NTIRE 2025 Image Denoising ($\sigma = 50$) Challenge Factsheet -title of the contribution-

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1. Introduction

This factsheet template is meant to structure the description of the contributions made by each participating team in the NTIRE 2025 challenge on image denoising with noise level $\sigma = 50$.

Ideally, all the aspects enumerated below should be addressed. The provided information, the codes/executables and the achieved performance on the testing data are used to decide the awardees of the NTIRE 2025 challenge.

Reproducibility is a must and needs to be checked for the final test results in order to qualify for the NTIRE awards.

The main winners will be decided based on overall performance and a number of awards will go to novel, interesting solutions and to solutions that stand up as the best in a particular subcategory the judging committee will decided. Please check the competition webpage and forums for more details.

The winners, the awardees and the top ranking teams will be invited to co-author the NTIRE 2025 challenge report and to submit papers with their solutions to the NTIRE 2025 workshop. Detailed descriptions are much appreciated.

The factsheet, source codes/executables, trained models should be sent to **all of the NTIRE 2025 challenge organizers (Lei Sun, Yawei Li, and Radu Timofte)** by email.

2. Email final submission guide

To: lei.sun@insait.ai
cshguo@gmail.com
yawei.li@vision.ee.ethz.ch
timofte.radu@gmail.com
cc: your_team_members
Title: NTIRE 2025 Image Denoising Challenge - TEAM_NAME - TEAM_ID

To get your TEAM_ID, please register at Google Sheet. Please fill in your Team Name, Contact Person, and Contact Email in the first empty row from the top of sheet. Body contents should include:

a) team name
b) team leader's name and email address
c) rest of the team members
d) user names on NTIRE 2025 CodaLab competitions
e) Code, pretrained model, and factsheet download command, e.g. `git clone ...`, `wget ...`
f) Result download command, e.g. `wget ...`
   - Please provide different urls in e) and f)

Factsheet must be a compiled pdf file together with a zip with .tex factsheet source files. Please provide a detailed explanation.

3. Code Submission

The code and trained models should be organized according to the GitHub repository. This code repository provides the basis to compare the various methods in the challenge. **Code scripts based on other repositories will not be accepted.** Specifically, you should follow the steps below.

1. Git clone the repository.
2. Put your model script under the `models` folder. Name your model script as `[Your_Team_ID]_[Your_Model_Name].py`.
3. Put your pretrained model under the `model_zoo` folder. Name your model checkpoint as `[Your_Team_ID]_[Your_Model_Name].[pth or pt or ckpt]`
4. Modify `model_path` in `test_demo.py`. Modify the imported models.
5. `python test_demo.py`

Please send us the command to download your code, e.g. `git clone [Your repository link]` When submitting the code, please remove the noisy and denoised images in `data` folder to save the bandwidth.

4. Factsheet Information

The factsheet should contain the following information. Most importantly, you should describe your method in detail. The training strategy (optimization method, learning

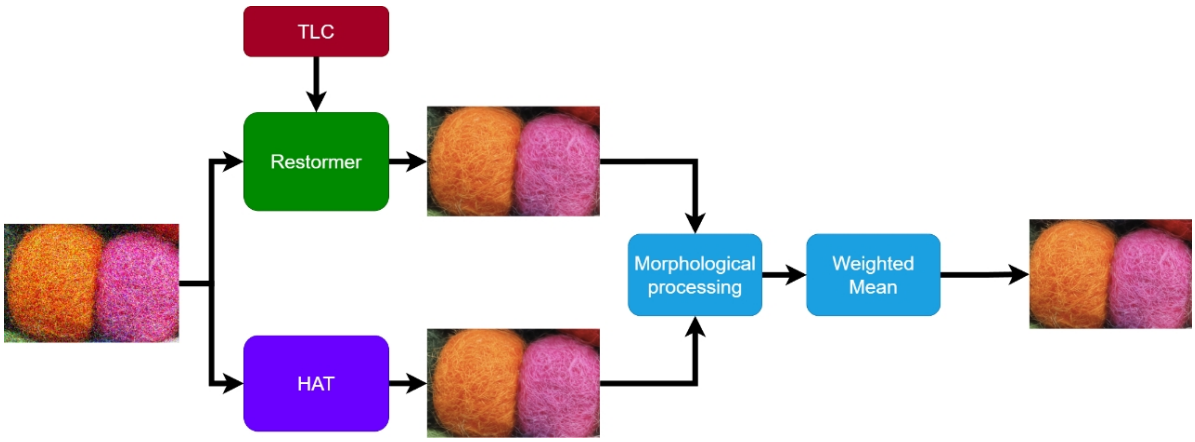

Figure 1. Our pipeline structure

Figure 2. From left to right, top to bottom, low-quality images, Restormer denoising results, HAT denoising results, weighted average results

rate schedule, and other parameters such as batch size, and patch size) and training data (information about the additional trainning data) should also be explained in detail.

