



EUSIPCO 2024 Review Results [Paper #1469]

From EUSIPCO 2024 <eusipco2024@cmsworkshops.com>

Date Wed 5/22/2024 6:00 PM

To Galiger Gergő <galiger.gergo@inf.elte.hu>; Nazila Azadi <nazila.azadi@silicon-austria.com>; Lehner Bernhard <bernhard.lehner@silicon-austria.com>; Mario Huemer <mario.huemer@jku.at>; Kovacs Peter <kovika@inf.elte.hu>

Dear Gergő Galiger, Nazila Azadi, Bernhard Lehner, Mario Huemer, Péter Kovács,

Paper ID: 1469

Title: Model-based neural networks for thermographic image reconstruction

The review process for the 32nd European Signal Processing Conference (EUSIPCO 2024) has now been finalized, and we regret to inform you that your paper has not been accepted for publication. We have received many high-quality contributions, which forced us to reject a number of good submissions.

The review comments that have led to this decision can be found below. We hope that they provide you with useful feedback to strengthen a future publication of your work.

We thank you for your interest in EUSIPCO 2024, and we hope that we can still welcome you as a participant. Please note that the event will be physical.

Registration will soon open on the conference website, <https://eusipcolyon.sciencesconf.org/>.

Sincerely,

Pierre Borgnat, Monica Bugallo, Steven McLaughlin
EUSIPCO 2024 Technical Program Co-chairs

---- Comments from the Reviewers ----

Review #03B5

Paper Format: Correctly formatted

Topic relevance: High

Originality of the content: Low

Methodology / Research design: Average

Evaluation of results and derived conclusions: High

References to previous work: Average

Correct English usage: Average

General Comments to Authors

The authors investigate thermographic image reconstruction, approached through two successive inverse problems. They propose employing a deep unfolding network, FISTA-NET, previously introduced for other inverse problems, to solve the first problem, thereby improving the final reconstruction. While the theoretical novelty of the work may be limited, the creation and evaluation of realistic datasets, ranging from synthetic cases with varying noise levels to real cases, are significant aspects. However, there are opportunities for improvement in certain areas. The authors could enhance the pedagogical clarity, particularly when introducing FISTA-NET. For instance, Figure 1 only becomes clear when looking at [5]: the absence of corresponding notation in the text makes the proximity step ambiguous, especially considering that the authors describe the regularization $\|\Omega\|$ as a simple ℓ_1 norm without any orthogonal operator. Similarly, clarification is needed regarding the gradient operator, which appears to be the transpose of A in the figure. It would be helpful to understand the scale of the number of parameters learned in FISTA-NET compared to a U-net and the number of ADMM iterations used as a warm start for FISTA-NET, including convergence criteria or early stopping conditions. Are these parameters the same with when ADMM is used independently with Abel or curvelets?

Furthermore, it is unclear on which images the U-net for the second stage is trained. Since the images from the first stage with FISTA-NET and ADMM are substantially different, the U-net may be operating in an extrapolation mode in one case, potentially leading to poor performance.

Lastly, the authors mention utilizing MSE as the loss for the ADMM reconstruction step and suggest that this could influence the observed behavior. Isn't FISTA-NET trained with the MSE loss (along with regularization on the network weights) while ADMM solves a minimization problem?

Review #0F93

Paper Format: Correctly formatted

Topic relevance: Average

Originality of the content: Low

Methodology / Research design: Low

Evaluation of results and derived conclusions: Average

References to previous work: Average

Correct English usage: Average

General Comments to Authors

My major concern about the paper is that technical novelty is limited. The authors have already proposed a U-net to solve the inverse problem in the second stage of the VWC approach. The adaptation of FISTA proposed in (3) is minor compared to the original FISTA approach in [5]; in essence, it boils down to fixing A as K and not allowing to learn it (or only learn some of its hyperparameters). The creation of the training dataset also does not constitute a significant contribution as it is based on simulation using a method already introduced by the authors in [3].

Some less important comments:

- The paper mentions the need for interpretable models that require less training data but also uses a U-net black-box model. This limits the interpretability of the method thereby contradicting the statements in the introduction.
- Some parts are not fully clear (to me at least). For example, in Section II, it is not clear how the two inverse problems are linked to each other particularly since there is only one inverse problem equation presented (that is, eq. (1))
- The number of iterations (layers) of FISTA and those of the model-based approaches are not reported.

Review #02F3

Paper Format: Correctly formatted

Topic relevance: High

Originality of the content: Average

Methodology / Research design: High

Evaluation of results and derived conclusions: High

References to previous work: Average

Correct English usage: Average

General Comments to Authors

This paper proposes a hybrid approach for thermographic image reconstruction, combining a deep unfolded FISTA algorithm with a U-Net. The effectiveness of the method is demonstrated both for synthetic and real-world data. Overall, the paper is well written and scientifically sound.

Review #0100

Paper Format: Correctly formatted

Topic relevance: High

Originality of the content: Low

Methodology / Research design: Average

Evaluation of results and derived conclusions: Average

References to previous work: Low

Correct English usage: High

General Comments to Authors

The paper describes a two-step process for thermographic imaging. The authors improve the first step in the process by refining the output of ADMM using the deep unfolding model FISTA-Net. They create simulated data to train the model and evaluate the whole process including FISTA-Net using synthetic and real-world data.

The use of FISTA-Net is an interesting yet incremental idea, and the data generation is already introduced in previous work [3].

Additionally, the description of FISTA(-Net) is very terse, and the full process of ADMM -> FISTA-Net -> U-Net is not clearly explained. In fact, U-Net is not mentioned once in the methodology section. As a minor comment on Section III-C: weight decay has a specific meaning in deep learning, this is not the right term here.

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