# NTIRE 2023 Image Denoising ($\sigma = 50$) Challenge Factsheet
# NAFNet-Dual

Bo Yang,Jingxiang Chen
NUIST
Nanjing, Jiangsu, China
1178729321@qq.com;jingxiangchen09@gmail.com

Chenghua Li,Xi Zhang
IA,CAS
Beijing,China
lichenghua2014@ia.ac.cn;sheryl.zhangxi@gmail.com

## 1. Introduction

This factsheet template is meant to structure the description of the contributions made by each participating team in the NTIRE 2023 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 2023 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 2023 challenge report and to submit papers with their solutions to the NTIRE 2023 workshop. Detailed descriptions are much appreciated.

The factsheet, source codes/executables, trained models should be sent to **all of the NTIRE 2023 challenge organizers (Yawei Li, Yulun Zhang, and Radu Timofte)** by email.

## 2. Email final submission guide

To: yawei.li@vision.ee.ethz.ch
yulun100@gmail.com
timofte.radu@gmail.com
cc: your_team_members
Title: NTIRE 2023 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 2023 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 denoise 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 trainning data) should also be explained in detail.

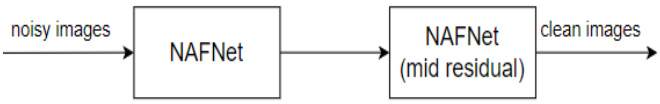


Figure 1. pipeline

## 4.1. Team details

- