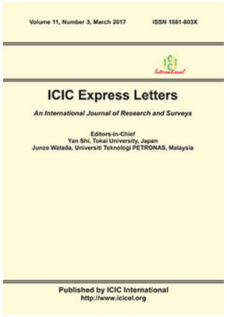
ISSN 1881-803X



ICIC Express Letters

An International Journal of Research and Surveys

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The primary aim of the ***ICIC Express Letters*** is to publish quality short papers (no more than 8 pages) of new developments and trends, novel techniques and approaches, innovative methodologies and technologies on the theory and applications of intelligent systems, information and control.

All submissions to this journal are processed through online submission system only. Each paper published in ICIC Express Letters will be assigned a DOI (Digital Object Identifier) number.

Editorial Board

Volume 19, Number 10, October 2025

Universitas Bhayangkara Jakarta Raya

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id>

Submission Confirmation (ICICEL-2410-014)

2 pesan

office@icicel.org <office@icicel.org> 24 Oktober 2024 pukul 16.01
Kepada: wowon.priatna@dsn.ubharajaya.ac.id
Cc: joniwarta@dsn.ubharajaya.ac.id, rasim@dsn.ubharajaya.ac.id, mayadi@dsn.ubharajaya.ac.id, aseprm@dsn.ubharajaya.ac.id, agus.hidayat@dsn.ubharajaya.ac.id

Dear Mr. Wowon Priatna,

We are pleased to receive your manuscript for possible publication in ICIC Express Letters (ICIC-EL).

Reference No.: ICICEL-2410-014
Title: Anomaly Detection in E-commerce Fraud Using a Hybrid Autoencoder-Transformer
Author(s): Wowon Priatna, Joni Warta, Rasim, Mayadi, Asep Ramdani Mahbub and Agus Hidayat1

The above number "ICICEL-2410-014" has been assigned to your paper. The review result will be sent to you in due time (about two months).

The following points were confirmed during submission.

1) The manuscript that has been submitted has not been published, is not scheduled to be published, and indeed is not currently under review for publication elsewhere.

2) The author (or the author's institution or company) will be approached with a kind request to pay a reasonable charge to cover part of the cost of publication if the manuscript is accepted. The charge amount for each accepted article is JPY64,000.

3) All authors have contributed to the completion of this manuscript and agree with submission of the contents of this manuscript. It is authors' responsibility to provide their correct contact information (affiliations and emails), and the journal office takes no responsibility to verify the information. If authors provide false contact information, then their submissions will be rejected, and their published papers will be retracted as soon as it becomes clear.

Please remember in any future correspondence regarding this article to always include its manuscript number "ICICEL-2410-014", and feel free to contact us at office@icicel.org if you have any further question.

Many thanks for submitting your manuscript to ICIC-EL.

Kind Regards,
Dr. Yan SHI
Editor-in-Chief, ICIC-EL
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org

office@icicel.org <office@icicel.org> 24 Oktober 2024 pukul 16.01
Kepada: wowon.priatna@dsn.ubharajaya.ac.id
Cc: joniwarta@dsn.ubharajaya.ac.id, rasim@dsn.ubharajaya.ac.id, mayadi@dsn.ubharajaya.ac.id, aseprm@dsn.ubharajaya.ac.id, agus.hidayat@dsn.ubharajaya.ac.id

[Kutipan teks disembunyikan]

Universitas Bhayangkara Jakarta Raya

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id>

Review Result: ICICEL-2410-014 -- Conditional Acceptance

2 pesan

office@icicel.org <office@icicel.org> 12 Desember 2024 pukul 07.02
Kepada: wowon.priatna@dsn.ubharajaya.ac.id
Cc: joniwarta@dsn.ubharajaya.ac.id, rasim@dsn.ubharajaya.ac.id, mayadi@dsn.ubharajaya.ac.id, aseprm@dsn.ubharajaya.ac.id, agus.hidayat@dsn.ubharajaya.ac.id

Dear Mr. Wowon Priatna,

Your paper,

Reference No.: ICICEL-2410-014
Title: Anomaly Detection in E-commerce Fraud Using a Hybrid Autoencoder-Transformer
Author(s): Wowon Priatna, Joni Warta, Rasim, Mayadi, Asep Ramdani Mahbub and Agus Hidayat1

that you submitted for possible publication in ICIC Express Letters (An International Journal of Research and Surveys), has been reviewed by the Associate Editors and reviewers. Based on the referee reports, I regret to inform you that your paper cannot be accepted in the current version. However, it may be publishable with the following conditions. Also, please use the ICIC-EL style files http://www.icicel.org/ell/information.html (either LaTeX source files or Word with PDF files) for preparing your paper (no more than 8 pages) for the publication.

The paper is generally well written and organized. The results presented in the paper seem correct, and potentially useful in practice. The techniques employed to tackle the problems are generally standard with some novelties. The paper can be accepted for publication subject to some necessary minor changes as below:

Comments:

1) In Section 1 and Section 2, the literature is both reviewed and the research aims are both stated, which is somewhat redundant. Please reorganize the first two sections to make it more logically. In the end of Introduction, a brief overview of the manuscript structure is suggested to be provided to facilitate readers.
2) It is suggested to use a flowchart to replace the Algorithm to show the proposed AET model.
3) In the part before Equation (12), “the original data” and “reconstructed data” are both represented with “X”, which is not right.
4) “The evaluation included comparisons with AE, Transformer, hybrid AE-Transformer, DNN, LSTM, RNN, and Ensemble models” is stated in Paragraph 1 of Section 4.2, but we cannot see the comparison with “AE, Transformer”.
5) The mentioned “Figure 2” in Paragraph 1 of Section 4.2 cannot be found in the manuscript. Figure 3 that appears in the beginning of Section 4.4 cannot be found in the manuscript.
6) AUC values shown in Figure1 do not agree with those described in Paragraph 2 of Section 4.2. For example, “DNN and hybrid AE-Transformer achieved the highest AUC (0.79)” is stated in text, but from Figure 1, the AUC value for hybrid AE-Transformer is 0.81. The AUC values in Table 2 are also shown differently. It is very confusing.
7) Many typos exist in the manuscript. For example, brackets do not come in pairs in “Put” line of Algorithm 1. Should “put” be “Input” in Algorithm 1? The formula for “Precision” in Section 3.7 is not right.
8) In Algorithm 1, the equation labels do not agree with the text. “(25)” is mentioned, but we cannot find it in the manuscript. Please recheck it.
9) In Section 4.4, the restate of the model evaluation results got in Section 4.3 is not very necessary.
10) The following research is suggested to be cited to enrich the current study: Vanessa Laurencia Hartoyo Putri, Ferry Vincenttius Ferdinand and Kie Van Ivanky Saputra, Improvement of Anomaly Detection Methods Using Modification and Ensemble Method: Application in Indonesian Financial Statement, ICIC Express Letters, Part B: Applications, vol.15, no.10, pp.1071-1079, 2024. https://doi.org/10.24507/icicelb.15.10.1071

Please note that if the paper is not revised satisfactorily complying with the conditions above, ICIC-EL reserves the right to reject the paper from the journal.

