Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Final Examination, Spring 2026
Course Code: CSE414, Course Title: Research Innovation & Technical Writings
Level:4 Term:1 Batch: 64

Time: 02:00 Hrs **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.

Table 1: Performance comparison of different deep learning models

Model	Accuracy	Precision	Recall	Params (M)	Model Size
VGG16	80%	77%	78%	25 M	32 MB
ResNet50	85%	84%	83%	19 M	75 MB
YOLOv5	83%	82%	81%	12 M	45 MB
DenseNet169	97%	94%	95%	45 M	50 MB
LW-CNN	96%	94%	93%	5 M	3.2 MB

CO2

a) Based on the results presented in Table 1, (i) analyze the comparative performance of the given models and (ii) determine the most suitable final proposed model in terms of performance with proper justification. **[2.5+ 2.5]**

b) Analyze the given models for real-world deployment, and identify the most suitable model based on computational efficiency, with proper justification. **[2.5+ 2.5]**

2. A healthcare organization wants to develop a deep learning–based system to detect pneumonia from chest X-ray images. The dataset is collected from different hospitals, so the images vary in quality, brightness, and resolution. The data are also imbalanced, with fewer pneumonia cases than normal cases. To improve model performance, engineers must preprocess the images, perform data augmentation, and train different deep learning models such as VGG16, ResNet50, DenseNet169, and a lightweight CNN. The models are compared using precision, recall, F1-score, and accuracy. Since the system will be used in real hospitals, the final model must not only be accurate but also efficient enough for deployment on devices with limited memory and processing power. Therefore, the engineers must balance predictive performance, computational efficiency, and practical usability.

CO2

a) Based on the above scenario, analyze the given problem and determine the following – **[5+5+ 5]**

(i) the relevant Complex Engineering Problem (CEP),
(ii) the relevant Knowledge Profile (KP), and
(ii) the Engineering Activities (EA) attributes applicable to it.

Justify each answer with reference to the CEP, KP, and EA involved.
[Please check Table 2 at the end of the question]

3.		A research group develops a deep learning model to classify brain MRI images into different tumor categories. The images are collected from multiple diagnostic centers and vary in quality and resolution. After training and testing the model, the researchers need to present the results in a standard and convincing manner so that the model's accuracy, robustness, and usefulness can be properly understood.		CO2
	a)	Based on the above scenario, outline the major elements that should be included in the result analysis section of the research report for proper evaluation, validation, and presentation of the proposed model's performance, with justification for each element.	[5]	
4.	*a)*	A student is preparing a research paper for publication as part of an academic project. During the writing process, the student copies some text from published articles without proper citation, paraphrases several ideas without acknowledging the original authors, and uses an AI writing tool to generate portions of the literature review and discussion. The student submits the paper without verifying the accuracy of all AI-generated content and without disclosing the use of AI assistance. After review, the supervisor identifies similarities to existing publications and questionable claims in the manuscript. These issues raise serious concerns about plagiarism, authorship responsibility, originality, and the ethical use of AI in research writing.		CO3
	b)	Analyze the ethical issues presented in the scenario with reference to plagiarism, originality, and the responsible use of AI in research writing, and apply ethical principles to propose appropriate practices to ensure academic integrity.	[10]	

Table 2: CEP, KP, and EA attributes

CEP	KP	EA
• EP1: Depth of Knowledge • EP2: Range of Conflicting Requirements • EP3: Depth of Analysis • EP4: Familiarity of Issues • EP5: Extent of Applicable Codes • EP6: Extent of Stakeholder Involvement • EP7: Interdependence	• K1: Natural science • K2: Mathematics • K3: Engineering fundamentals • K4: Specialist knowledge • K5: Engineering design • K6: Engineering practice • K7: Comprehension • K8: Research literature	• EA1: Range of resources • EA2: Level of interactions • EA3: Innovation • EA4: Consequences for society and environments • EA5: Familiarity