From:	Zhenyu Zhang
To:	Oscar Perez Concha
Subject:	RE: Updated Response Regarding Assignment 1 Feedback (Please Refer to This Version)
Date:	2024 11 8 9:04:00
Attachments:	image002.png image003.png

Dear Oscar,

Thank you very much for your follow-up response and the opportunity to clarify further.

I understand that the approach in Question 4 was flawed, as the VAE trained on both classes would not effectively highlight anomalies based on reconstruction error. I acknowledge that I should have refined this approach to use a normal-only VAE for anomaly detection, as you explained.

I would like to add that in Question 5, I adopted a different approach by incorporating multi-class classification. In this implementation, I used the latent space from the VAE to distinguish between three classes—normal, bacterial pneumonia, and viral pneumonia.

```
# Assign labels to the images
# 0: NORMAL, 1: BACTERIAL PNEUMONIA, 2: VIRAL PNEUMONIA
normal_labels = [0] * len(sampled_normal_image_paths)
bacterial_labels = [1] * len(sampled_bacterial_image_paths)
viral_labels = [2] * len(sampled_viral_image_paths)

# Combine image paths and labels
multi_class_labels = normal_labels + bacterial_labels + viral_labels
```

Here, I did apply a targeted VAE training approach, using a combination of different labels and a classifier to help distinguish between the conditions. The rationale was to enhance the ability of the model to differentiate between the multiple conditions by learning representations from all the classes. This was different from the more binary perspective I adopted in Question 4, where my approach was to use reconstruction errors directly for classification.

I put a lot of effort into coding, debug and building my models, and I fully accept my mistakes regarding insufficient justifications and limited model evaluation (I totally forgot to check the assessment criteria towards the end). However, I received 0.5/5 and 0.5/4 for Model Implementation in question 4 and 5. I believe I did implement a working model, and I feel that I largely met the requirements in terms of implementation and achieving results. I would greatly appreciate more insight into why this score was as low as it was. Did my implementation diverge significantly from what was required?

Regarding the pre-submission opportunity on September 23rd, I deeply regret not making use of it. At the time, I struggled to complete Part A because of numerous bugs, but in hindsight, I realize that submitting a draft could have provided me with invaluable feedback and helped me avoid some of these issues. This is a lesson I will definitely carry forward to assignment 2.

May I ask do we have similar pre-submission opportunity for assignment 2? I do not see that on course website.

Thank you again for your support and for taking the time to help me better understand where I went wrong.

Kind regards,
Zhenyu

From: Oscar Perez Concha <o.perezconcha@unsw.edu.au>
Sent: 2024年11月7日 15:00
To: Zhenyu Zhang <zhenyu.zhang1@student.unsw.edu.au>
Subject: RE: Updated Response Regarding Assignment 1 Feedback (Please Refer to This Version)

Dear Zhenyu,

Thank you for your email and further explanations.

I just have a couple of points to discuss here regarding your rationale:

1. "The idea of VAE evaluation in Questions 4 and 5 was that a higher reconstruction error could indicate an anomaly, which I assumed to be pneumonia in this case" & "assuming that the VAE had learned more features from normal images during training"

To reconstruct 'normal' images well, you should have trained the VAE only on 'normal' images. This way, the VAE would learn an embedding or latent space representing 'normal' images but not 'pneumonia' images. Therefore, this assumption is, unfortunately, not correct as you pointed out in your email.

2. "I appreciate you pointing this out, and I'd be happy to modify that method to amend this."

Regarding modifying the method, I'm afraid I cannot consider this towards your marks, as I'm sure you understand it would be unfair to your colleagues.

As you may recall, I arranged a pre-submission opportunity on September 23rd (almost 3 weeks before the final submission) for questions 1 through 5 to offer preliminary feedback. For future assignments where this opportunity is offered, you might consider submitting your work in advance, as I think it would have helped you in this case.

However, if you still have any questions about the assignment, I am available to meet on Tuesday, November 12th, from 4:00 to 4:30 pm. Please email me your questions or specific areas you'd like to review, so I can carefully double-check your assignment in advance.

If you feel that all your questions have been addressed and you don't need further clarification, there's no need to meet.