Please submit your Revised Manuscript, Revision Note, the Publication Page Charges and Copyright Form (http://www.icicel.org/ell/information.html) to us within Three Weeks' Time (from the date of this message) at ICIC-EL online submission system http://www.icicel.org. All authors' handwritten signatures are required in Copyright Form. Thank you for your understanding and cooperation.

Please feel free to contact us if you have any questions about your paper.

Best Regards,
Dr. Yan SHI
Editor-in-Chief, ICIC-EL
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org

---

office@icicel.org <office@icicel.org> 12 Desember 2024 pukul 07.02
Kepada: wowon.priatna@dsn.ubharajaya.ac.id
Cc: joniwarta@dsn.ubharajaya.ac.id, rasim@dsn.ubharajaya.ac.id, mayadi@dsn.ubharajaya.ac.id, aseprm@dsn.ubharajaya.ac.id, agus.hidayat@dsn.ubharajaya.ac.id

[Kutipan teks disembunyikan]

Universitas Bhayangkara Jakarta Raya

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id>

Contact from ICIC-EL (ICICEL-2410-014)

9 pesan

ICIC-EL <lilima@icicel.org> 7 Januari 2025 pukul 08.20
Kepada: wowon.priatna@dsn.ubharajaya.ac.id
Cc: office <office@icicel.org>

Dear Mr. Wowon Priatna,

Thanks for your contributions to ICIC-EL.

The documents for revised version of your manuscript have been received.

However, the credit card you provide does not work.

Please check it and reply us soon.

Kind Regards,
Lili Ma

On behalf of Dr. Yan SHI
Editor-in-Chief, ICIC Express Letters
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id> 7 Januari 2025 pukul 15.35
Kepada: ICIC-EL <lilima@icicel.org>, office@icicel.org

Subject: Credit Card Confirmation

Dear Ms. Lili Ma,

Thank you for your email.

I have contacted my bank, and they confirmed that my credit card is now active and ready for use. Kindly try processing the debit again with the following details:

- **Credit Card Type:** Visa
- **Credit Card No.:** 4889 5030 2008 3524
- **Expiration Date:** 10/29
- **Card Holder's Name:** Wowon Priatna
- **Authorized Signature:** Wowon Priatna

Please let me know if there are any further issues.

Kind regards,
Wowon Priatna

[Kutipan teks disembunyikan]

ICIC-EL <lilima@icicel.org> 7 Januari 2025 pukul 16.15
Kepada: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Cc: office <office@icicel.org>

Dear Mr. Wowon Priatna,

Thanks for your quick reply.

However, the card still does not work.

Please recheck it and reply us soon.

Kind Regards,
Lili Ma

On behalf of Dr. Yan SHI
Editor-in-Chief, ICIC Express Letters
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org

From: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Date: 2025-01-07 16:35:27
To: ICIC-EL <lilima@icicel.org>,office@icicel.org
Subject: Re: Contact from ICIC-EL (ICICEL-2410-014)

> **Subject:** Credit Card Confirmation
>
> Dear Ms. Lili Ma,
>
> Thank you for your email.
>
> I have contacted my bank, and they confirmed that my credit card is now active and ready for use. Kindly try processing the debit again with the following details:
>
> Please let me know if there are any further issues.

Kind regards,

Wowon Priatna

Pada Sel, 7 Jan 2025 pukul 08.21 ICIC-EL <lilima@icicel.org> menulis:

[Kutipan teks disembunyikan]

Kampus I (Kampus Harsono)

Jl. Harsono RM No.67 Ragunan Pasar Minggu, Jakarta Selatan, DKI Jakarta 12550, Indonesia

Kampus II (Kampus Perjuangan)

Jl. Raya Perjuangan Bekasi Utara, Kota Bekasi, Jawa Barat 17121, Indonesia

Telp : +62 21 88955882 Fax : +62 21 88955871 https://ubharajaya.ac.id/

Email : info@ubharajaya.ac.id Support : support.ubharajaya.ac.id

---

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id> 7 Januari 2025 pukul 17.07
Kepada: ICIC-EL <lilima@icicel.org>

Dear Ms. Lili Ma,

Thank you for your response and understanding regarding the issue with my credit card.

I have contacted my bank to investigate the matter. However, they require additional details about the transaction to proceed with further verification and resolution. I kindly request your assistance in confirming or providing the following information:

1. The name of the merchant as it appears in the transaction attempt.
2. The exact time and date when the transaction was processed or attempted.

Additionally, to avoid further delays, I would like to inquire if there is an alternative payment method available, such as a bank transfer, PayPal, or any other option accepted by the journal.

I am committed to resolving this issue as quickly as possible and will follow up immediately upon receiving the requested information. Thank you for your assistance and understanding.

Kind regards,
Wowon Priatna

[Kutipan teks disembunyikan]

ICIC-EL <lilima@icicel.org> 8 Januari 2025 pukul 09.30
Kepada: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Cc: office <office@icicel.org>

Dear Mr. Wowon Priatna,

Thanks for your contributions to ICIC-EL.

For your questions,

1. The name of the merchant as it appears in the transaction attempt.

--- The item is Journal Fee by IJICIC.

2. The exact time and date when the transaction was processed or attempted.

---After your confirmation, we will charge you soon.

[Kutipan teks disembunyikan]

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id> 8 Januari 2025 pukul 21.13
Kepada: ICIC-EL <lilima@icicel.org>

Dear ICIC-EL Team,

Thank you for your email and your kind explanation.

Here are the details regarding the payment:

1. **Name of the Merchant:**
   The item is Journal Fee by IJICIC.

2. **Exact Time and Date of the Transaction Attempt:**
   Please proceed with the transaction at your convenience.

Below are the updated credit card details for processing the payment:

Credit Card: [X] Visa [ ] MasterCard
Credit Card No.: 4365 / 0202 / 0976 / 9107
Expiration Date: 01 / 2028
Card Holder's Name : TBAI MUNANDAR
Authorized Signature: TBAI MUNANDAR

Please let me know if there is anything else you need from my side.

Looking forward to your confirmation.

Best regards,
Wowon Priatna

[Kutipan teks disembunyikan]

ICIC-EL <lilima@icicel.org> 9 Januari 2025 pukul 07.25
Kepada: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Cc: office <office@icicel.org>

Dear Mr. Wowon Priatna,

Please send us your complete updated Invoice Letter in the form of PDF.

Thanks for your cooperation.

