

AI-Driven Diagnostic Systems: Utilization of Computer Vision Techniques and Deep Learning Methods for Early-Stage Detection in Medical Imaging

Research Proposal

Abstract

Technological advancement has revolutionized medical science, so diagnosis has become easier. In this case, AI has a significant role in making the journey relevant. The AI-driven diagnosis system is exciting and useful because it has the power of computer vision which enhances the early detection of diseases from medical images. Computer vision and deep learning are two important parts of AI technology which has made a revolutionary change in medical imaging. With this, the problems in the human body can be diagnosed and early precautions can be adopted. In recent time, breast cancer has become a frequently occurred disease among female. AI tool deep learning has a significant role in rapid detection of breast cancer through pathological images. The main aim of this research is to evaluate the role of technological advancement in the revolution of medical science in the case of ensuring accuracy and speedy diagnosis of breast cancer. In this research, mixed-method approach will be adopted by collecting primary and secondary data.

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Introduction

In modern medicine, medical imaging has become a blessing. Techniques such as X-rays, MRIs, CT scans, and ultrasounds provide crucial visual information about the internal structures of the body (Dodda, 2024). These images help doctors diagnose a wide range of conditions, from broken bones to tumours, cancers and guide treatment decisions (Yeasmin, 2024). However, the interpretation of these images can be a difficult task as a large volume of images needs to be checked and a disease carefully. In this modern era, AI technology has eased this challenge by using two technologies- computer vision and deep learning (Pinto, 2023).

In computer vision, the computers mainly interpret the images and understand the visual information (Tian, 2024). Computer vision algorithms are used to analyse and identify the special features in the pictures. Therefore, the results in the pictures can be easily identified which sometimes becomes difficult for human eyes (Kalra, 2024). Another way is deep learning where the artificial neural networks are trained to perform tasks by expressing them in large amounts of data. these models learn to identify complex patterns and features in images that are indicative of various medical conditions (Esteva, 2021).

There are some benefits of using AI in medical imaging which has brought a revolutionary change (Vijayalaxmi, 2024). Firstly, the diseases can be early and the doctors can prescribe necessary treatments at the very beginning of the disease. Secondly, AI-driven tools can give accurate interpretation of images which can create errors by the human eyes (Ma, 2023). So, the diagnosis can be accurate and reliable. Thirdly, through automating the analysis of medical images, AI can streamline the diagnostic process. This not only speeds up the time it takes to get results but also allows healthcare professionals to focus on patient care rather than spending time on routine image analysis. Finally, high-quality diagnosis can be ensured in rural areas where the technology is not widely available (Zeb, 2024). These tools can support local healthcare providers by providing advanced diagnostic capabilities that might otherwise be unavailable (Savadjiev, 2019). Apart from these benefits, there are some disadvantages as well. Data privacy is not ensured in this technology. Also, there can be a presence of potential biasness which may give misleading information sometimes. Additionally, using AI is not a widely accepted and easy process. Many people don't know about its benefits and don't use it in daily diagnosis (Albahli, 2021). Moreover, integrating this technology in medical imaging can be a costly process which may take time to be effective.

Breast cancer has become a serious disease now a days. Many women are getting affected with this disease but it can be cured & patient can be saved if early detection is possible. In this case the role of AI tool-deep learning is beyond description. The images found from the biopsy report from pathological images can be useful in this regard. Deep learning techniques have demonstrated significant tools in medical image analysis through the segmentation task. Therefore, in this research the deep learning tools and its effectiveness in early detection of breast cancer will be elaborately discussed.

Literature Review

According to Thakur (2024), disease prediction through medical imaging has become an easy task due to the presence of innovative technology AI. The presence of models ensures early detection of diseases which may create the opportunity to prevent some fatal diseases from an early stage. The authors conducted this research to identify the role of AI tools in the early detection of diseases. They have conducted quantitative research by collecting secondary data. They have developed an algorithm model of machine learning which may detect diseases in the primary stages. Therefore, the authors have easily detected the role of AI tools in early disease detection. The research result reflected that there is a significant role AI tools in ensuring early disease detection as many fatal diseases can be easily prevented. The authors welcomed more research activities in this area.

According to Nazir (2024), the role of one of the tools of AI which is deep learning is highly beneficial in the improvement of cancer diagnosis, drug discovery and gene editing. The authors conducted this research to identify the role of deep learning in the advancement of medical treatment and diagnosis. The authors conducted quantitative research by collecting secondary data. They developed a model which developed an idea of how AI integration is useful in medical diagnosis. The authors utilized the Federated Learning concepts in the ethical implications of medical diagnosis. The research result reflected that the decision-making process becomes easier through the usage of AI tools. Also, the accuracy of the diagnosis can be ensured. So, the authors welcomed extensive research activities in this area.

According to Sharma (2020), in this research, the authors mainly focused on the current and future roles of AI tools in medical diagnosis. In the case of CT scans, X-rays AI can easily detect the

diseases in the early stage and the medical professionals can prescribe the required treatment. Therefore, the medical diagnosis can be easier, less time-consuming and reliable. The authors conducted review research by following qualitative data. They collected the research gaps and found out the role of AI tools in medical activities. The research result reflected that, in most cases, AI tools are so effective and rapid they may not be possible by the human eyes even. Therefore, the author welcomed more research works on this area so that AI tools can be incorporated into the medical disease detection in future.

Research Aim

This research aims to evaluate the beneficial impacts of using AI-driven diagnosis tool-deep learning segmentation in detecting early-stage breast cancer through pathological images to adopt some preventive measures.

Research Objectives

- Evaluating the performance of different deep learning architectures for the detection of early-stage breast cancer.
- Investigating the influence of dataset diversity & size in the performance of segmentation models.
- Exploring the potential benefits of using dataset & multiple magnification levels to improve segmentation accuracy and identifying the challenges.
- Developing a robust & accurate deep learning segmentation model for breast cancer detection and integrating it in the clinical workflows.
- Providing some recommendations for further research activities.

Problem Statement

For starting medical treatments for curing breast cancer from the very early stage of a disease, it is important to ensure early detection. This can reduce the death rates from fatal diseases. Traditional methods can make the cancer diagnosis lengthy and involve an expert radiologist. Also, this can't ensure the errorless and rapid results of the test. In this regard, deep learning segmentation can be useful and rapid. Recent advancements in AI, particularly through computer vision and deep

learning, offer promising solutions to medical challenges by automating and enhancing the diagnostic process (Panayides, 2020). Despite these advancements, there is still a need for comprehensive research to evaluate the effectiveness, reliability, and clinical applicability of deep learning segmentation in diagnostic systems in detecting breast cancer at an early stage through pathological images.

Research Questions

- How effective the performance of different deep learning architectures for the detection of early-stage breast cancer ?
- What is the influence of dataset diversity & size in the performance of segmentation models ?
- What is the potential benefits of using dataset & multiple magnification levels to improve segmentation accuracy and identifying the challenges ?
- What will be a robust & accurate deep learning segmentation model for breast cancer detection and integrating it in the clinical workflows?

Proposed Methodology

Research Design: In this research, the quantitative method will be applied. So, data from different secondary sources will be considered in this regard.

Data Collection: Data will be collected in two ways:

- Public Database: Widely accessible data like the Cancer imaging archive, Kaggle's medical imaging datasets, or the MIMIC-CXR database will be followed.
- Clinical Data: The reports from various breast cancer institutions will be evaluated.
- Type of Image: Breast cancer pathological images of benign & malignant cases.

Deep learning Model Selection & Training:

- Deep learning architecture "Deep lab" will be selected based on the performance & medical image segmentation.
- Normalization & Augmentation: Rotation, scaling and flipping to ensure accuracy of data.

- Training the models will be done through loss functions like dice loss & cross entropy. Again, the optimization algorithm will be Adam & SGD.

Model Evaluation :

Algorithm Selection: According to the image type, and following deep learning tools two approaches can be adopted.

- Convolutional Neural Network: feature extraction and classification
- Transfer learning: pre-trained models such as ResNet, VGG, or Inception as a starting point to leverage their learned features.
- For checking the performance precession, recall, F1-score & Intersection over Union will be adopted.

Data Analysis

- Conducting statistical analysis like regression, random and fixed effect analysis to identify the validation of the collected data.
- The external validation of data will be done by testing the model on the independent dataset to verify the practical utility.

Expected Outcome

- Comparing the performance of different deep learning segmentation methods for the detection of breast cancer through pathological images.
- Analysing the impact of dataset sizes, diversity & magnification levels in the detection of breast cancer in early stage.
- Developing the robust and accurate deep learning segmentation model in breast cancer detection.

References

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Vijayalakshmi, A., & Joshi, H. (2024). Elevating Medical Imaging: AI-Driven Computer Vision for Brain Tumor Analysis. In *Intersection of AI and Business Intelligence in Data-Driven Decision-Making* (pp. 331-350). IGI Global.

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Zeb, S., Fnu, N., Fahad, M., Qayyum, M. U., & Abbasi, N. (2024). Enhancing Diagnostic Accuracy for Medical Imaging and Radiology with AI-Driven Synergy Tools: Enabling Early Intervention and Preventive Measures through Early Detection of Cardiovascular Conditions. *European Journal of Science, Innovation and Technology*, 4(4), 38-47.

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Personal Website [↗](#)

Research Interest Software Engineering, Microservices, Computer Vision, Deep Learning

PROJECTS

Obhai Cashless Ride-Sharing Platform: I have made significant contributions to the development and implementation of a sophisticated, enterprise-level ride-sharing software solution, characterized by entirely digitised transactions, providing a seamless user experience while ensuring a high level of robustness and reliability. [↗](#)

Taxi Fare Prediction: I have developed a regression ML model which takes estimated taxi fare based on distance and travel time of any place in Bangladesh as input and output a range of fare with a prediction score denoting the customer's probability to take the ride with that fare. The model is trained with 10 million data points of Obhai customer's historical journey and behavioural data [↗](#)

Crop Land Classification: Computer Vision and Deep Learning project. I have utilised a deep single Magnificence model and trained it with cropland satellite imagery from USDA's CDL (Cropland Data Layer) and NAIP (National Agriculture Imagery from the USGS Earth Explorer of Kansas, U.S.A. The model can classify 6 croplands from the region [↗](#) .

Thesis: Detection of Acute Lymphocyte Leukemia (ALL) AND Its Type By Image Processing and Machine Learning. [↗](#)

Drowsy Driver Detection: A Computer Vision and Deep Learning project utilising the Dlib's facial landmark detection algorithm to detect drowsiness through studying eye aspect ratio. [↗](#)

e-Library: A Desktop app built on Electron and client-side database. It is a user-friendly in-house library management system which includes book stock management, and record keeping of books taken. It also includes an alert system to notify the user to return the books before the due date. The app includes 2-factor authentication and role-based access. [↗](#)

Current Research **Deep Multi Magnification Network for Multi-Class Breast Cancer Tissue Segmentation:** Currently, I am studying a Deep Multi Magnification Network architecture which takes input image patches of multi magnification level and outputs the classification and segmentation of the tissues. Currently, the model can segment 6 classes of tissues. My objective is to retrain the network with publicly available datasets and to include more class predictions to increase the accuracy of the pathological examination of breast cancer. [↗](#)

SKILLS

- **Languages:** JavaScript, Python, MATLAB, SQL, NoSQL, Java
- **Libraries:** jQuery, NumPy, SciPy, Pandas, Scikit-Learn, Matplotlib, Keras, TensorFlow, PyTorch
- **Paradigms:** Algorithms, System Architecture, Code Versioning, Statistical Analysis, Data Cleaning, Data Visualization, Data Modeling, Deep Learning, Machine Learning, Database Design, Cloud Engineering
- **Problem-Solving:** Solved about 60 problems on online judges.

EDUCATION

Bachelor of Science, Computer Science and Engineering Sep 2014 - Mar 2019
BRAC University
CGPA: 3.26/4.00 (Major CGPA: 3.50)

EXPERIENCE

Engineering Manager *MGH Logistics Ltd. MGH Group* Jan 2023 - Present

- Engineered tailored adaptation and integration of Infor Nexus for MGH freight forwarding, catering to unique business workflows.
- Established technical partnerships with Levi's, Carrefour, and Inditex, implementing robust Electronic Data Transfer systems to streamline and automate communications among buyers, shippers, and suppliers.

Senior Software Engineer *OBHAI Solutions Limited* Jan 2021 - Dec 2022

- Led the system scaling of OBHAI, the leading ride-hailing platform in the country, to provide daily services to one million customers.
- Introduced a cashless payment system within the application, enabling customers to make direct payments from their digital wallets and ensuring immediate distribution of earnings to riders' digital accounts.
- Supervised incorporating a machine learning-powered fare engine into the platform, which led to a rise in the number of rides by 13

Software Engineer *OBHAI Solutions Limited* April 2019 - Dec 2020

- Implemented a supply-demand driver dynamic fare engine for the ride-sharing platform.
- Developed Financial Administrative modules such as Ride Payment Disbursement, Rider Payable Calculation and BI reports to monitor and maintain the cash flow inside the organisation
- Designed a commission module for ride service providers and developed dynamic performance-based and schedule-based modules to meet requirements. This model is now being embraced by other ride-hailing platforms.

MOOC AND CERTIFICATION

- *Machine Learning (Stanford Online)*
 - Linear Regression and Logistic Regression
 - Hand Written Digit Recognition using Neural Network
 - Implementation of Regularization and Bias-Variance trade-off
 - Spam Classification using Support Vector Machine
 - Image Compression using K-means

- Dimensionality Reduction using Principal Component Analysis
- Anomaly Detection and Recommender System
- *Deep Learning Specialization (deeplearning.ai)*
 - Implementing efficient (vectorized) neural networks
 - Improving Neural Networks using initialization, L2 and dropout regularization, Batch normalization, gradient checking, mini-batch gradient descent, Momentum, RMSprop and Adam.
 - Applying convolutional networks to visual detection and recognition tasks.
 - Applying Recurrent Neural Networks (RNN), and commonly-used variants such as GRU and LSTM.

ID # 14201008



Inspiring Excellence

BRAC UNIVERSITY

has conferred upon

Simadri Choudhury

the degree of

Bachelor of Science in Computer Science and Engineering

with all the rights, honours, privileges and obligations pertaining thereto.

Given in Dhaka, Bangladesh on the 23rd day of November in the year 2019.


Controller of Examinations




Vice Chancellor



BRAC UNIVERSITY

OFFICE OF THE CONTROLLER OF EXAMINATIONS
TRANSCRIPT

Undergraduate Program

Program : BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND ENGINEERING

Page 1 of 2



Student ID : 14201008

Name : HIMADRI CHOWDHURY

Course No	Course Title	Credits Earned	Grade	Grade Points	Course No	Course Title	Credits Earned	Grade	Grade Points
SEMESTER : FALL , 2014					SEMESTER : SUMMER , 2016				
ENG091	FOUNDATION COURSE (IN ENGLISH)	0.0	B-	2.7	SEMESTER	Credits Attempted	9.0	Credits Earned	9.0
PHY111	PRINCIPLES OF PHYSICS I	3.0	C+	2.3	CUMULATIVE	Credits Attempted	42.0	Credits Earned	42.0
SEMESTER	Credits Attempted	3.0	Credits Earned	3.0	GPA	2.87			
CUMULATIVE	Credits Attempted	3.0	Credits Earned	3.0	CGPA	2.94			
SEMESTER : SPRING , 2015					SEMESTER : FALL , 2016				
CSE110	PROGRAMMING LANGUAGE I	3.0	B-	2.7	ACT201	FINANCIAL ACCOUNTING	3.0	B+	3.3
ENG101	FUNDAMENTALS OF ENGLISH	3.0	B	3.0	CSE220	DATA STRUCTURES	3.0	A	4.0
MAT110	MATHEMATICS I: DIFFERENTIAL CALCULUS & COORDINATE GEOMETRY	3.0	B-	2.7	CSE250	CIRCUITS AND ELECTRONICS	3.0	A-	3.7
SEMESTER	Credits Attempted	9.0	Credits Earned	9.0	MAT216	MATHEMATICS IV: LINEAR ALGEBRA & FOURIER ANALYSIS	3.0	C+	2.3
CUMULATIVE	Credits Attempted	12.0	Credits Earned	12.0	SEMESTER	Credits Attempted	12.0	Credits Earned	12.0
SEMESTER : SUMMER , 2015					CUMULATIVE	Credits Attempted	54.0	Credits Earned	54.0
DEV101	BANGLADESH STUDIES	3.0	A	4.0	GPA	3.33			
ENG102	ENGLISH COMPOSITION I	3.0	A-	3.7	SEMESTER	Credits Attempted	12.0	Credits Earned	12.0
HUM103	ETHICS AND CULTURE	3.0	A	4.0	CUMULATIVE	Credits Attempted	66.0	Credits Earned	66.0
SEMESTER	Credits Attempted	9.0	Credits Earned	9.0	GPA	3.65			
CUMULATIVE	Credits Attempted	21.0	Credits Earned	21.0	CGPA	3.14			
VC's List					SEMESTER : SPRING , 2017				
SEMESTER : FALL , 2015					BUS202	BUSINESS LAW	3.0	B+	3.3
CSE230	DISCRETE MATHEMATICS	3.0	C+	2.3	CSE331	AUTOMATA AND COMPUTABILITY	3.0	C+	2.3
CSE260	DIGITAL LOGIC DESIGN	3.0	B+	3.3	CSE341	MICROPROCESSORS	3.0	A-	3.7
MAT120	MATHEMATICS II: INTEGRAL CALCULUS & DIFFERENTIAL EQUATIONS	3.0	C+	2.3	CSE370	DATABASE SYSTEMS	3.0	A-	3.7
STA201	ELEMENTS OF STATISTICS AND PROBABILITY	3.0	C+	2.3	SEMESTER	Credits Attempted	12.0	Credits Earned	12.0
SEMESTER	Credits Attempted	12.0	Credits Earned	12.0	CUMULATIVE	Credits Attempted	78.0	Credits Earned	78.0
CUMULATIVE	Credits Attempted	33.0	Credits Earned	33.0	GPA	3.25			
SEMESTER : SPRING , 2016					SEMESTER : SUMMER , 2017				
BUS101	INTRODUCTION TO BUSINESS	3.0	B+	3.3	CSE251	ELECTRONIC DEVICES AND CIRCUITS	3.0	B	3.0
CSE111	PROGRAMMING LANGUAGE-II	3.0	B	3.0	CSE310	OBJECT ORIENTED PROGRAMMING	3.0	A	4.0
PHY112	PRINCIPLES OF PHYSICS II	3.0	C+	2.3	CSE321	OPERATING SYSTEMS	3.0	B	3.0
					CSE340	COMPUTER ARCHITECTURE	3.0	C+	2.3
					SEMESTER	Credits Attempted	12.0	Credits Earned	12.0
					CUMULATIVE	Credits Attempted	90.0	Credits Earned	90.0
					GPA	3.08			
					CGPA	3.15			
					SEMESTER : FALL , 2017				

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03 Dec 2019

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TRANSCRIPT DETAILS

BRAC University is committed to providing high quality education to meet the demands of the modern age. The University is accredited by the Bangladesh University Grants Commission (UGC) and approved by the Ministry of Education, Government of Bangladesh. BRAC University follows a trimester system which consists of semester-based courses, credit hours, continuous evaluation, letter grade and grade points. The duration of a semester is 13 working weeks.

Course Numbering System

Each course is identified by a two-part numbering system. The first part with three letters represents the subject area and the second part with three digits refers to the level of the course. Undergraduate courses are numbered from 100 to 599. Courses with numbers less than 100 are non-credit courses.

Fresher (1st Year) courses	100-199
Sophomore (2nd Year) courses	200-299
Junior (3rd Year) courses	300-399
Senior (4th Year) courses	400-499
Senior (5th Year) courses	500-599

Grading System

The grading of BRAC University is on scale of 0 to 4 and is indicated by the following manner:

Numerical Scores	Letter Grade	Grade Points
90 - 100	A	4.0
85 - <90	A-	3.7
80 - <85	B+	3.3
75 - <80	B	3.0
70 - <75	B-	2.7
65 - <70	C+	2.3
60 - <65	C	2.0
57 - <60	C-	1.7
55 - <57	D+	1.3
52 - <55	D	1.0
50 - <52	D-	0.7
<50	F	0.0

The performance of students is evaluated through class tests, quizzes, assignments and midterm exams throughout the semester. Semester end evaluation includes final examinations, term papers, project reports etc. Numerical scores earned by a student in tests, examinations, assignments etc. are cumulated and converted to letter grades.

CGPA Computation

The Grade Point Average (GPA)/Cumulative Grade Point Average (CGPA) are computed in the following manner:

$$\text{CGPA} = \frac{\text{Sum of (Grade points x Credits)}}{\text{Sum of Credits Attempted}}$$

Academic Standing

CGPA	Standing
3.80 to 4.00	Highest Distinction
3.65 to 3.79	High Distinction
3.50 to 3.64	Distinction
2.00 to 3.49	Satisfactory

The following grade notations are not part of the GPA computation:

P	: Pass
S	: Satisfactory
W	: Withdrawal
AU	: Audit

Transfer of Credits

Transfer of credits from institutions having equivalent curriculum, grading system and grading standard may be allowed to transfer. Credit transfer from other institution should not exceed 50% of the courses required for degree completion at BRAC University. The university will consider applications for transfer of credit on a case-by-case basis.

Requirements for the Bachelor's Degree

For graduation, a student must complete the requisite number of credits of each course works generally spread over four years and meet other requirements depending on the program and must maintain a CGPA of 2.00. The University, however, reserves the right not to award the degree on disciplinary or similar grounds.

Release of Information

This transcript will not be released to a third party without written consent of the student.

Medium of Instruction

English is the medium of instruction at BRAC University.

Authenticity

Official Transcripts are printed on papers with specific security features with an embossed seal of the university signed by the Controller of Examinations.

For further information visit www.bracu.ac.bd or send e-mail to info@bracu.ac.bd, academic.records@bracu.ac.bd



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Undergraduate Program

Program : BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND
ENGINEERING

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Student ID : 14201008

Name : HIMADRI CHOWDHURY

Course No	Course Title	Credits Earned	Grade	Grade Points
CSE320	DATA COMMUNICATIONS	3.0	A	4.0
CSE360	COMPUTER INTERFACING	3.0	A-	3.7
CSE420	COMPILER DESIGN	3.0	B	3.0
CSE470	SOFTWARE ENGINEERING	3.0	A-	3.7
MAT215	MATHEMATICS III: COMPLEX VARIABLES & LAPLACE TRANSFORMATIONS	3.0	A-	3.7

SEMESTER	Credits Attempted	15.0	Credits Earned	15.0	GPA	3.62
CUMULATIVE	Credits Attempted	105.0	Credits Earned	105.0	CGPA	3.21

SEMESTER : SPRING , 2018

CSE350	DIGITAL ELECTRONICS AND PULSE TECHNIQUES	3.0	B	3.0
CSE421	COMPUTER NETWORKS	3.0	A-	3.7
CSE423	COMPUTER GRAPHICS	3.0	B+	3.3
CSE471	SYSTEM ANALYSIS AND DESIGN	3.0	A	4.0

SEMESTER	Credits Attempted	12.0	Credits Earned	12.0	GPA	3.50
CUMULATIVE	Credits Attempted	117.0	Credits Earned	117.0	CGPA	3.24

SEMESTER : SUMMER , 2018

CSE422	ARTIFICIAL INTELLIGENCE	3.0	B+	3.3
CSE460	VLSI DESIGN	3.0	B	3.0
CSE461	DIGITAL SYSTEM DESIGN	3.0	A-	3.7
ECO101	INTRODUCTION TO MICROECONOMICS	3.0	B	3.0
PSY101	INTRODUCTION TO PSYCHOLOGY	3.0	B+	3.3

SEMESTER	Credits Attempted	15.0	Credits Earned	15.0	GPA	3.26
CUMULATIVE	Credits Attempted	132.0	Credits Earned	132.0	CGPA	3.25

SEMESTER : SUMMER , 2019

CSE400	PROJECT & THESIS		4.0	A-	3.7
SEMESTER	Credits Attempted	4.0	Credits Earned	4.0	GPA 3.70
CUMULATIVE	Credits Attempted	136.0	Credits Earned	136.0	CGPA 3.26

Course No	Course Title	Credits Earned	Grade	Grade Points
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Academic Standing : Satisfactory

***** Transcript Total *****

	Credits Earned	Grade Points	Cumulative GPA
Total Institution:	136.0	443.20	3.26
Total Transfer/Waiver :	0.0	--	--
Total Credits:	136.0	443.20	3.26

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80 - <85	B+	3.3
75 - <80	B	3.0
70 - <75	B-	2.7
65 - <70	C+	2.3
60 - <65	C	2.0
57 - <60	C-	1.7
55 - <57	D+	1.3
52 - <55	D	1.0
50 - <52	D-	0.7
<50	F	0.0

The performance of students is evaluated through class tests, quizzes, assignments and midterm exams throughout the semester. Semester end evaluation includes final examinations, term papers, project reports etc. Numerical scores earned by a student in tests, examinations, assignments etc. are cumulated and converted to letter grades.

CGPA Computation

The Grade Point Average (GPA)/Cumulative Grade Point Average (CGPA) are computed in the following manner:

$$\text{CGPA} = \frac{\text{Sum of (Grade points x Credits)}}{\text{Sum of Credits Attempted}}$$

Academic Standing

CGPA	Standing
3.80 to 4.00	Highest Distinction
3.65 to 3.79	High Distinction
3.50 to 3.64	Distinction
2.00 to 3.49	Satisfactory

The following grade notations are not part of the GPA computation:

P	: Pass
S	: Satisfactory
W	: Withdrawal
AU	: Audit

Transfer of Credits

Transfer of credits from institutions having equivalent curriculum, grading system and grading standard may be allowed to transfer. Credit transfer from other institution should not exceed 50% of the courses required for degree completion at BRAC University. The university will consider applications for transfer of credit on a case-by-case basis.

