VIETNAM NATIONAL UNIVERSITY, HANOI
INTERNATIONAL SCHOOL

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

EXAMINER'S REPORT ON GRADUATION THESIS

Candidate: Nguyen Dinh Thanh

Thesis title: Early Detection Autism Spectrum Disorder in Children Using Machine Learning

Major: Informatics and Computer Engineering

Code: 8480111.01QTD

Examiner:

Place of work:

I. COMMENT

1. The necessity, scientific significance and practicality of the thesis

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition for which early identification is important because timely intervention may improve communication, social interaction, and adaptive development. Conventional assessment relies heavily on behavioral observation and specialist expertise; therefore, objective and quantitative screening support based on eye-tracking and artificial intelligence is a relevant and timely research direction.

Scientifically, the thesis investigates a multimodal feature set combining gaze behavior, computational saliency, and object/face-related attention, and evaluates several conventional classifiers, ensemble methods, and a multilayer perceptron under a common experimental framework. The work is useful as an empirical study on the suitability of different learning algorithms for ASD-related visual-attention patterns.

Practically, the study illustrates the possibility of developing a non-invasive, computer-assisted screening aid. However, the proposed system should currently be considered a research prototype rather than a clinically validated diagnostic tool because the dataset is small, the reported accuracy is moderate, and external validation has not been conducted.

2. Reliability and relevance of the thesis

The thesis topic is generally relevant to the Master's program in Informatics and Computer Engineering. The title, objectives, methodology, and experimental section are broadly consistent with one another. The use of the public Saliency4ASD dataset, standard machine-learning algorithms, and commonly used performance metrics provides a reasonable basis for experimental investigation.

The overall workflow - data preparation, feature engineering, model training, ensemble construction, and evaluation - is appropriate. Nevertheless, the reliability of the conclusions depends strongly on how samples are divided into training, validation, and test sets. Because only 28 participants are included, the thesis must clearly demonstrate that the split is performed at the participant level. If image-level observations from the same participant appear in both training and test sets, information leakage may occur and the reported performance may be overly optimistic. This crucial issue is not sufficiently clarified in Sections 3.1-3.4 (pp. 15-25).

The thesis does not appear to duplicate a single existing work; however, its methodological novelty is mainly in the integration and comparative evaluation of established features and classifiers. The contribution should therefore be stated more precisely as an applied multimodal framework and systematic experimental comparison, rather than as a fundamentally new learning algorithm.

3. Strong points and weak points of the thesis's content, structure, and format

Strong points:

1. The thesis addresses an interdisciplinary and socially meaningful topic at the intersection of artificial intelligence, computer vision, eye-tracking, and healthcare.
2. The proposed framework combines fixation-based measures, saliency-related descriptors, and face/object attention features, thereby capturing several complementary aspects of visual behavior
3. A relatively broad range of learning methods is evaluated, including Random Forest, XGBoost, SVC, AdaBoost, CatBoost, stacking, soft voting, and MLP.
4. The experimental chapter reports several clinically relevant metrics, particularly recall and F2-score, rather than relying only on accuracy.
5. The general organization into introduction, background, methodology, experimental results, and conclusions is understandable and suitable for a master's thesis.

Weak points:

1. Literature review and research gap (Sections 2.4.3 and 2.6, pp. 12-14): The review remains largely descriptive and does not systematically compare related studies. A summary table should be added, including dataset, number of subjects, input modality, feature type, model, validation protocol, performance, and limitation. The research gap should then be derived directly from this comparison. Particularly, no reference is provided in Chapter 2.
2. Incorrect equations (Section 2.5.3, p. 13): The recall and precisions formulas are the same. The thesis states TP/(TP+FP), which is the precision denominator. Recall (sensitivity) must be TP/(TP+FN). Please check.
3. Dataset (pp. 15-16): No references for the Dataset.
4. Chapter 3 is organized more as a review of machine learning algorithms than as a description of the proposed research methodology. The rationale for selecting each technique, the connections among different processing stages, and their contributions to the overall framework are not adequately discussed. Consequently, the chapter lacks a systematic structure and is not sufficiently focused on the specific objectives of the thesis.
5. Comparison with prior work (Section 4.1.5, pp. 35-36): The discussion compares models only within the thesis. It should compare the obtained results with published studies using Saliency4ASD or similar eye-tracking datasets under comparable validation conditions. Without this, it is difficult to assess the actual advancement over the state of the art.
6. Presentation and consistency issues (multiple pages): The thesis contains duplicated or inconsistent front-matter entries (e.g., 'LIST OF TABLES' appears twice in the contents), inconsistent chapter descriptions in Section 1.3, broken words and punctuation, and several double periods. The manuscript requires thorough English proofreading and format checking. Figure resolution and readability in Figures 4.1-4.10 should also be improved.
7. References (pp. 40-45): Several entries contain editorial notes such as 'Verify on IEEE Xplore', 'Verify on PubMed', or explanatory comments in parentheses. These are not acceptable in a final reference list. The author should verify bibliographic accuracy, remove such notes, standardize citation style, and ensure that all references are directly relevant to the thesis.

II. QUESTIONS

1. Why did you choose the Saliency4ASD dataset for this study? What are its main advantages and limitations?
2. Chapter 3 mainly introduces the selected machine learning algorithms but lacks a systematic description of their implementation. The proposed methodology would be clearer if it were

presented as a flowchart or a step-by-step implementation procedure illustrating the complete workflow from data preprocessing to model evaluation.?

III. CONCLUSION

The thesis addresses a relevant research problem and demonstrates considerable effort in integrating eye-tracking, saliency analysis, computer vision, and machine-learning methods. The experimental results provide preliminary evidence that multimodal visual-attention features can support ASD-related classification. The thesis generally has the scope and structure expected of a master's research project.

However, several issues must be clarified or corrected, for example format presentation, the incorrect recall equation, qualify of the Figures.

Subject to satisfactory clarification and revision of the above points, the thesis can be submitted to the Master's Thesis Examination Committee. I recommend that the candidate be allowed to defend the thesis.

Hanoi, July 10th, 2026

EXAMINER

DAO QUY THINH

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Hanoi, ... 11 / 7 / 2026

RESOLUTION OF THE MASTER THESIS EXAMINATION COMMITTEE

Pursuant to the Decision No. .2840.../QD-DHQGHN issued on 24/.06./202.6 by President of Vietnam National University, Hanoi on establishing the Master thesis examination committee to examine the master thesis of the student .Nguyễn Đình Thanh..... (date of birth: .02../.02../2001

Thesis title: .....

.....Early Detection Autism Spectrum Disorder.....

.....in Children using Machine Learning Techniques

Major: .....ICE.....

Code: .....8480111 01 QTD.....

The thesis examination committee conducted a meeting at 10.:.07(hour/minute), on 11./7.../2026 at VNU - International School.

After the candidate's presentation on the thesis, opponents' review, committee members' comments, candidate's answers, the committee deliberated and came to a conclusion:

1. The necessity, scientific significance and practicality of the thesis topic

.....

.....Necessity & practicality: Minimizes subjectivity and time in traditional clinical screening by automating the early detection of ASD.....

.....Scientific significance: proposes a multimodal framework integrating gaze metrics, SAM, ResNet, and social context.....

.....

2. Structure, research methodology, references, etc., of the thesis

- Methodology : Saliency 4 ASD dataset, using RF, XG Boost, SVC, AdaBoost, MLP and Ensemble methods
- References ~ 32 references covering computer vision, eye tracting and autism research

3. Research outcomes:

- Nave Bayes achieved the best accuracy.
- Do not have comparison with other study.

4. Limitations and requests for thesis correction *(if any)*:

- Add citation to the literature review.
- Add the flow chart of the algorithm.
- Other : follow the examiner's report

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Thesis marked: ..8../..10.

Outcome of master thesis defense of candidate .....:

Qualified: ☑ Unqualified: ☐

(The thesis is qualified if the average score marked by the Committee is 5.5 or higher).

This resolution is passed by .03../..03 members of the Committee.

