Second review to the project "Generative modeling of oil reservoir properties"

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Preview

As I wrote a firs review for that project, now I just highlight the major changes and comment on the final result.

1 Project Report

1.1 Results

Results are well presented with plots and numbers. And numbers are impressive – the model can work as both content generator and even a classifier (the R^2 value for porosity and permeability in the wells is clos to 1). All the conclusions based on the obtained results seem logical and meaningful.

However, there is lack of comparison with baseline and another methods (like VAE, DDIM, GANs, etc) in both performance and time consumption terms. So we can't understand the difference: maybe VAE is as good as the DDPM for this particular task.

Others areas for improvement:

- **Limited Contextual Factors:** The geological context is reduced to a single variable (cross-section angle). While this simplifies the problem, it overlooks other potential geological parameters (e.g., sedimentation rates, fault systems). A discussion of this limitation would strengthen the critique of the approach.

- **Dataset Diversity:** The dataset is derived from the Brugge benchmark, which may not fully represent real-world geological heterogeneity. Including data from multiple reservoirs or depositional environments could enhance generalizability.

- **Outlier Analysis:** The report acknowledges outliers in R^2 and MAPE metrics but does not investigate their causes. A deeper analysis of failure cases would improve robustness.

- The report lacks an explicit description of the training process, including loss functions, training duration, hardware used, and any hyperparameter search.

1.2 Styling, quality and structure comments

The report is coherent and well-structured. There are some issues that I mentioned in the previous review like "Submission and Formatting Instructions for ICML 2025" on the top of report pages.

Additional issues:

- Minor grammatical errors (e.g., "such methods has been outperformed" → "such methods have been outperformed").

- Sometimes present and past tenses are mixed.

2   GitLab

As I wrote in the previous review, the GitLab repo is very well organized. Here I again highlight some major strengths and weaknesses (in my personal opinion) and add the comment on the new content.
Strengths:

- **Good navigation:** It's clear where to look for models, training scripts, notebooks, slides and reports.

- **Clear "Before you start"**. Author wrote all the necessary steps what to do to run the code. 'requirements.txt' is also provided.

- **Code structure**. It's easy to configure the code (there are config files). It's easy to run the code from a command line. There are both the general template for code running and some examples provided.

- **Code quality**. The code is well-readable. It's easy to understand what's going on inside the scripts.

- **Notebooks**. There is a jupyter notebook with results obtaining and plotting.

Weaknesses:

- Author writes "Contact me and send me your email...". But I didn't find any author's contacts like an email or phone. But as I understood, that is quite "secret" project, so, it's OK.

- There is no code for direct model inference; there is no model weights. So, I can't just check the results without model's training. But author did not provide the exact model setup (hyperparameters and exact architecture) with which his results were achieved. And in the repo there are lots of configs. So, it's hard to reproduce the author's results without his personal guidance.

3   Overall comment

A definitely appreciate this work. It has clear motivation, important real-world application, and in is done with the high quality! I hope the author will continue it and will achieve good results, publish a paper and earn mountains of money.
I really hope that my comments will help author to make his work even better somehow.