Kind Regards,

Lili Ma

On behalf of Dr. Yan SHI
Editor-in-Chief, ICIC Express Letters
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org

From: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Date: 2025-01-08 22:13:17
To: ICIC-EL <lilima@icicel.org>
Subject: Re: Re: Re: Contact from ICIC-EL (ICICEL-2410-014)

> Dear ICIC-EL Team,
>
> Thank you for your email and your kind explanation.
>
> Here are the details regarding the payment:
>
> 1. **Name of the Merchant:**
>   The item is Journal Fee by IJICIC.
> 2. **Exact Time and Date of the Transaction Attempt:**
>   Please proceed with the transaction at your convenience.
>
> Below are the updated credit card details for processing the payment:
>
> Please let me know if there is anything else you need from my side.
>
> [Kutipan teks disembunyikan]
>
> [Kutipan teks disembunyikan]

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id> 9 Januari 2025 pukul 10.06
Kepada: ICIC-EL <lilima@icicel.org>

Dear Lili Ma,

Thank you for your email.

Please find attached the complete and updated Invoice Letter in PDF format as requested. Should you require any additional information or have further questions, please do not hesitate to contact me.

Thanks for your cooperation.

Kind Regards,
Wowon Priatna

[Kutipan teks disembunyikan]

INVOICE-update.pdf
75K

ICIC-EL <lilima@icicel.org> 9 Januari 2025 pukul 13.08
Kepada: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Cc: office <office@icicel.org>

Dear Mr. Wowon Priatna,

The payment is OK this time.

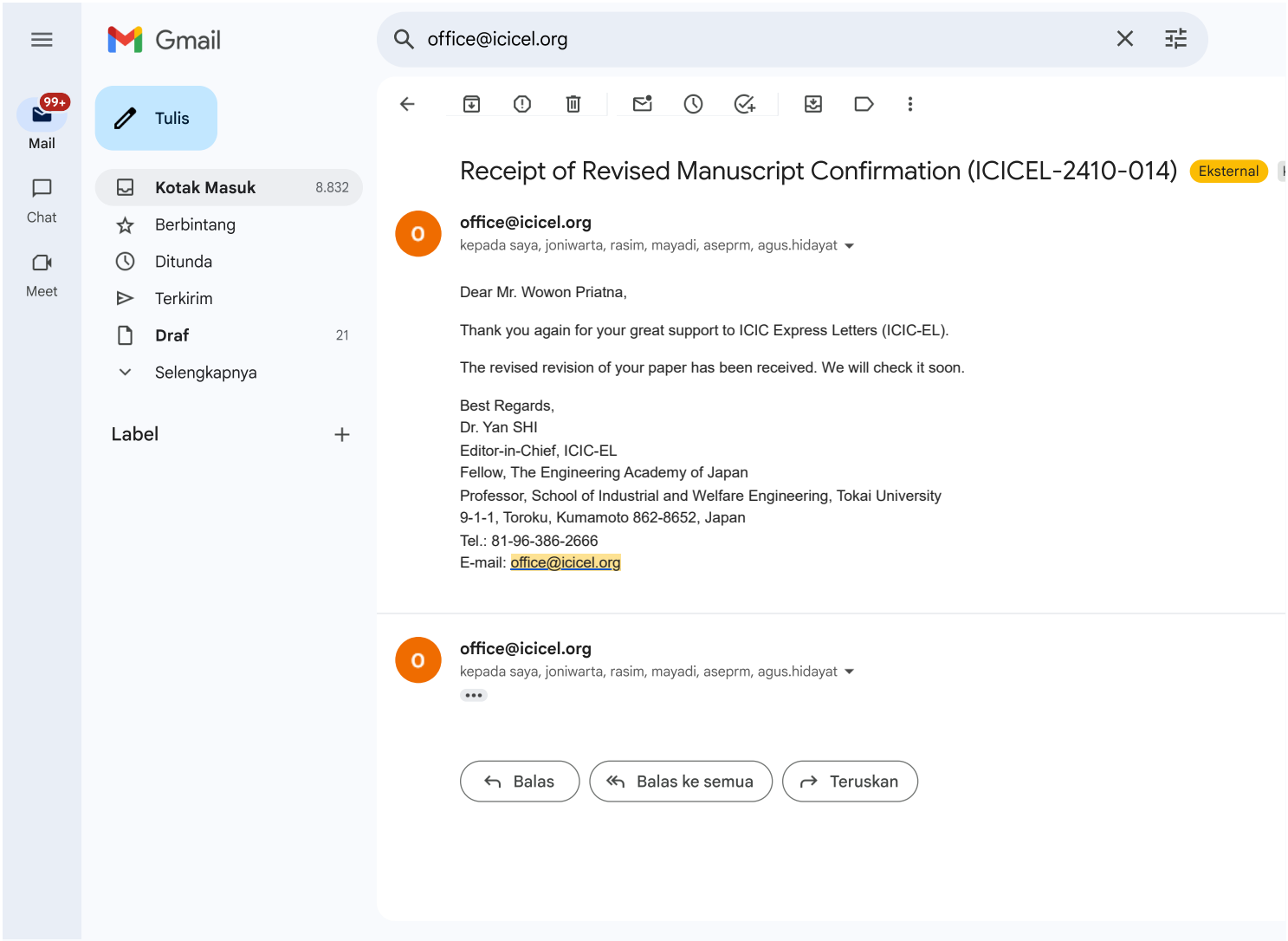
Thanks for your cooperation.

Kind Regards,
Lili Ma

On behalf of Dr. Yan SHI
Editor-in-Chief, ICIC Express Letters
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org

发件人："Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
发送日期：2025-01-09 11:06:19
收件人：ICIC-EL <lilima@icicel.org>
主题：Re: Re: Re: Re: Contact from ICIC-EL (ICICEL-2410-014)

[Kutipan teks disembunyikan]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office@icicel.org
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Chat
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Kotak Masuk 8.832
Berbintang
Ditunda
Terkirim
Draf 21
Selengkapnya
Label
Receipt of Revised Manuscript Confirmation (ICICEL-2410-014)
Eksternal
office@icicel.org
kepada saya, joniwarta, rasim, mayadi, aseprm, agus.hidayat
Dear Mr. Wowon Priatna,
Thank you again for your great support to ICIC Express Letters (ICIC-EL).
The revised revision of your paper has been received. We will check it soon.
Best Regards,
Dr. Yan SHI
Editor-in-Chief, ICIC-EL
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org
office@icicel.org
kepada saya, joniwarta, rasim, mayadi, aseprm, agus.hidayat
Balas
Balas ke semua
Teruskan

Universitas Bhayangkara Jakarta Raya

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id>

Paper Proof (ICICEL-2410-014)

2 pesan

office@icicel.org <office@icicel.org> 16 Juli 2025 pukul 07.58
Kepada: wowon.priatna@dsn.ubharajaya.ac.id
Cc: joniwarta@dsn.ubharajaya.ac.id, rasim@dsn.ubharajaya.ac.id, mayadi@dsn.ubharajaya.ac.id, aseprm@dsn.ubharajaya.ac.id, agus.hidayat@dsn.ubharajaya.ac.id

Dear Mr. Wowon Priatna,

I am glad to inform you that your accepted paper (ICICEL-2410-014) has been edited for the publication in ICIC Express Letters (ICIC-EL). It is extremely important that you go over the galley proof very carefully for errors and any necessary changes, like whether corresponding author has been denoted by the asterisk symbol (*).

