NTIRE 2025 Efficient SR Challenge Factsheet
Efficient Feature Aggregation Network for Image Super-Resolution

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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 efficient image super-resolution.

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 (Yawei Li, Bin Ren, Nancy Mehta, and Radu Timofte)** by email.

2. Email final submission guide

To:
yawei.li@vision.ee.ethz.ch
bin.ren@unitn.com
cshguo@gmail.com
zongwei.wu@uni-wuerzburg.de
timofte.radu@gmail.com
CC:
your_team_members

Title: NTIRE 2025 Efficient SR 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 the 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, pre-trained 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]`

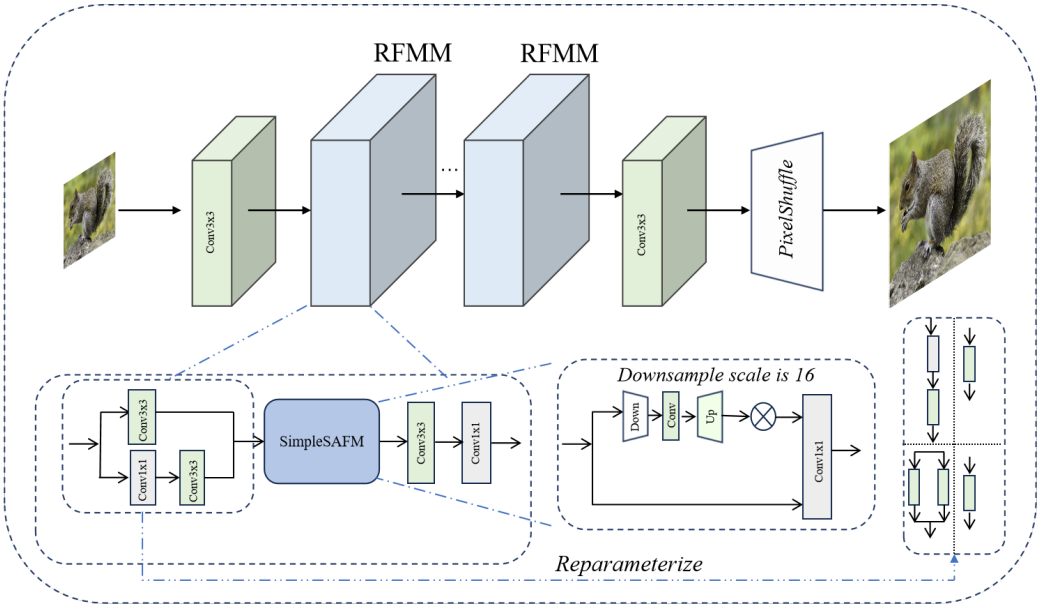

Figure 1. The overall network architecture of our FAnet.

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

4.1. Team details

- Team name:mmSR
- Team leader name: Jiyu Wu
- Team leader address is Shenzhen, China.The phone number is (+86)13415210345.And email is jiyu_wu@163.com.
- Rest of the team members: Jiancheng Huang, Yifan Liu, Yi Huang, Shifeng Chen.
- Affiliation:Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences.
- Affiliation of the team and/or team members with NTIRE 2025 sponsors (check the workshop website):No direct affiliation with NTIRE 2025 sponsors.
- User names and entries on the NTIRE 2025 Codalab competitions (development/validation and testing phases): jiyuwu
- Best scoring entries of the team during the development/validation phase: Valid PSNR is 26.92dB, Test PSNR is 27.05dB.
- Link to the codes/executables of the solution(s): https://github.com/geiyu5/2025ESR

4.2. Method details

We improve the model based on SAFMN++ and name it FAnet as shown in the figure1. Compared to SAFMN++, our model achieves a higher PSNR with a lower computational cost. Unlike the original SAFMN++ [3] method, we introduce modifications in both the data and model structure.

Regarding the data, in addition to using the provided training dataset, we analyze the super-resolution results of the model and categorize common issues in detail generation. Due to constraints on model parameters and computational resources, directly enabling a lightweight model to generate details identical to the ground truth (GT) is impractical. Therefore, we employ a convolutional neural network, such as DRCT [5], to generate images with details that are easier for the model to learn. These images serve as pseudo-GT to facilitate the learning process and prevent excessive learning difficulty that may lead to biased model training.

In terms of model structure, as shown in the figure, we improve the Feature Mixing Module of the original architecture and incorporate the concept of re-parameterization, designing the RFMM. We modify the convolutional extraction network preceding the original module into a parallel structure to accommodate multi-granularity feature extraction and apply re-parameterization during inference. Furthermore, we adjust the downsampling factor in SimpleSAFM to 16 to achieve lower computational complexity.

We train our model on the DIV2K [4], Flickr2K [2], and LSDIR [1] datasets. The cropped low-resolution (LR) image size is set to 64 × 64 and subjected to random flipping and rotation. The RFA model is optimized using the Adam optimizer with L1 loss minimization in a multi-stage training scheme. During the training phase, we set the initial learning rate to 2×10^{-3} and the minimum learning rate to 1×10^{-6}, training for 500,000 iterations with a mini-batch size of 512. Afterward, we fine-tune the model multiple times using a learning rate of 1×10^{-4} and the minimum learning rate set to 1×10^{-6}, with a mini-batch size of 64.

5. Other details

The NTIRE 2025 challenge has been an exciting opportunity to push the boundaries of image restoration, enhancement, and manipulation techniques. It provided a unique platform for researchers to test new algorithms and compare them against state-of-the-art methods. The competition was well-organized, and the problem statements were clearly defined, enabling us to dive deep into the technical aspects of image processing.

References

[1] Yawei Li, Kai Zhang, Jingyun Liang, Jiezhang Cao, Ce Liu, Rui Gong, Yulun Zhang, Hao Tang, Yun Liu, Denis Demandolx, et al. Lsdir: A large scale dataset for image restoration. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 1775–1787, 2023. 3

[2] Bee Lim, Sanghyun Son, Heewon Kim, Seungjun Nah, and Kyoung Mu Lee. Enhanced deep residual networks for single image super-resolution. In *Proceedings of the IEEE conference on computer vision and pattern recognition workshops*, pages 136–144, 2017. 3

[3] Bin Ren, Yawei Li, Nancy Mehta, Radu Timofte, Hongyuan Yu, Cheng Wan, Yuxin Hong, Bingnan Han, Zhuoyuan Wu, Yajun Zou, et al. The ninth ntire 2024 efficient super-resolution challenge report. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 6595–6631, 2024. 2

[4] Radu Timofte, Eirikur Agustsson, Luc Van Gool, Ming-Hsuan Yang, and Lei Zhang. Ntire 2017 challenge on single image super-resolution: Methods and results. In *Proceedings of the IEEE conference on computer vision and pattern recognition workshops*, pages 114–125, 2017. 3

[5] Hang Wang, Xuanhong Chen, Bingbing Ni, Yutian Liu, and Jinfan Liu. Omni aggregation networks for lightweight image super-resolution. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 22378–22387, 2023. 2