4.1. Team details

- Team name
  BuptMM

- Team leader name
  Jingyu Ma
- Team leader address, phone number, and email
  Address: Beijing University of Posts and Telecommunications, Haidian District, Beijing, China
  Phone number: +86-18800192598
  Email: whalemjy@bupt.edu.cn
- Rest of the team members
  Zhijuan Huang, Huiyuan Fu, Hongyuan Yu, Boqi Zhang, Jiawei Shi, Heng Zhang, HuaDong Ma
- Team website URL (if any)
- Affiliation
  Beijing University of Posts and Telecommunications
  Xiaomi Inc., China
- Affiliation of the team and/or team members with NTIRE 2025 sponsors (check the workshop website)
- User names and entries on the NTIRE 2025 Codalab competitions (development/validation and testing phases)
  whalemjy, 10 / 15
- Best scoring entries of the team during development/validation phase
  10(valid) / 15(test)
- Link to the codes/executables of the solution(s)
  https://github.com/ALEX-YRDM/BuptMM

4.2. Method details

You should describe your proposed solution in detail. This part is equivalent to the methodology part of a conference paper submission. The description should cover the following details.

- General method description (How is the network designed.)
  In recent years, the Transformer architecture has been widely used in image denoising tasks. In order to further explore the superiority of the two representative networks, Reformer and HAT, in this field, we propose a dual network&post-processing denoising model that combines the advantages of the former's global attention mechanism and the latter's channel attention mechanism.
- Representative image / diagram / pipeline of the method(s) As shown in Figure 1, our network is divided into two stages. In the first stage, we use DIV2K and LSDIR training sets to train Restaormer and HAT respectively, and then enhance the ability of Restaormer through TLC technology during its reasoning stage. In the second stage, we first use the Canny operator to perform edge detection on the images processed by the two models. We take an OR operation on the two edge images, and then XOR the result with the edge of HAT to obtain the edge difference between the two images. For this part of the edge difference, we use the result obtained by HAT as the standard for preservation. Finally, we take the average of the other pixels of HAT and Reformer to obtain the final result.
- Training strategy
  We used the DIV2K and LSSIR datasets to train both the Restormer and HAT simultaneously. We employed a progressive training strategy for the Restormer, where the image block size increased from 128 to 384 with a step size of 64. We also used a fixed size training strategy for the HAT, with a patch size of 512.
- Experimental results
  As shown in Fig 2.
- References
  [1]Syed W Z, Aditya A, Salman K, Munawar H, Fahad S K, Ming-Hsuan Y, et al. Restormer: Efficient Transformer for High-Resolution Image Restoration[J], Computing Research Repository, 2022, 2022(1): 5718-5729.
  [2]Jingbo L, Zhilu Z, Yuxiang W, Dongwei R, Dongsheng J, Qi T, Wangmeng Z, et al. Improving Image Restoration Through Removing Degradations in Textual Representations[J], Computing Research Repository, 2024
  [3]Xiangyu C, Xintao W, Jiantao Z, Yu Q, Chao D, et al. Activating More Pixels in Image Super-Resolution Transformer.[J], Computing Research Repository, 2023: 22367-22377.

Additionally, you can refer to the following items to detail your description.

- Total method complexity (number of parameters, FLOPs, GPU memory consumption, number of activations, runtime)
  250 [M] (two models, approximate value)
  GPU memory consumption: 8 * 80 [G] (training), 38.47G (reasoning)
  runtime: Train & Valid:19H(Restormer) + 24H(HAT) Test: 482.83s
- Which pre-trained or external methods / models have been used (for any stage, if any)
- Which additional data has been used in addition to the provided NTIRE training and validation data (at any stage, if any)
- Training description
  Dual models trained separately
- Testing description
  Use two models to directly detect images without cropping process
- Quantitative and qualitative advantages of the proposed solution
  Our method can effectively remove Gaussian noise with sigma=50 and has good edge preservation effect
- Results of the comparison to other approaches (if any)
- Results on other benchmarks (if any)
- Novelty degree of the solution and if it has been previously published
- It is OK if the proposed solution is based on other works (papers, reports, Internet sources (links), etc). It is eth-

ically wrong and a misconduct if you are not properly giving credits and hide this information.
We used some SOTA methods as our backbone, which have been listed in the references

5. Other details

- Planned submission of a solution(s) description paper at NTIRE 2025 workshop.
- General comments and impressions of the NTIRE 2025 challenge.
- What do you expect from a new challenge in image restoration, enhancement and manipulation?
- Other comments: encountered difficulties, fairness of the challenge, proposed subcategories, proposed evaluation method(s), etc.

References