SECRETARY OF THE THESIS EXAMINATION COMMITTEE	**CHAIR OF THE THESIS EXAMINATION COMMITTEE**
Pham Thi Viet Huong	Nguyen Quang Thuan

Certification by VNU - International School
P.P. RECTOR
OFFICE OF ACADEMIC AFFAIRS

Hoàng Tuyết Minh

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Hanoi, ...11./7./....., 2026

MINUTES OF MASTER THESIS DEFENSE

The master thesis defense session of student: ..Nguyễn Đình Thanh.....
(date of birth: .02../.02./...2001.) was conducted at .10:..00(hour/minute), on ..11./..7../2026.
at VNU - International School.

Thesis title: .....
.....Early Detection Autism Spectrum Disorder in
.....Children using Machine learning Techniques.
Major: .....ICE.....
Code: .....8481011.01.QTD.....
Members of the Master thesis examination committee are present: .3./3

No	Full name	University/ Organizations	Role in Committee	Note
1	TS. Nguyễn Quang Thuận	VNU - IS	Chair	
2	PGS.TS. Đào Quý Thịnh	HUST	Opponent	
4	TS. Phạm Thị Việt Hường	VNU IS	Secretary	

PART I: INTRODUCTION

1. Representatives of VNU - International School made welcoming remarks including:

- Introduction of the master thesis defense and participants;

- Announcement about Decision of the President of Vietnam National University, Hanoi on establishing the Master thesis examination committee (Decision No. 2..84.0./QD-DHQGHN issued on 24./.6.../202.6).

PART II: THESIS DEFENSE SESSION

1. TS. Nguyễn Quang Thuận – The Chair led the Master thesis examination committee.

2. TS. Pham Thi Viet Huong – The Secretary of the Committee announced the scientific background and conditions for master thesis defense of the candidate (candidate's scientific background file and academic results are attached).

3. The candidate Nguyễn Anh Thanh made a presentation on the thesis.

4. PGS TS Đào Quý Thuỷ – Opponent commented on the thesis (with attached documents).

5. Questioning period from members of the Committee:

1. Why choose this dataset ?

2. Add the flowchart of the algorithm

6. Candidate's answers

1. The supervisor introduces the dataset

7. The Secretary of the Committee commented on the thesis conducting progress of the candidate (with attached document).

8. Committee's Deliberations:

- Election of Vote counting committee:

1. Chair: Pham Thi Viet Huong
2. Member: Đào Quý Thuỷ

- The examination committee voted by secret ballot.

- The vote counting committee:

+ The Chair reported the vote counting result (with attached vote counting record).

- The Examination committee deliberated and came to a conclusion on the thesis examination by reaching a consensus on the assessment resolution on the thesis. The resolution concluded:

The student's thesis satisfies the requirements of a master's thesis with revisions.

PART III: OUTCOME OF THE EXAMINATION PROCESS

1. The Chair of the Vote Counting committee announced the result of the ballot on the thesis examination.

2. The Chair of the Examination Committee announced the resolution on the thesis examination.

3. The Chair of the Examination Committee made statements and gave controls to the organizer.

The thesis defense session ended at 10:45 (hour/minute), on 11/7/2016

Hội đồng đánh giá đề án nhất trí thông qua đề án của học viên Nguyễn Đình Thanh đạt yêu cầu với kết quả (thang điểm ...): 8.8 điểm (Bằng chữ: eight point eight). Học viên cần chỉnh sửa một số nội dung theo yêu cầu Hội đồng và nộp đề án hoàn thiện cho Trung tâm Thông tin - Thư viện, Đại học Quốc gia Hà Nội theo quy định.

SECRETARY OF THE THESIS EXAMINATION COMMITTEE	**CHAIR OF THE THESIS EXAMINATION COMMITTEE**
Phạm Thị Việt Hường	Nguyễn Quang Thuấn

Certification by VNU - International School
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Hanoi, ...11../.7..../...., 202.6

MINUTES OF VOTE COUNTING COMMITTEE
OF THE MASTER THESIS EXAMINATION COMMITTEE

Pursuant to the Decision No. .2840/QD-DHQGHN issued on 24/06../202.6 by President of Vietnam National University, Hanoi on establishing the Master thesis examination committee, the committee conducted a meeting at at 10..:..00 (hour/minute), on .24./.6.../2026. at VNU - International School to examine the master thesis of the candidate .....Nguyễn Anh Thắn.....