Could you kindly let me know either way?

Have a very good day.

Warm regards,
Oscar

Dr Oscar Perez-Concha

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From: Zhenyu Zhang <zhenyu.zhang1@student.unsw.edu.au>
Sent: Wednesday, 6 November 2024 7:47 AM
To: Oscar Perez Concha <o.perezconcha@unsw.edu.au>
Subject: RE: Updated Response Regarding Assignment 1 Feedback (Please Refer to This Version)

Dear Oscar,

Thank you very much for your response and for considering my request. I truly appreciate your willingness to meet with me to discuss my assignment further.

Unfortunately, I might not be able to join a Teams meeting until next Monday or Tuesday. If you're available on Monday, 11th November, or Tuesday, 12th November, I would be very grateful to arrange a time on one of those days that suits you.
Also, I wanted to let you know in advance that I do not have a camera, as I am using a desktop computer. I hope this will not be an issue for our meeting.

I now see where I misunderstood the need for providing justifications for my work. Thank you for pointing me towards the General Instructions and rubric. I realize now that it was expected that I provide explanations throughout each step, which I should have been more careful to do. I'll make sure 'Justification' will be provided in my next assignment.

The idea of VAE evaluation in Questions 4 and 5 was that a higher reconstruction error could indicate an anomaly, which I assumed to be pneumonia in this case. My intention was that normal images would be reconstructed well, leading to lower reconstruction errors, while pneumonia images would have higher errors, assuming that the VAE had learned more features from normal images during training. However, you're correct that the VAE was trained on both pneumonia and normal images, meaning that the reconstruction error would not necessarily differ significantly between the two

classes. This approach was a misapplication of VAE principles, and I should have either used a different feature extraction approach or a straightforward classification without relying on reconstruction error. I appreciate you pointing this out, and I'd be happy to modify that method to amend this.

Thank you again for your patience and understanding.

Kind regards,
Zhenyu

From: Oscar Perez Concha <o.perezconcha@unsw.edu.au>
Sent: 2024年11月5日 16:08
To: Zhenyu Zhang <zhenyu.zhang1@student.unsw.edu.au>
Subject: RE: Updated Response Regarding Assignment 1 Feedback (Please Refer to This Version)

Dear Zhenyu,

Thank you for your email. I appreciate your explanations, and of course, I would be very happy to consider your request and to have a chat with you via Teams so you can go into more detail about your assignment and explain it to me.

Are you available for a Teams meeting at any of the following times?

- Thursday, 7th November, at 3:15 pm
- Friday, 8th November, at 11:00 am
- Alternatively, I am free this afternoon from 4:00 pm to 5:00 pm. I know this is short notice, but if today works best for you and you see this email in time, I would be happy to meet with you then.

A couple of questions/clarifications:

- *In addition, unlike question 6, there was no explicit requirement for a justification in the question 4 and 5 itself. However, marks were allocated for it in the feedback.*

  From the General Instructions:
  https://www.openlearning.com/unswmed/courses/hdat9510-machine-learning-2/assignment_1/?cl=1

  Justification for your decisions is crucial. Provide a one or two sentence explanation **for each section** preceding the relevant Python code block using "Text" cells.

  In addition to this**, I circulated the rubric in advance** with the marking criteria. See General Instructions:
  https://www.openlearning.com/unswmed/courses/hdat9510-machine-learning-2/assignment_1/?cl=1

  Marking criteria: Marks will be deducted for failure to follow the previous

instructions. Please refer to the **rubric** for detailed **assessment criteria.**

- Questions 4 and 5: Could you clarify how you evaluate the model? `# Make predictions based on the threshold`

```
predicted_labels = [1 if error > threshold else 0 for error in reconstruction_errors] # 1 for 'PNEUMONIA', 0 for 'NORMAL'
```

  Why "if error>threshold is Pneumonia"? As far as understand, you trained VAE with both images of pneumonia and normal images, hence, the error should be similar for both. Am I correct or am I missing something?

Thank you, Zhenyu.