Please check the proof following the guidelines below.

1) Any changes should be marked directly in the PDF file (ICICEL-2410-014(edit)) that you downloaded from ICIC-EL online submission system (http://www.icicel.org). Please make sure that the corrections are clear and easy to understand.

2) At this stage, only minor changes can be accepted.

3) Please be particularly diligent when checking the highlighted parts in the galley proof.

4) If any figure requires change, please provide the updated figure in .eps, .pdf or .jpg format and send it to ICIC-EL office via email: office@icicel.org

Return the proof.

If the galley proof requires corrections, you should return the marked PDF file on ICIC-EL submission system (http://www.icicel.org). If there is no change needed, you should also return the original edited PDF file to the submission system.

Proof must be received within Three Days from the date of this letter. If we do not hear from you within Three Days or your paper proof is not proper, your paper may not be published as scheduled.

In order to send the Journal to you, please also send us your detailed postal address as the following sample via email: office@icicel.org. If we did not receive your address within three days from the date of this letter, we suppose you do not need the hard copy of the journal containing your paper.

Paper ID (For example, ICICEL-2208-101)
Your name (For example, Prof. Koichi Shirai)
E-mail: XXXXXXXX
Mobile phone: XXXXXXXX
Detailed address: (For example, Department of Medical Care and Welfare Engineering, Tokai University, 9-1-1, Toroku, Higashi-ku, Kumamoto-shi, Kumamoto 862-8652, Japan)

Thanks for your cooperation.

Best Regards,
Dr. Yan SHI
Editor-in-Chief, ICIC-EL
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org

office@icicel.org <office@icicel.org> 16 Juli 2025 pukul 07.58
Kepada: wowon.priatna@dsn.ubharajaya.ac.id
Cc: joniwarta@dsn.ubharajaya.ac.id, rasim@dsn.ubharajaya.ac.id, mayadi@dsn.ubharajaya.ac.id, aseprm@dsn.ubharajaya.ac.id, agus.hidayat@dsn.ubharajaya.ac.id

[Kutipan teks disembunyikan]

Universitas Bhayangkara Jakarta Raya

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id>

Contact from ICIC-EL (ICICEL-2410-014)

9 pesan

ICIC-EL <lilima@icicel.org> 7 Januari 2025 pukul 08.20
Kepada: wowon.priatna@dsn.ubharajaya.ac.id
Cc: office <office@icicel.org>

Dear Mr. Wowon Priatna,

Thanks for your contributions to ICIC-EL.

The documents for revised version of your manuscript have been received.

However, the credit card you provide does not work.

Please check it and reply us soon.

Kind Regards,
Lili Ma

On behalf of Dr. Yan SHI
Editor-in-Chief, ICIC Express Letters
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id> 7 Januari 2025 pukul 15.35
Kepada: ICIC-EL <lilima@icicel.org>, office@icicel.org

Subject: Credit Card Confirmation

Dear Ms. Lili Ma,

Thank you for your email.

I have contacted my bank, and they confirmed that my credit card is now active and ready for use. Kindly try processing the debit again with the following details:

- **Credit Card Type:** Visa
- **Credit Card No.:** 4889 5030 2008 3524
- **Expiration Date:** 10/29
- **Card Holder's Name:** Wowon Priatna
- **Authorized Signature:** Wowon Priatna

Please let me know if there are any further issues.

Kind regards,
Wowon Priatna

[Kutipan teks disembunyikan]

ICIC-EL <lilima@icicel.org> 7 Januari 2025 pukul 16.15
Kepada: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Cc: office <office@icicel.org>

Dear Mr. Wowon Priatna,

Thanks for your quick reply.

However, the card still does not work.

Please recheck it and reply us soon.

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Lili Ma

On behalf of Dr. Yan SHI
Editor-in-Chief, ICIC Express Letters
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org

From: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Date: 2025-01-07 16:35:27
To: ICIC-EL <lilima@icicel.org>,office@icicel.org
Subject: Re: Contact from ICIC-EL (ICICEL-2410-014)

> **Subject:** Credit Card Confirmation
>
> Dear Ms. Lili Ma,
>
> Thank you for your email.
>
> I have contacted my bank, and they confirmed that my credit card is now active and ready for use. Kindly try processing the debit again with the following details:
>
> Please let me know if there are any further issues.

Kind regards,

Wowon Priatna

Pada Sel, 7 Jan 2025 pukul 08.21 ICIC-EL <lilima@icicel.org> menulis:

[Kutipan teks disembunyikan]

Kampus I (Kampus Harsono)

Jl. Harsono RM No.67 Ragunan Pasar Minggu, Jakarta Selatan, DKI Jakarta 12550, Indonesia

Kampus II (Kampus Perjuangan)

Jl. Raya Perjuangan Bekasi Utara, Kota Bekasi, Jawa Barat 17121, Indonesia

Telp : +62 21 88955882 Fax : +62 21 88955871 https://ubharajaya.ac.id/

Email : info@ubharajaya.ac.id Support : support.ubharajaya.ac.id

---

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id> 7 Januari 2025 pukul 17.07
Kepada: ICIC-EL <lilima@icicel.org>

Dear Ms. Lili Ma,

Thank you for your response and understanding regarding the issue with my credit card.

I have contacted my bank to investigate the matter. However, they require additional details about the transaction to proceed with further verification and resolution. I kindly request your assistance in confirming or providing the following information:

1. The name of the merchant as it appears in the transaction attempt.
2. The exact time and date when the transaction was processed or attempted.

Additionally, to avoid further delays, I would like to inquire if there is an alternative payment method available, such as a bank transfer, PayPal, or any other option accepted by the journal.

I am committed to resolving this issue as quickly as possible and will follow up immediately upon receiving the requested information. Thank you for your assistance and understanding.

Kind regards,
Wowon Priatna

[Kutipan teks disembunyikan]

ICIC-EL <lilima@icicel.org> 8 Januari 2025 pukul 09.30
Kepada: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Cc: office <office@icicel.org>

Dear Mr. Wowon Priatna,

Thanks for your contributions to ICIC-EL.

For your questions,

1. The name of the merchant as it appears in the transaction attempt.

--- The item is Journal Fee by IJICIC.

2. The exact time and date when the transaction was processed or attempted.

---After your confirmation, we will charge you soon.

[Kutipan teks disembunyikan]

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id> 8 Januari 2025 pukul 21.13
Kepada: ICIC-EL <lilima@icicel.org>

Dear ICIC-EL Team,

Thank you for your email and your kind explanation.

Here are the details regarding the payment:

1. **Name of the Merchant:**
   The item is Journal Fee by IJICIC.

2. **Exact Time and Date of the Transaction Attempt:**
   Please proceed with the transaction at your convenience.

