# Reer review to the project "Generative modeling of oil reservoir properties"

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## 1 Project Report

### 1.1 Problem statement

The report presents a clear problem statement in the introduction. It identifies a gap in the application of diffusion models to physical systems, particularly in geology, for generating reservoir property cross-sections using both well measurements and geological context (angle-based).

### 1.2 Main Idea and Model Used

The core idea is well-described: using a DDPM-based diffusion model conditioned on two modalities, well measurements and geological context, to generate geological cross-sections.

I really appreciate that author highlighted both advantages and drawbacks of the chosen model with the clear explanation of the choice.

Maybe, a schematic or flow diagram of the model pipeline would improve clarity. For me, conditioning implementation is not clear. And there are no accurate details about model architecture.

### 1.3 Comparison with related methods

The report includes a concise but relevant literature review and a discussion of comparable generative methods: GANs, VAEs, GNNs

But it would be more readable, if the report contained a comparison table for all mentioned methods or kind of benchmarking for them. For me, the "Related work" section does not give the clear understanding, why author refused all listed architectures (VAEs, GNNs) just with addition a conditioning on the geological context? OK, GANs are worse than DDPMs in conditional generation tasks, but what's about other methods?

Also, there is no clear comparison with the diffusion-like solutions. Why is actually DDPM?

### 1.4 Intermediate results

Metrics are described, figures with intermediate results are presented and are illustrative. Results are reasonably explained.

However, some terms like “masked tensor”, “collector fraction”, and “variogram” are mentioned without definitions or explanations. It could be difficult for non-specialists to understand them clearly.

Also, for me there's lack of quantitative results: some numbers are provided, but there's not enough to understand quality well (but I understand that it is the intermediate results, so it's OK). Moreover, no numbers about training procedure are presented. No model hyperparameters, learning curves or validation metrics during training. $R^2$ is mentioned but not calculated.

### 1.5 Styling, quality and structure comments

Report has good logic structure (Introduction → Related Work → Data → Model → Metrics → Results). Language is good, without excessive jargon. References are comprehensive and mostly up-to-date.

However, there are some minor drawbacks for me:

- No abstract. I understand, that project is not finished yet, but I like to read about the whole work and the results in a few sentences to understand generally what it is about.
- There's no "Conclusion" or "Limitations and Future Work" sections. Project is not finished, but that sections may help readers to understand your next steps.
- Report contains "**Submission and Formatting Instructions for ICML 2025**" on the top of pages. I gues, it's better to change it to the project name or something...

## 2 GitHub

- Repository is great and well-organized. README file clearly explains what to do to run the code.
- 'requirements.txt' included; '.gitignore' included. All code is reasonably located in the folders.
- Link to the training dataset is provided.
- Code is readable and clear. If code is borrowed, the link to the original code is provided.
- There are almost no comments or docstrings or typization on the code. However, as I said, it is readable and well structured.
- It's hard to track the project progress in git, because there are no commits related to code.

## 3 Overall comment

I had some difficulties while reading, because I'm not familiar with oil-related terminology. So, for me there was lack of definitions, explanations and formulas. But, maybe it's just a my problem.

Maybe, I didn't write much about the project's advantages concentrating on the drawbacks and possible improvements. However, in the end I'd like to empathize that the work is great, interesting and is done professionally! Moreover, the project is strongly applied to the very important field.

So, my respect and good luck! I hope, that my comments will be helpful for your work.