**Comments and Responses**

**Responses to Comments from Reviewer 1**

**General Comment:**

This work proposed an interesting photon counting CT based thermometry method, and experimentally demonstrates that by combing material decomposition and machine learning techniques, the proposed method can predict accurate temeprature for unseen material without the tedious calibration steps which are often required in traditional CT thermometry. Although the experiments were only conducted in projetion domain, the method is very novel and the results are inspiring. Especially, the nonlinear thermal properties (against concentration) of CaCl2 solutions demonstrated in the experiments are very interesting, which reveals the holes in current CT thermometry models. However, there are still some minor issues that should be addressed or improved before publication.

**Response:**

We thank the reviewer for the encouragement, helpful suggestions, and excellent summary.

**Comment 1:**

The performance of the current CT thermometry methods within ~5 years should be briefly introduced in the background; e.g., the state of the art resolution/accuracy/precision. Akio Yoneyama (SAGA Light Source) from Japan has done some interesting work on thermometry and you may reference some of his work.

**Response**:

We thank the reviewer for the suggestion. We have mentioned that the current accuracy of CT thermometry in the introduction. We have also cited Yoneyama’s work on X-ray phase contrast thermometry in our conclusion.

**Comment 2:**

The MAEs of CaCl2 and protein shake are 1.8 and 3.97 in the abstract, but in the result part it becomes "the network achieves a MAE of 3.97 °C on 300 mM CaCl2 over a temperature range of 35 °C to 60 °C and an MAE of 1.80 °C on a milk-based protein shake over a temperature range of 38 °C to 50 °C."  Please double check.

**Response**:

We thank the reviewer for pointing out the discrepancy. The mean absolute error is reported correctly in the results section and the abstract has been updated to match.

**Comment 3:**

Adding some error bars on the prediction results will make the results more convincing (since you have multiple LOIs which can show the stability of the network prediction).

**Response**:

We thank the reviewer for the suggestion. Figure 3 has been updated to include the 95% confidence interval of the predictions and a description of how it was computed is included in the methods/materials.

**Comment 4:**

In figure 2, I am wondering if the source to detector distance should point to the PCD? Please double check.

**Response**:

We thank the reviewer for pointing out the discrepancy. Yes, you are correct, the figure has been updated so that the red arrow is pointing to the PCD.

**Comment 5:**

It states that "the source was operated at 100kVp 100μA" in the manuscript, so the maximum energy of photons should be no greater than 100keV. Should the maximum range of the energy bin of PCD be 100keV instead of 110keV? Please double check.

**Response**:

We thank the reviewer for pointing out the discrepancy. Instances of “110 keV” in the text and figures have been updated to “100 keV”

**Comment 6:**

Label (b) in Figure 3 is missing.

**Response**:

We thank the reviewer for pointing out the discrepancy. Figure 3b has been updated.

**Responses to Comments from Reviewer 2**  
**General Comment:**

In this letter, the authors developed an approach combining photon-counting CT for material decomposition and a neural network to predict temperature based on CT number thermal characteristics of base materials and spectral tomographic measurements of a volume of interest. The idea is novel and the results demonstrate the feasibility. In my opinion, it can be further enhanced from the following aspects:

**Response:**

We thank the reviewer for the encouragement, helpful suggestions, and excellent summary.

**Comment 1:**

In Eq.(1), the authors should clearly define all the involved variables.

**Response:**

We thank the reviewer for the comment. Undefined variables in equation 1 have now been defined.

**Comment 2:**

In Fig. 2, it is not clear what is the temperature for (a). it is not clear what are the energies for (b)-(f).

**Response:**

We thank the reviewer for the comment. The legends in figure 2 have been updated to make the energy levels clear.

**Comment 3:**

From Fig.3, one can see that there are some differences between the predictions and ground-truths. It will be great if the authors can plot a curve for prediction accuracy and analyze how it affect the possible applications.

**Response:**  
We thank the reviewer for the suggestion. We have added error bars to our result plots in Figure 3 and a description of how they were computed in the methods/materials. The new figure provides further support for our results.