Below are the updated credit card details for processing the payment:

Credit Card: [X] Visa [ ] MasterCard
Credit Card No.: 4365 / 0202 / 0976 / 9107
Expiration Date: 01 / 2028
Card Holder's Name : TBAI MUNANDAR
Authorized Signature: TBAI MUNANDAR

Please let me know if there is anything else you need from my side.

Looking forward to your confirmation.

Best regards,
Wowon Priatna

[Kutipan teks disembunyikan]

ICIC-EL <lilima@icicel.org> 9 Januari 2025 pukul 07.25
Kepada: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Cc: office <office@icicel.org>

Dear Mr. Wowon Priatna,

Please send us your complete updated Invoice Letter in the form of PDF.

Thanks for your cooperation.

Kind Regards,

Lili Ma

On behalf of Dr. Yan SHI
Editor-in-Chief, ICIC Express Letters
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
E-mail: office@icicel.org

From: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Date: 2025-01-08 22:13:17
To: ICIC-EL <lilima@icicel.org>
Subject: Re: Re: Re: Contact from ICIC-EL (ICICEL-2410-014)

> Dear ICIC-EL Team,
>
> Thank you for your email and your kind explanation.
>
> Here are the details regarding the payment:
>
> 1. **Name of the Merchant:**
>   The item is Journal Fee by IJICIC.
> 2. **Exact Time and Date of the Transaction Attempt:**
>   Please proceed with the transaction at your convenience.
>
> Below are the updated credit card details for processing the payment:
>
> Please let me know if there is anything else you need from my side.
>
> [Kutipan teks disembunyikan]
>
> [Kutipan teks disembunyikan]

Wowon Priatna, S.T., M.Ti <wowon.priatna@dsn.ubharajaya.ac.id> 9 Januari 2025 pukul 10.06
Kepada: ICIC-EL <lilima@icicel.org>

Dear Lili Ma,

Thank you for your email.

Please find attached the complete and updated Invoice Letter in PDF format as requested. Should you require any additional information or have further questions, please do not hesitate to contact me.

Thanks for your cooperation.

Kind Regards,
Wowon Priatna

[Kutipan teks disembunyikan]

INVOICE-update.pdf
75K

ICIC-EL <lilima@icicel.org> 9 Januari 2025 pukul 13.08
Kepada: "Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
Cc: office <office@icicel.org>

Dear Mr. Wowon Priatna,

The payment is OK this time.

Thanks for your cooperation.

Kind Regards,
Lili Ma

On behalf of Dr. Yan SHI
Editor-in-Chief, ICIC Express Letters
Fellow, The Engineering Academy of Japan
Professor, School of Industrial and Welfare Engineering, Tokai University
9-1-1, Toroku, Kumamoto 862-8652, Japan
Tel.: 81-96-386-2666
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发件人："Wowon Priatna, S.T., M.Ti" <wowon.priatna@dsn.ubharajaya.ac.id>
发送日期：2025-01-09 11:06:19
收件人：ICIC-EL <lilima@icicel.org>
主题：Re: Re: Re: Re: Contact from ICIC-EL (ICICEL-2410-014)

[Kutipan teks disembunyikan]

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ANOMALY DETECTION IN E-COMMERCE FRAUD USING A HYBRID AUTOENCODER-TRANSFORMER

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Abstract. *The rise of e-commerce has led to an increase in fraudulent activities, posing significant risks to online transactions. Effective anomaly detection for e-commerce fraud is essential for maintaining transaction trust and security. This study proposes a hybrid framework that combines Autoencoder (AE) and Transformer models to enhance anomaly detection in e-commerce fraud. An AE is utilized for dimensionality reduction and latent space representation of transaction data, providing a compact and informative feature set. The Transformer model captures global and local dependencies in the data through its self-attention mechanism, enabling more accurate anomaly identification. The proposed hybrid approach addresses the limitations of traditional methods by effectively identifying complex data patterns and detecting anomalies more precisely. Evaluation using the Credit Card Fraud Dataset and the IEEE-CIS Fraud Detection Dataset demonstrates the hybrid model's superior performance compared to conventional models such as Deep Neural Network (DNN), Long Short-Term Memory (LSTM), and Recurrent Neural Network (RNN), with significant improvements in accuracy, precision, recall, F1-Score, and Area Under the Curve (AUC) metrics. The findings indicate that the proposed hybrid Autoencoder-Transformer framework can significantly enhance the detection of fraudulent activities in e-commerce, contributing to safer and more secure online transactions.*
Keywords: Anomaly detection, Transformer, Hybrid autoencoder, Fraud detection, Machine learning

1. **Introduction.** E-commerce has grown rapidly in recent years, offering substantial benefits to both businesses and consumers. However, this growth has been accompanied by an increased risk of fraudulent activities, including identity theft, fraudulent transactions, and data manipulation, all of which can result in significant financial losses. As e-commerce continues to expand, effective fraud detection mechanisms have become crucial for maintaining trust and security in online transactions [1]. Machine learning algorithms, such as K-Nearest Neighbors (KNN) and logistic regression, have been applied to fraud detection [2], but they struggle with high-dimensional and complex datasets. Advanced methods like Local Outlier Factor (LOF) offer improvements but still face limitations in managing sophisticated fraud patterns [3].

Recent advancements in deep learning, particularly Autoencoders (AE) and Transformer models, have shown significant promise in anomaly detection tasks. Autoencoders compress input data into latent representations, capturing the data's underlying structure [4], while Transformers leverage self-attention mechanisms to capture long-term dependencies in sequential data [5]. Despite their strengths, these models face individual

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limitations: Autoencoders are prone to overfitting on high-dimensional data and struggle with temporal patterns, whereas Transformers may overlook crucial local patterns in large, heterogeneous datasets [6-8].

This research introduces a novel hybrid Autoencoder-Transformer framework that synergizes the strengths of both models to address their individual limitations. Unlike prior studies [4,5], which applied Autoencoder or Transformer models in isolation, this approach combines the dimensionality reduction capabilities of Autoencoders with the global and local dependency modeling of Transformers. This integration enables comprehensive anomaly detection, particularly for identifying complex fraud patterns that single-model methods often miss.

The structure of this manuscript is as follows. Section 2 reviews related work in anomaly detection and fraud detection systems. Section 3 describes the proposed hybrid Autoencoder-Transformer framework, including its methodology and implementation details. Section 4 presents the experimental results and discusses the findings. Finally, Section 5 concludes the study with key insights and future research directions.

2. **Related Work.** Traditional Machine Learning (ML) methods, such as decision trees, random forests, Support Vector Machines (SVM), and logistic regression, have been widely used for fraud detection. However, their reliance on labeled data and sensitivity to class imbalance make them less effective for high-dimensional and imbalanced fraud datasets, limiting their generalizability in real-world scenarios [9,10]. Unsupervised methods like isolation forests avoid the need for labeled data but struggle to capture complex patterns and temporal dependencies critical for detecting sophisticated fraud [11]. Recent advancements, such as the approach in [12], combined Mahalanobis distance, isolation forests, and local outlier factors with ensemble techniques, improving performance on imbalanced datasets and offering insights for robust anomaly detection systems.

Deep learning models, such as Autoencoders (AE) and Recurrent Neural Networks (RNNs), have advanced fraud detection by capturing more complex patterns. However, AEs often overfit on high-dimensional data and lack the ability to model temporal sequences, while RNNs can handle sequential dependencies but require significant computational resources [13]. To address these limitations, hybrid models such as AE-PRF [14] and CoTMAE [15] have been proposed, combining AEs with probabilistic random forests or convolutional-Transformer architectures to improve training efficiency and performance, albeit with challenges in fully balancing global and local dependencies [16]. This study introduces a hybrid Autoencoder-Transformer framework that leverages the dimensionality reduction capabilities of Autoencoders and the dependency modeling of Transformers. By combining these approaches, the framework addresses the limitations of traditional and hybrid methods, providing a more accurate and scalable solution for fraud detection in complex e-commerce datasets.

3. **Research Methodology.** This study aims to perform anomaly detection in fraud detection by proposing the integration of a Hybrid Autoencoder with a Transformer (Hybrid AET). This integration is expected to perform better than previous anomaly detection models.

3.1. **Dataset.** The dataset, sourced from Kaggle, consists of 1,472,952 e-commerce transaction records, with 5.01% labeled as fraud. It includes 16 features designed to test machine learning models for fraud detection. Details of the dataset are summarized in Table 1.

3.2. **Autoencoder.** An AE is an artificial neural network designed to learn efficient data representations, particularly in dimensionality reduction or mapping to a lower-dimensional latent space [17]. AE comprises two primary components: the encoder and

Table 1. Dataset information

Class	Fraud	Non-fraud
Is fraudulent	73,838	1,399,114

the decoder [18]. The encoder maps input to a latent space, and the decoder reconstructs it [19,20]. The process is described mathematically in Equations (1)-(3).

$$z = f\theta(x) = \sigma(W_{e^x} + b_e) \tag{1}$$

In this context, the encoder $f\theta$ transforms the input x to the latent space z, W_{e^x} and b_e represent the weights and biases of the encoder layer, respectively, and σ is the activation function.

$$\dot{\mathrm{x}} = g_{\emptyset}(z) = \sigma(W_{d^z} + b_d) \tag{2}$$

where W_{d^z} and b_d are the weights and biases of the decoder layer. The objective of the AE is to minimize the loss function, which is often the Mean Square Error (MSE) between the original input x and the reconstruction $\hat{x}$.

$$\iota(x, \hat{x}) = \frac{1}{n}\sum_{i=1}^{n} \|x_i - \hat{x}_i\|^2 \tag{3}$$

3.3. **Transformer.** The architecture that revolutionized Natural Language Processing (NLP) and other fields is detailed in "Attention is All You Need". This architecture, known as the Transformer, utilizes a self-attention mechanism to identify relationships among elements in sequential data [21]. The self-attention mechanism allows the model to efficiently consider the entire context of the input without processing the data in sequence, differing from traditional methods like RNN and LSTM. The fundamental formula for self-attention is given in Equation (4).

$$Attention(Q, K, V) = softmax\left(\frac{QK^T}{\sqrt{DK}}\right)V \tag{4}$$

where Q (query), K (key), and V (value) are representations of the input, calculated using Equation (5).

$$Q = XW_Q,\ K = XW_K,\ V = XW_V \tag{5}$$

where W_Q, W_K, and W_V are the weight matrices corresponding to the query (Q), key (K), and value (V) inputs in self-attention mechanism of the Transformer. These weights determine the transformation of the input data matrix X for each of the attention components. Specifically, X represents the input sequence that the Transformer processes, and the weight matrices W_Q, W_K and W_V are responsible for transforming this input into the corresponding query, key, and value vectors that are used in the attention mechanism.

The Transformer architecture comprises multiple encoder and decoder layers. Encoders use self-attention and feed-forward networks to create contextual representations, while decoders generate outputs based on these representations. Multi-head self-attention captures diverse relationships within the data, enabling the model to understand long-term dependencies [22,23].

3.4. **Development of hybrid Autoencoder.** The first step in developing a hybrid Autoencoder is to define and train the Autoencoder. An Autoencoder consists of several layers: an input layer, an encoder layer, a bottleneck layer, and a decoder layer. The encoding process begins by passing the input data X through the encoder layer, which consists of two dense layers with ReLU activation functions. The equations for the encoder layer in the hybrid Autoencoder are given in Equations (6) and (7).

$$h_1 = \emptyset(W_1 \cdot X + b_1) \tag{6}$$

$$h_2 = \emptyset(W_2 \cdot h_1 + b_2) \tag{7}$$

Here, W_1 and W_2 are the weight matrices for the first and second layers of the Autoencoders encoder, respectively, and b_1 and b_2 are the corresponding bias terms. The activation function $\emptyset$ is typically a non-linear function like ReLU. The bottleneck layer then compresses the data into a lower dimension using Equation (8).

$$z = \emptyset(W_3 \cdot h_2 + b_3) \tag{8}$$

where W_3 and b_3 are the weight matrix and bias term responsible for compressing the data into the latent space. After compressing the data, the decoding phase starts, aiming to reconstruct the original data from the latent representation. The decoder comprises two dense layers with ReLU activation functions and an output layer with a Sigmoid activation function. The decoder layers are described by Equations (9)-(11):

$$h_3 = \emptyset(W_4 \cdot z + b_4) \tag{9}$$

$$h_4 = \emptyset(W_5 \cdot h_3 + b_5) \tag{10}$$

$$\dot{\mathrm{x}} = \sigma(W_6 \cdot h_4 + b_6) \tag{11}$$

where W_4, W_5, W_6 and b_4, b_5, b_6 are the weight matrices and bias terms, transforming the latent representation z through hidden layers h_3 and h_4 to reconstruct the input data $\dot{\mathrm{x}}$.

The model is compiled using the Adam optimizer and MSE loss function, as detailed in Equation (3). The Autoencoder is compiled in Python with the command Autoencoder.compile (optimizer = 'adam', loss = 'mse'). The trained AE transforms the input data into a latent representation, producing compressed data z. This compressed data is then used to train the Transformer model. To detect anomalies, the AE's reconstruction error is calculated as the squared Euclidean distance between the original data X and the reconstruced data $\hat{X}$, as described in Equation (12).

$$Score_{AE} = \left\| X - \hat{X} \right\|^2 \tag{12}$$

The anomaly score from the Transformer is calculated based on the Transformer's model prediction output as described in Equation (13).

$$Score_{Transformer} = Transformer \cdot predict(X) \tag{13}$$

The combined anomaly score is obtained by merging the two scores using specific weights (α and β) as described in Equation (14).

$$Score_{Combines} = \alpha \cdot Score_{AE} + \beta \cdot Score_{Transformer} \tag{14}$$

where α and β are weighting parameters that determine the contribution of the AE's reconstruction error score ($Score_{AE}$) and the Transformer's anomaly score $Score_{Transformer}$ to the final combined score. The values of α and β are determined using a hyperparameter optimization process, such as grid search or Bayesian optimization.