Warm regards,
Oscar

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From: Zhenyu Zhang <zhenyu.zhang1@student.unsw.edu.au>
Sent: Saturday, 2 November 2024 12:56 PM
To: Oscar Perez Concha <o.perezconcha@unsw.edu.au>
Subject: Updated Response Regarding Assignment 1 Feedback (Please Refer to This Version)

Dear Oscar,

Thank you for your detailed feedback on Assignment 1. Please allow me to address your comments regarding questions 3, 4 and 5, where I implemented a custom VAE and a classification model. I apologize for the multiple emails. Please disregard my previous message.

Completeness in Data Loading and Preprocessing (Question 3)
Regarding the comments on "Completeness - Data Loading and Preprocessing" in Question 3, I did identify that the dataset was imbalanced. I mentioned this explicitly in the "Further Improvement Strategies" section in Question 5, suggesting the use of class balancing methods, such as class weights or oversampling, to give more emphasis to the minority class (e.g., viral pneumonia). While I did not implement these strategies directly, I made sure to acknowledge them as potential areas of

improvement.

In addition, unlike question 6, there was no explicit requirement for a justification in the question 4 and 5 itself. However, marks were allocated for it in the feedback.

My approach and rationale for question 4
In Question 4, I decided to use a VAE to explore its capability in extracting important features from the chest X-ray images before classification. The specific enhancements I made include:

1. Custom training step for the VAE:
I implemented a custom `train_step` method to properly handle the 'KL divergence' and 'reconstruction loss' inherent in VAEs. The standard `.fit()` method may not handle these losses adequately, which is why I opted for a custom approach. The reconstruction loss ensures that the output images are as close as possible to the input, while the KL divergence helps regularize the latent space to follow a normal distribution.

2. AdamW optimizer and learning rate scheduler:
- I chose the 'AdamW optimizer' to potentially achieve better generalization by introducing weight decay, which prevents overfitting.
- I added a 'learning rate scheduler' to gradually reduce the learning rate during training. Helping the model converge more effectively via allowing it to make larger updates early in the training process and smaller adjustments as it converges toward a solution.
- The 'early stopping' callback was also included to prevent overfitting by stopping training if the model did not improve over several epochs.

3. Model training strategy:
By implementing a custom training loop with these components, I aimed to create a model capable of effectively learning the nuances of the dataset while maintaining generalizability.

My approach and rationale for question 5
In Question 5, the VAE architecture and training approach were largely retained, with some modifications to include multiple output classes in the classification stage. My thought process was that the **latent space learned by the VAE** could be useful for distinguishing between multiple types of pneumonia conditions or normal cases.

I understand now that both Question 4 and Question 5 deviated from the original expectation, which was a simpler CNN model with a well-explained enhancement directly in line with what we studied in Week 1. My intention behind implementing the VAE was to use it as a feature extractor, assuming it could improve the classification results. Unfortunately, I now realize that this choice made the implementation more complex than required, and I did not adequately justify how the VAE contributed to the classification process.

I would also like to mention that during the time I was working on Questions 4 and 5, we were learning about VAEs, which inspired me to apply this new knowledge to my assignment. I did not realize at the time that the VAE would also be expected as part of Question 7, and by the time I noticed, I no longer had enough time to modify my previous work.

If possible, I would like to kindly request reconsideration for partial marks. My goal was to apply what we were currently learning and to explore how more advanced methods could be integrated, even though I now understand that my choice diverged from the simpler approach expected. I realize that

my lack of explanation added to the confusion, and I have learned from this experience about the importance of aligning more closely with assignment requirements.

Thank you for considering my request, and I genuinely appreciate the opportunity to learn from this experience.

Best regards,
Zhenyu Zhang

From: Oscar Perez Concha <o.perezconcha@unsw.edu.au>
Sent: 2024年11月1日 18:25
To: Zhenyu Zhang <zhenyu.zhang1@student.unsw.edu.au>
Subject: Assignment 1 Marks and Feedback Released

Dear Zhenyu,

I hope this message finds you well. I wanted to let you know that the feedback and marks for Assignment 1 are now available. Please check the Excel sheet provided in the link below:
Feedback-Assignment01-ZZhang.xlsx

Have a wonderful weekend!

Best regards,
Oscar

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