Requirements for the Bachelor's Degree

For graduation, a student must complete the requisite number of credits of each course works generally spread over four years and meet other requirements depending on the program and must maintain a CGPA of 2.00. The University, however, reserves the right not to award the degree on disciplinary or similar grounds.

Release of Information

This transcript will not be released to a third party without written consent of the student.

Medium of Instruction

English is the medium of instruction at BRAC University.

Authenticity

Official Transcripts are printed on papers with specific security features with an embossed seal of the university signed by the Controller of Examinations.

For further information visit www.bracu.ac.bd or send e-mail to info@bracu.ac.bd, academic.records@bracu.ac.bd

Test Report Form

ACADEMIC

NOTE Admission to undergraduate and post graduate courses should be based on the ACADEMIC Reading and Writing Modules.
GENERAL TRAINING Reading and Writing Modules are not designed to test the full range of language skills required for academic purposes.
It is recommended that the candidate's language ability as indicated in this Test Report Form be re-assessed after two years from the date of the test.

Centre Number

BD050

Date

05/FEB/2023

Candidate Number

029091

Candidate Details

Family Name

CHOWDHURY

First Name

HIMADRI

Candidate ID

19941594134000123



Date of Birth

11/12/1994

Sex (M/F)

M

Scheme Code

Private Candidate

Country or Region
of Origin

Country of
Nationality

BANGLADESH

First Language

BENGALI

Test Results

Listening

7.5

Reading

7.5

Writing

6.0

Speaking

6.5

Overall
Band
Score

7.0

CEFR
Level

C1

Administrator Comments

Centre stamp



Validation stamp



Administrator's
Signature

Eharmee

Date

07/02/2023

Test Report Form
Number

22BD029091CHOH050A

Himadri Chowdhury

Most Recent Test Date: November 21, 2022

Address: TA 140, Middle Badda, Dhaka 1208, Dhaka, 1208 Bangladesh

Registration Number: 1692922

Print Date: May 25, 2023

Email: himadrichowdhury172@gmail.com

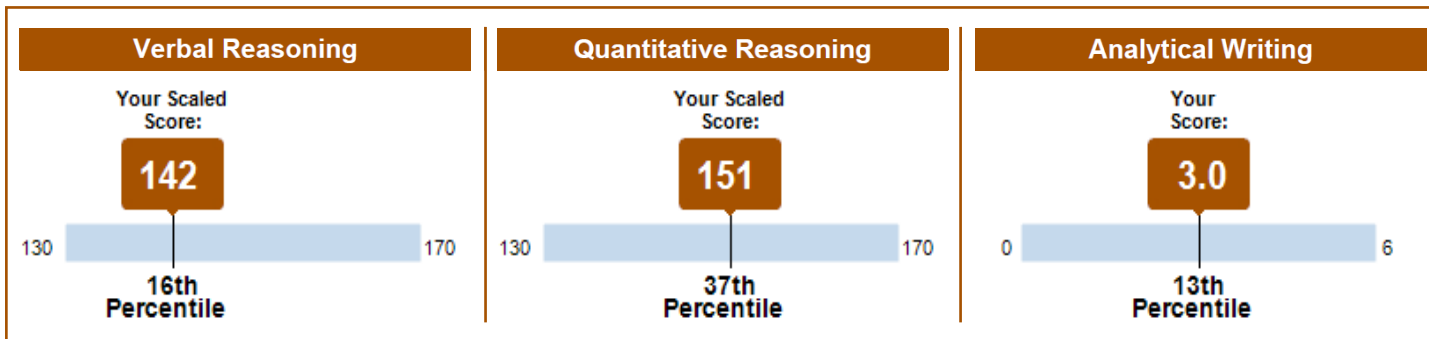
Phone: 880-01826611971

Date of Birth: December 11, 1994

Gender: Male

Intended Graduate Major: Computer Science (0402)

Your Scores for the General Test Taken on November 21, 2022



Your Test Score History

General Test Scores

Test Date	Verbal Reasoning		Quantitative Reasoning		Analytical Writing	
	Scaled Score	Percentile	Scaled Score	Percentile	Score	Percentile
November 21, 2022	142	16	151	37	3.0	13
September 15, 2022	143	18	145	17	3.0	13

Subject Test Scores

You do not have reportable test scores at this time.