3.5. **Development of Transformer model.** The development of the Transformer model begins with parameter initialization, including sequence length, model dimension (d_model), number of heads (num_heads), and feed-forward dimension (ff_dim). Positional encoding is added to represent positional information, computed using sine and cosine functions as described in Equations (15) and (16).

$$PE_{pos,2i} = \sin\left(\frac{pos}{10000^{\frac{2i}{d_{model}}}}\right) \tag{15}$$

$$PE_{pos,2i} = \cos\left(\frac{pos}{10000^{\frac{2i}{d_{model}}}}\right) \tag{16}$$

Here, pos denotes the sequence position, and i represents the dimension index, ensuring unique representations interpretable by the Transformer. The Transformer encoder block

comprises multi-head attention, dropout, layer normalization, and a feed-forward network. Multi-head attention enables the model to focus on multiple input parts simultaneously, as shown in Equation (4), while dropout regularizes the model, as per Equation (17).

$$Dropout(x) = x \cdot mask \tag{17}$$

A binary vector mask is utilized to specify the elements to be dropped. Subsequently, layer normalization is applied to standardizing the elements within the layer, as articulated in Equation (18).

$$LayerNorm(x) = \frac{x - \mu}{\sqrt{\sigma^2 + \epsilon}} \cdot \gamma + \beta \tag{18}$$

where μ represents the mean, σ^2 represents the variance, ϵ is a small constant, and γ and β are learnable parameters. Finally, the feed-forward network is composed of two dense layers with ReLU activation and dropout, as detailed in Equation (19).

$$FFN(x) = ReLU(xW_1 + b_1)W_2 + b_2 \tag{19}$$

The Transformer model, incorporating encoder blocks, is trained on compressed AE data and original labels using the Adam optimizer and binary crossentropy loss. After training, anomaly scores are generated from the Transformer's output.

3.6. **Hybrid integration of the Autoencoder and Transformer.** The process is visually summarized in Figure 1, which illustrates the steps in the proposed hybrid Autoencoder-Transformer framework.

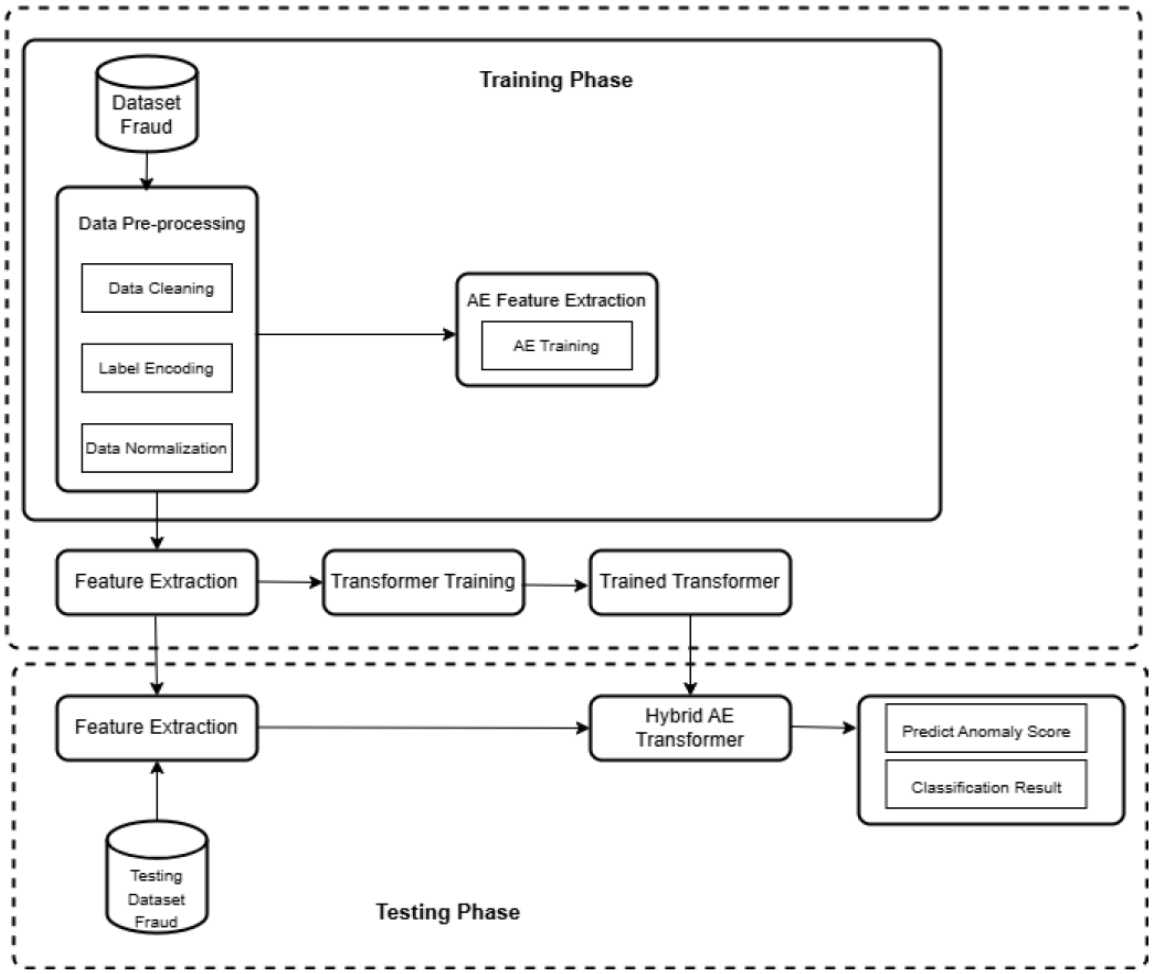

FIGURE 1. Steps in the proposed Hybrid AET framework

3.7. **Model evaluation.** The subsequent step in this research involves evaluating the performance of the developed intrusion detection model. The objective of this performance evaluation is to ascertain the model's practical applicability. The evaluation parameters include Accuracy (Ac), Recall (Re), Precision (Pr), F1-Score (F1), and Area Under the Curve (AUC) [24]. These parameters provide a comprehensive assessment of the model's effectiveness and reliability. The formulas for these parameters are detailed in Equations (20)-(24) [25].

$$Accuracy = \frac{TP + TN}{TP + FP + TN + FN} \tag{20}$$

$$Precision = \frac{TP}{TP + FP} \tag{21}$$

$$Recall = \frac{TP}{TP + TN} \tag{22}$$

$$F1\text{-}Score = \frac{2 \times Precision \times Recall}{Precision + Recall} \tag{23}$$

$$AUC = \int_0^1 TPR(FPR)d(FPR) \tag{24}$$

4. Results and Discussion.

4.1. **Model implementation.** The Hybrid AET model was developed using Python, following the steps in Figure 1. The Autoencoder (AE) used three encoding layers with ReLU activation and dropout (0.2) and three decoding layers, with the output layer using sigmoid activation. The AE was compiled with the Adam optimizer (learning rate 0.001), MSE loss function, and trained for 10 epochs (batch size: 64). The Transformer model featured an embedding dimension of 64, 4 attention heads, a feed-forward dimension of 64, and a dropout rate of 0.1. It included positional encoding and two encoder blocks with multi-head attention, dropout, and layer normalization. The model was compiled with the Adam optimizer (learning rate 0.001), binary crossentropy loss function, and trained for 10 epochs (batch size: 64).

