- [35] N. Josias Gbètoho Saho and E. C. Ezin, "Comparative Study on the Performance of Elliptic Curve Cryptography Algorithms with Cryptography through RSA Algorithm," *CARI 2020 - Colloq. Africain sur la Rech. en Inform. en Mathématiques Appliquées*, 2020, [Online]. Available: <https://hal.science/hal-02926106v1>
- [36] A. A. Santosa and F. Alamsjah, "The Drivers of a Digital Signature System Adoption: Evidence from Finance and Information System Departments," *J. Inf. Syst. Eng. Bus. Intell.*, vol. 8, no. 1, pp. 80–90, 2022, doi: 10.20473/jisebi.8.1.80-90.
- [37] J. Xu, "A Comprehensive Study of Digital Signatures: Algorithms, Challenges and Future Prospects," *ITM Web Conf.*, vol. 73, p. 03009, 2025, doi: 10.1051/itmconf/20257303009.
- [38] F. Lalem, A. Laouid, M. Kara, M. Al-Khalidi, and A. Eleyan, "A Novel Digital Signature Scheme for Advanced Asymmetric Encryption Techniques," *Appl. Sci.*, vol. 13, no. 8, 2023, doi: 10.3390/app13085172.
- [39] A. D. Alrehily, A. F. Alotaibi, S. B. Almutairy, M. S. Alqhtani, and J. Kar, "Conventional and Improved Digital Signature Scheme: A Comparative Study," *J. Inf. Secur.*, vol. 06, no. 01, pp. 59–67, 2015, doi: 10.4236/jis.2015.61007.
- [40] B. Pickle, "Digital Signature," TechTerms.com. [Online]. Available: <https://techterms.com/definition/digitalsignature>
- [41] M. R. Khan *et al.*, "Analysis of Elliptic Curve Cryptography & RSA," *J. ICT Stand.*, vol. 11, no. 4, pp. 355–378, 2023, doi: 10.13052/jicts2245-800X.1142.
- [42] Y. Yan, "The Overview of Elliptic Curve Cryptography (ECC)," *J. Phys. Conf. Ser.*, vol. 2386, no. 1, 2022, doi: 10.1088/1742-6596/2386/1/012019.
- [43] Y. El Housni, "Introduction to the Mathematical Foundations of Elliptic Curve Cryptography," 2018, [Online]. Available: <https://hal.science/hal-01914807>
- [44] G. I. Taopan, M. Boru, and A. Fanggidae, "Pengamanan Portable Document Format (PDF) Menggunakan Algoritma Kriptografi Kurva Eliptik," *J. Komput. dan Inform.*, vol. 10, no. 1, pp. 47–54, 2022, doi: 10.35508/jicon.v10i1.5296.
- [45] T. Ara, P. G. Shah, and M. Prabhakar, "Dynamic key Dependent S-Box for Symmetric Encryption for IoT Devices," *Proc. 2018 2nd Int. Conf. Adv. Electron. Comput. Commun. ICAECC 2018*, pp. 1–5, 2018, doi: 10.1109/ICAIECC.2018.8479442.
- [46] P. Sharma and N. Saxena, "Elliptic Curves and Their Applications to Cryptography," *Int. J. Eng. Res. Technol.*, vol. 6, no. 04, pp. 964–969, 2017, doi: 10.1201/b14977-9.
- [47] G. Shankar *et al.*, "Improved Multisignature Scheme for Authenticity of Digital Document in Digital Forensics Using Edward-Curve Digital Signature Algorithm," *Secur. Commun. Networks*, vol. 2023, 2023, doi: 10.1155/2023/2093407.
- [48] K. Azizan, "Analisis Komparatif Elliptic Curve Digital Signature Algorithm (ECDSA) dengan Edward-Curve Digital Signature Algorithm (EdDSA) untuk Penandatanganan file

Digital,” Bandung, 2024.

