1. **Does the paper address relevant scientific questions within the scope of SE?**

   Yes, the research aligns well with the scope of SE, especially in the areas of geophysics, spectroscopy and applications of machine learning techniques in geosciences.

2. **Does the paper present novel concepts, ideas, tools, or data?**

   Yes. The idea of using deep learning to predict the petrophysical properties from high resolution hyperspectral data can be considered as a novel approach in upscaling workflows. Also, application of the Shapely method for analysing the impact of different spectral bands on the model's predictions is an innovative addition.

3. **Are substantial conclusions reached?**

   Largely, yes. Conclusions are well supported by the key results, however some additional work on uncertainty quantification would be very beneficial.

   Could the authors quantify the uncertainty of predictions using techniques such as Monte Carlo dropout, Bayesian inference or confidence intervals?

4. **Are the scientific methods and assumptions valid and clearly outlined?**

   Authors have outlined each step of data processing in detail; however, inclusion of a workflow flowchart would greatly enhance clarity. A visual representation of the step-by-step process, including data acquisition, data preprocessing, clustering, deep learning, evaluation, Shapely analysis, and final outputs would be very helpful for readers.

5. **Are the results sufficient to support the interpretations and conclusions?**

   The performance metrics used (R^2 and RMSE) support the claim that hyperspectral data can predict the petrophysical properties accurately.

   Nevertheless, the model struggles with unseen lithologies, more cross validation on other datasets can help generalise the conclusions.

6. **Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)?**

   Mostly, yes. As mentioned before, all processing steps have been well documented.
   However, model hyperparameters could be better detailed for traceability of the results.

7. **Do the authors give proper credit to related work and clearly indicate their own new/original contribution?**

   Yes.

8. **Does the title clearly reflect the contents of the paper?**

   Yes.

9. **Does the abstract provide a concise and complete summary?**

Partially. Authors need to clearly state the problem and motivation upfront. They should start the abstract by emphasising why upscaling petrophysical measurements using hyperspectral data is important. This would draw the attention of the readers.

Since automating petrophysical property predictions could lead to major cost and efficiency benefits, this should be explicitly stated in the abstract.

10. **Is the overall presentation well structured and clear?**

    Yes.

11. **Is the language fluent and precise?**

    Yes.

12. **Are mathematical formulae, symbols, abbreviations, and units correctly defined and used?**

    Yes.

13. **Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?**

    The legend of Figure 7 contains German geological terms for lithologies (e.g., Salzton, Werra Anhydrit, Kupferschiefer). Authors should translate such terms into English (e.g., Salt Clay, Werra Anhydrite, Copper Shale).

    Other figures are well presented.

14. **Are the number and quality of references appropriate?**

    Yes.

15. **Is the amount and quality of supplementary material appropriate?**

    N/A.