4.2. **Evaluation model.** The implemented model was evaluated for performance using Equations (20)-(24), as shown in Table 2. The evaluation included comparisons among hybrid AE-Transformer, DNN, LSTM, RNN, and Ensemble models, with results depicted in Figure 2. The hybrid AE-Transformer model demonstrated superior performance compared to the other algorithms.

Table 2. Model evaluation results

Method	Model evaluation results				
	Ac	Pr	Re	F1-Score	AUC
DNN	0.949	0.866	0.068	0.127	0.79
LSTM	0.946	0.0	0.0	0.0	0.50
RNN	0.946	0.0	0.0	0.0	0.74
Ensemble	0.947	1.0	0.021	0.041	0.78
Hybrid AET	0.952	0.866	0.137	0.041	0.81

Figure 2 illustrates the ROC curves comparing the performance of DNN, LSTM, RNN, Ensemble, and hybrid AE-Transformer models. The hybrid AE-Transformer achieved the highest AUC (0.81), followed by DNN (0.79). Ensemble and RNN models scored AUCs of 0.78 and 0.74, respectively, while LSTM had the lowest AUC at 0.50.

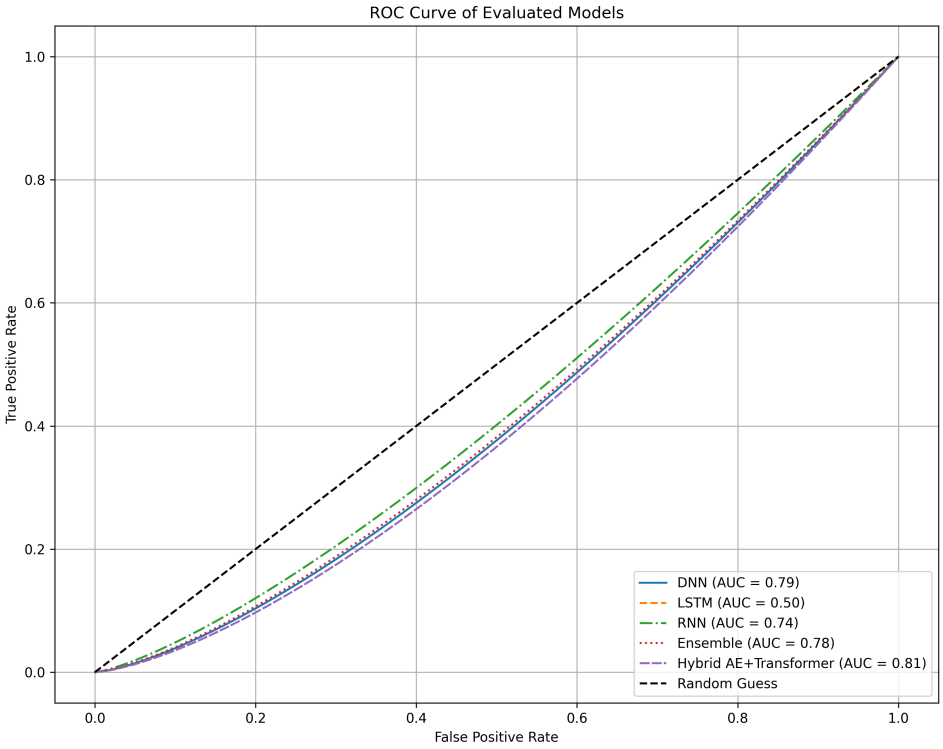

FIGURE 2. ROC curve of evaluated models

4.3. **Testing.** The proposed Hybrid AET model was evaluated on two datasets: a credit card fraud dataset (284,807 records) and the IEEE-CIS Fraud Detection dataset (590,540 records). As shown in Table 3, the model achieved the highest AUC (0.9773) and accuracy (0.9993) for Dataset 1, and AUC (0.793) and accuracy (0.952) for Dataset 2, with balanced precision and recall. The Ensemble model followed with slightly lower AUCs, while DNN and RNN showed moderate performance. LSTM performed poorly, with an AUC of 0.5. These results highlight the effectiveness of the Hybrid AET model for e-commerce fraud detection.

TABLE 3. Model evaluation testing dataset

Dataset		DNN	LSTM	RNN	Ensemble	Hybrid AET
Dataset 1	Ac	0.237	0.9984	0.9984	0.9989	0.9993
	Pr	0.0021	0.0	0.0	0.8125	0.7813
	Re	0.9677	0.0	0.0	0.4194	0.8065
	F1	0.0041	0.0	0.0	0.5532	0.7937
	AUC	0.8948	0.5	0.8555	0.9301	0.9773
Dataset 2	Ac	0.949	0.946	0.946	0.947	0.952
	Pr	0.866	0.0	0.0	1.0	0.866
	Re	0.068	0.0	0.0	0.021	0.137
	F1	0.127	0.0	0.0	0.041	0.041
	AUC	0.774	0.5	0.74	0.789	0.793

4.4. **Discussion.** The Hybrid AET model demonstrated robustness and scalability in e-commerce fraud detection, effectively balancing precision and recall while achieving high AUC values. Its hybrid architecture, combining Autoencoders for dimensionality reduction and Transformers for capturing complex data dependencies, addresses limitations of traditional models in handling high-dimensional data and subtle anomalies. The findings

highlight the model's potential for real-time fraud detection in large-scale e-commerce systems. However, its computational complexity and reliance on high-quality training data present challenges for practical implementation. Future research should focus on optimizing computational efficiency and improving adaptability to diverse datasets.

5. **Conclusions.** This study introduced a Hybrid AET model for anomaly detection in e-commerce fraud, combining Autoencoders for dimensionality reduction and Transformers for capturing data dependencies. The model consistently outperformed traditional methods (DNN, LSTM, RNN, and Ensemble) across two datasets, achieving the highest AUC of 0.9773 on Dataset 1 and 0.793 on Dataset 2. These results demonstrate its capability for accurate fraud detection with a balanced precision and recall.

The findings highlight the model's potential for real-time fraud detection in e-commerce systems, improving transaction security while handling large data volumes. However, challenges such as high computational demands, dependency on data quality, and model complexity must be addressed. Future work should focus on optimizing computational efficiency, enhancing model interpretability, and expanding its application to other fraud domains.

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