Project Title: Vector Quantized Variational Image Compression

1. Summary and contributions. Briefly summarize the project.

This project examines applicability of neural network for image compression. Specifically, author implemented ***vector quantized variational autoencoders (VQ-VAE)*** on *Vimeo90k* and *Kodak* dataset. The results were compared against other compression methods. Ranging from other deep image compression techniques(CompressAI model zoo) to more traditional methods like JPEG, AVI. Author concludes, that *VQ-VAE* lacks generalization and struggles with overfitting and adds that these challenges could be resolved with adaptive vector quantization that in turn could potentially make it SOTA.

2. Strengths. Describe all the strengths of the project in enough depth.

1. The author gave some preliminary information about image compression, metrics used for evaluation and some background about different variational image compression techniques.
2. The figures, tables and formulas are representative, enumerated and informative, although with some caveats I will explain below.
3. Paper is well structured, references are comprehensive and well organized.

3. Weaknesses. Explain all the limitations of this project in enough depth.

1. In the results section there's some difficulties understanding the Figure 3. The colors are repetitive and the names of the algorithms are not explicitly defined in paper. So, it's hard to know what is what. Given that the Figure 3 is borrowed from another paper it would help to duplicate some paragraphs explaining its content. Moreover, it would help to add shapes(squares, circles, stars) in addition to color-code to better distinguish between methods.
2. The paper aims to compare *VQ-VAE* with other methods contained in another paper (Begaint et al.), but if so, why they're not compared in a single Table or Figure? I suggest listing all algorithms in the single table, because it's hard to make comparisons by looking at Figure 3 and Tables 2-3 with "naked eye".

4. Correctness. Are the claims and method correct? Is the empirical methodology correct?

1. The proposed methodology is correct. All images were preprocessed in a similar way.
2. Author acknowledges that, VQ models outperforms convolutional models due to lack of fine-tuning of the latter.
3. Metrics used for comparison (PSNR and BPP) between different compression models are widely used in image compression community.

5. Clarity. Is the project report well written?

1. In the **Subsection 3.3** I suggest defining the peak signal to noise ratio more explicitly or adding some reference.
2. As stated above the Figure 3 and Tables 2-3 should be revised.
3. The Figure 4 should be placed in the Results section and not in the references. When including Figure, generally, it is best practice to mention it in the paper somehow. I suggest adding a paragraph explaining the Figure 4 in detail.
4. Finally, it would help to mention why we use neural network for image compression in the first place. What is its advantage over conventional methods?

6. Related work. Is it clearly discussed?

The **Section 1.3** gives comprehensive overview of the foundations of the deep image compression with all relevant references. Although, I would suggest adding some papers that employ VQ-VAE for image compression and listing their results.

7. Reproducibility. Are there enough details to reproduce the major results of this work?

1. Steps described in GitHub repository of this project are clear.
2. I have not faced any challenges repeating the experiment and was able to successfully obtain similar results.

8. Overall score. You should NOT assume that you were assigned a representative sample of projects. The "Overall Score" for each project should reflect your assessment of the project.

(2) A very good submission; deserves high grade, tending to maximal (A).

9. Confidence score.

(3) You are **fairly confident** in your assessment. It is possible that you did not understand some parts of the submission or that you are unfamiliar with topic.