Your Score Recipient(s)

Undergraduate Institution

Report Date	Institution (Code)	Department (Code)	Test Title	Test Date
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Himadri Chowdhury

Most Recent Test Date: November 21, 2022

Date of Birth: December 11, 1994

Registration Number: 1692922

Print Date: May 25, 2023

Designated Score Recipient(s)

Report Date	Score Recipient (Code)	Department (Code)	Test Title	Test Date
November 30, 2022	ARIZONA STATE UNIVERSITY (4007)	COMPUTER ENGINEERING (1201)	General Test	November 21, 2022
November 30, 2022	ARKANSAS STATE UNIVERSITY (6011)	COMPUTER ENGINEERING (1201)	General Test	November 21, 2022
November 30, 2022	Kansas State University (6334)	COMPUTER ENGINEERING (1201)	General Test	November 21, 2022
November 30, 2022	Texas AM University Central Texas (6756)	COMPUTER ENGINEERING (1201)	General Test	November 21, 2022
September 28, 2022	ARIZONA STATE UNIVERSITY (4007)	COMPUTER ENGINEERING (1201)	General Test	September 15, 2022
September 28, 2022	Kansas State University (6334)	COMPUTER SCIENCE (0402)	General Test	September 15, 2022
September 28, 2022	Texas AM University Central Texas (6756)	COMPUTER SCIENCE (0402)	General Test	September 15, 2022

About Your GRE® Score Report

Score Reporting Policies

With the *ScoreSelect®* option, you can decide which test scores to send to the institutions you designate. There are three options to choose from:

- Most Recent option – Send your scores from your most recent test administration
- All option – Send your scores from all administrations in the last five years
- Any option – Send your scores from one OR as many test administrations in the last five years (this option is not available on test day when you select up to four FREE score reports)

Scores for a test administration must be reported in their entirety. Institutions will receive score reports that show only the scores that you selected to send to them. There will be no special indication if you have taken additional GRE tests. See the *GRE® Information Bulletin* for details. The policies and procedures explained in the Bulletin for the current testing year supersede previous policies and procedures in previous bulletins.

Scores will be sent to designated score recipients approximately 10-15 days after a computer-delivered test and 5 weeks after a paper-delivered test. If your scores are not available for any reason, you will see "Not Available" in Your Test Score History.

GRE test scores are reportable according to the following policies:

- For tests taken prior to July 1, 2016, scores are reportable for five (5) years following the testing year in which you tested (July 1 – June 30). For example, scores for a test taken on May 15, 2015, are reportable through June 30, 2020. GRE scores earned prior to August 2011 are no longer reportable.
- For tests taken on or after July 1, 2016, scores are reportable for five (5) years following your test date. For example, scores for a test taken on July 3, 2016, are reportable through July 2, 2021.

Note: Score recipients will only receive scores from test administrations that you have selected to send to them.

Percentile Rank (% Below)

A percentile rank for a test score indicates the percentage of test takers who took that test and received a lower score. Regardless of when the reported scores were earned, the percentile ranks for General Test and Subject Test scores are based on the scores of all test takers who tested within the most recent three-year period.

Himadri Chowdhury**Most Recent Test Date: November 21, 2022****Date of Birth:** December 11, 1994

Registration Number: 1692922

Print Date: May 25, 2023

Retaking a GRE Test

You can take the GRE® General Test *once every 21 days*, up to *five times* within any continuous rolling 12-month period (365 days). This applies even if you canceled your scores on a test taken previously. You can take the paper-delivered GRE General Test and GRE® Subject Tests as often as they are offered.

Note: This policy will be enforced even if a violation is not immediately identified (e.g., inconsistent registration information) and test scores have been reported. In such cases, the invalid scores will be canceled and score recipients will be notified of the cancellation. Test fees will be forfeited.

For More Information

For information about interpreting your scores, see *Interpreting Your GRE Scores* at www.ets.org/gre/test-takers/general-test/scores/understand-scores.

For detailed information about your performance on the Verbal Reasoning and Quantitative Reasoning sections of the computer-delivered GRE General Test, access the free GRE Diagnostic Service from your ETS account. This service includes a description of the types of questions you answered right and wrong, the difficulty level of each question, and the time spent on each question. This service is available approximately 15 days after your test administration and for six months following your test administration.

If you have any questions concerning your score report, email GRE Services at gre-info@ets.org or call 1-609-771-7670 or 1-866-473-4373 (toll free for test takers in the U.S., U.S. Territories and Canada) between 8 a.m. and 7:45 p.m. (New York Time).