Thesis title: .....

.....Early Detection Autism Spectrum Disorder in .....Children using Machine learning Techniques

Major: .....ICE.....

Code: .....8480111.01.QTP.....

The vote counting committee was voted:

1. Chair: .....Phạm Thị Việt Hường.....
2. Member: .....Đào Quý Thuần.....

The number of members presenting is ..03/03, the members who are opponents are 01../..03

Number of votes distributed to members: ...03...

Number of unused remaining votes: ...0....

Number of valid votes: ..03..

Number of invalid votes: .....0...

Number of votes for the score ..8.6 is: ..2....

Number of votes for the score ..8..7 is: ..1....

Number of votes for the score ..... is: .....

Average score: ..8..8../....10...

(In text: ...eight...point...eight.....)

Note: The thesis score is the average of scores marked by the examination committee's members presenting in the thesis defenses session, taken to one decimal place and not rounded.

MEMBER OF THE VOTE COUNTING COMMITTEE	CHAIR OF THE VOTE COUNTING COMMITTEE
(sign with full name)	*(sign with full name)*
Đào Quý Thuỷ	Phạm Thị Việt Hường

Certification by VNU - International School

P.P. RECTOR

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DEFENSE SCORE SHEET FOR MASTER THESIS

Pursuant to the Decision No. 2840.../QĐ-ĐHQGHN issued on 24./.06./2026. by President of Vietnam National University, Hanoi on establishing the Master thesis examination committee, the committee conducted a meeting at ....:..... (hour/minute), on .11./..7.../2026.. at VNU - International School to examine the master thesis of the candidate Nguyễn Anh Thanh

Thesis title:

Early Detection Autism Spectrum Disorder in Children using machine learning techniques

Major: ICE

Code:

Comments:

- The structure is logical and clear.
- There is no citation in the thesis.
- It is much better if the thesis make a comparison or state about the proposed methods with the existed methods.

Result: *(The mark of each committee member is on ……-point scale, possibly odd to one decimal place):*

- In number: ….8.8…… marks
- In text: eight point eight marks

Hanoi, ……17/7……, 2026

Marker

Nguyễn Quang Thuận

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DEFENSE SCORE SHEET FOR MASTER THESIS

Pursuant to the Decision No. 2840/QĐ-ĐHQGHN issued on 24/6/2026 by President of Vietnam National University, Hanoi on establishing the Master thesis examination committee, the committee conducted a meeting at 10:00 (hour/minute), on 11/7/2026 at VNU - International School to examine the master thesis of the candidate Nguyễn Đình Thành

Thesis title: Early Detection Autism Spectrum Disorder in Children using Machine learning Techniques

Major: ICE

Code: 8480111.01QTP

Comments:

- No citation

- No comparison with other study

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Result: *(The mark of each committee member is on ……-point scale, possibly odd to one decimal place)*:

- In number: ……8.7…… marks
- In text: ..eight..point..seven marks

Hanoi, ..11/7/..……, 2026.

Marker

Phạm Thị Việt Hường

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DEFENSE SCORE SHEET FOR MASTER THESIS

Pursuant to the ~~Decision~~ No. 2840...../QĐ-ĐHQGHN issued on 29../06../2026.. by President of Vietnam National University, Hanoi on establishing the Master thesis examination committee, the committee conducted a meeting at ....:..... (hour/minute), on 11./.7.../2026. at VNU - International School to examine the master thesis of the candidate Nguyễn Đình Thanh

Thesis title:

Early ~~Detection~~ Autism ~~Detection~~ Spectrum Disorder in Children using machine learning techniques

Major: ICE

Code:

Comments:

Good

Result: *(The mark of each committee member is on ……-point scale, possibly odd to one decimal place):*

- In number: ……8.8…… marks
- In text: ..Eight….point..eight marks

Hanoi, …July…11th……, 2026

Marker

Dao Quy Thinh