- [49] M. Yuliana and W. D. Walidaniy, “Efficient Multi-signature and QR Code Integration for Document Authentication Using EdDSA-based Algorithm,” *Int. J. Intell. Eng. Syst.*, vol. 17, no. 2, pp. 390–401, 2024, doi: 10.22266/ijies2024.0430.32.
- [50] M. Bisheh-Niasar, R. Azarderakhsh, and M. Mozaffari-Kermani, “Cryptographic Accelerators for Digital Signature Based on Ed25519,” *IEEE Trans. Very Large Scale Integr. Syst.*, vol. 29, no. 7, pp. 1297–1305, 2021, doi: 10.1109/TVLSI.2021.3077885.
- [51] R. Zhang, L. Niu, and F. Wei, “GLV / GLS Scalar Multiplication on Twisted Edwards Curves,” in *Security and Privacy in New Computing Environments*, 2022, pp. 319–330.
- [52] B. Ranganatha Rao and B. Sujatha, “A hybrid elliptic curve cryptography (HECC) technique for fast encryption of data for public cloud security,” *Meas. Sensors*, vol. 29, no. January 2023, p. 100870, 2023, doi: 10.1016/j.measen.2023.100870.
- [53] S. Eom, H. S. Lee, and K. Song, “Memory-Efficient Algorithm for Scalar Multiplications on Twisted Edwards Curves for Isogeny-Based Cryptosystems,” *Math. Probl. Eng.*, vol. 2022, 2022, doi: 10.1155/2022/3846369.
- [54] N. H. Sabbry and A. Levina, “A Resource-Efficient Edwards25519 Point Multiplication Technique for Resource-Constrained Devices,” *IEEE Access*, vol. 13, no. July, pp. 142274–142283, 2025, doi: 10.1109/ACCESS.2025.3596685.
- [55] M. Das and Z. Wang, “ED25519: A NEW SECURE COMPATIBLE ELLIPTIC CURVE FOR MOBILE WIRELESS NETWORK SECURITY,” *Jordanian J. Comput. Inf. Technol.*, vol. 8, no. March, pp. 57–71, 2022.
- [56] R. H. Ramakrishna and A. S. Mustafa, “Mobile Payment Transfer Using Edwards Curve Digital Signature Algorithm Based on the Proof of Work in Blockchain,” *Int. J. Intell. Eng. Syst.*, vol. 17, no. 5, pp. 56–64, 2024, doi: 10.22266/ijies2024.1031.06.
- [57] S. Serengil and A. Ozpinar, “LightDSA: A Python-Based Hybrid Digital Signature Library and Performance Analysis of RSA, DSA, ECDSA and EdDSA in Variable Configurations, Elliptic Curve Forms and Curves,” 2025. [Online]. Available: <http://arxiv.org/abs/2505.23773>
- [58] M. El-Hajj and P. Beune, “Lightweight public key infrastructure for the Internet of Things: A systematic literature review,” *J. Ind. Inf. Integr.*, vol. 41, no. April, p. 100670, 2024, doi: 10.1016/j.jii.2024.100670.
- [59] Haridas Atmaram Tekale, “A Comprehensive Study on QR Codes,” *Int. J. Adv. Res. Sci. Commun. Technol.*, pp. 328–335, 2024, doi: 10.48175/ijarsct-18935.
- [60] Y. Wu and Y. Zhang, “Optical character recognition with different languages,” in *Applied and Computational Engineering*, 2023, pp. 60–64. doi: 10.54254/2755-2721/17/20230914.
- [61] S. Pargaonkar, “A Comprehensive Research Analysis of Software Development Life Cycle (SDLC) Agile & Waterfall Model Advantages, Disadvantages, and Application Suitability in Software Quality Engineering,” *Int. J. Sci. Res. Publ.*, vol. 13, no. 8, pp. 120–124, 2023, doi: 10.29322/ijsrp.13.08.2023.p14015.
- [62] A. Saravanos and M. X. Curinga, “Simulating the Software Development Lifecycle: The Waterfall Model,” *Appl. Syst. Innov.*, vol. 6, p. 19, 2023.
- [63] Z. D. Pakpahan, “Implementasi Sistem Tanda Tangan Digital QR Code Berbasis Web Menggunakan Framework CodeIgniter,” Universitas Lampung, 2025.
- [64] S. CJ, “SHA 512 - Secure Hash Algorithm - Step by Step Explanation - Cryptography - Cyber Security - CSE4003,” YouTube. [Online]. Available:

https://youtu.be/JViXozmJnSk?si=KTQGXd_nFvZgbc3

- [65] Q. H. Dang, "Secure Hash Standard," 2015. [Online]. Available: http://csrc.nist.gov/publications/fips/fips180-3/fips180-3_final.pdf%5Cnhttp://thor.info.ua.ic.ro/~fltiplea/CC/FIPS180-3.pdf%5Cnhttp://nvlpubs.nist.gov/nistpubs/FIPS/NIST.FIPS.180-4.pdf

