**Response to Reviewer #1:**

Thank you for your feedback. We have made the revisions requested to the manuscript and addressed your comments in this document in blue. We hope this adequately addresses the concerns raised.

1. This work is a good demonstration of how machine learning and artificial intelligent can be used to effectively monitor carbon plume migration either from injection or monitoring wells by correlating change in injection rate to the behavior of other dynamic parameters. Although, the approach has been applied in many fields such reservoir parameters prediction, flow rate prediction, etc., the use of LSTM for data forecasting is adequately justified. It is the first application to injection rate monitoring in CCUS, although there is more room for model optimization and improvement. Overall, it is a well written manuscript and I recommend that it should be accepted with minor revision following some corrections.

Author Response: Thank you very much

1. Some of the information I the abstract can be moved to the introduction.

Line 12-18 should be moved to introduction.

Author Response: Noted; it is already mentioned in the introduction from lines 49-58 in the original manuscript. We have now removed it from the abstract entirely.

Line 60 – “Given the early stage of this technique, it is imperative to initiate pilot development and validate the technology” should be reworded.

CCUS technology is about 40-year-old not in pilot stage, there are many demonstrations of capabilities around the world especially in oil and gas industries.

Author Response: Noted, we have removed the statement.

Line 159-162-Please clarify or explain why 67% of data was use for training the model and 33% for validation. Why did use this percentage? Would 50:50 change the accuracy of the model?

Author Response: The 2/3: 1/3 training: validation ratio is a generalised “rule of thumb” and is just dependent on the programmers view at the time of code writing. In our experience, models can also be built with a 70:30 or 80:20 ratio.

We opted in this case to set aside more data as a validation set because we wanted to build a model that we hoped would be more insensitive to noise. In other words, the less data we use in our training set, the more generalised the model, but use too little and we ran the risk of underfitting, therefore limiting its usefulness as a predictor.

Similarly, if we used too much data for training, we would have created an overfitted model that would not be sufficiently generalised. This ratio was thus a good comprise in this authors opinion.

Line 328-32- Clarify the difference between figure 6a and 6b (Anomalies versus variation plot; notice that one is in months while the other appear to be in days in 2012)? In figure 6b, the injection difference does not match the LSTM prediction very well. Can you explain why? Why are this data set chosen for the validation?

Author Response: The reviewer is correct in that 6(a) is in months and demonstrates that general variabilities can be captured by the model, as per design. 6(b), which is in days, then shows that as much as possible, small-scale perturbations are somewhat predicted, albeit not perfectly, because at such small scales, the data starts to behave like “noise”, with low amplitude, high frequency characteristics that any model would be hard pressed to predict 100%. At this scale it is most important to capture the statistical behaviour than point-for-point data.

**To the editor, here are our responses/explanations based on the email:**

**International Journal of Greenhouse Gas Control**Reviewer's Responses to Questions

Note: In order to effectively convey your recommendations for improvement to the author(s), and help editors make well-informed and efficient decisions, we ask you to answer the following specific questions about the manuscript and provide additional suggestions where appropriate.  
  
1. Are the objectives and the rationale of the study clearly stated?  
  
Please provide suggestions to the author(s) on how to improve the clarity of the objectives and rationale of the study. Please number each suggestion so that author(s) can more easily respond.

Reviewer #1: This work is a good demonstration of how machine learning and artificial intelligent can be used to effectively monitor carbon plume migration either from injection or monitoring wells by

Author Response: Thank you

2. If applicable, is the application/theory/method/study reported in sufficient detail to allow for its replicability and/or reproducibility?  
  
Please provide suggestions to the author(s) on how to improve the replicability/reproducibility of their study. Please number each suggestion so that the author(s) can more easily respond.

Reviewer #1: Mark as appropriate with an X:  
Yes [] No [x] N/A []  
Provide further comments here:

Author Response: Thank you

3. If applicable, are statistical analyses, controls, sampling mechanism, and statistical reporting (e.g., P-values, CIs, effect sizes) appropriate and well described?  
  
Please clearly indicate if the manuscript requires additional peer review by a statistician. Kindly provide suggestions to the author(s) on how to improve the statistical analyses, controls, sampling mechanism, or statistical reporting. Please number each suggestion so that the author(s) can more easily respond.

Reviewer #1: Mark as appropriate with an X:  
Yes [x] No [] N/A []  
Provide further comments here: The manuscript is in the domain of artificial intelligent. Perhap, mathematical modelling expert can provide more useful insight for the work. I recommend Prof. Hassan Hassanzadeh (University of Calgary), for further review of models.

Author Response: Thank you

4. Could the manuscript benefit from additional tables or figures, or from improving or removing (some of the) existing ones?  
  
Please provide specific suggestions for improvements, removals, or additions of figures or tables. Please number each suggestion so that author(s) can more easily respond.

Reviewer #1: no

Author Response: Thank you

5. If applicable, are the interpretation of results and study conclusions supported by the data?  
  
Please provide suggestions (if needed) to the author(s) on how to improve, tone down, or expand the study interpretations/conclusions. Please number each suggestion so that the author(s) can more easily respond.

Reviewer #1: Mark as appropriate with an X:  
Yes [x] No [] N/A []  
Provide further comments here: The results from the models are well interpreted and are well supported in the conclusion.

Author Response: Thank you

6. Have the authors clearly emphasized the strengths of their study/theory/methods/argument?  
  
Please provide suggestions to the author(s) on how to better emphasize the strengths of their study. Please number each suggestion so that the author(s) can more easily respond.

Reviewer #1: The study applies artificial intelligence to determine the effectiveness of CO2 containment. it is a new application of method to CCS. The LSTM model can be expatiated more to help reader follow the application.

Author Response: Thank you

7. Have the authors clearly stated the limitations of their study/theory/methods/argument?  
  
Please list the limitations that the author(s) need to add or emphasize. Please number each limitation so that author(s) can more easily respond.

Reviewer #1: Yes they did mentioned that the model can be improved by improving the feedback loop for better prediction accuracy.

Author Response: Thank you

8. Does the manuscript structure, flow or writing need improving (e.g., the addition of subheadings, shortening of text, reorganization of sections, or moving details from one section to another)?  
  
Please provide suggestions to the author(s) on how to improve the manuscript structure and flow. Please number each suggestion so that author(s) can more easily respond.

Reviewer #1: It is easy to follow

Author Response: Thank you

9. Could the manuscript benefit from language editing?

Reviewer #1: No

Author Response: Thank you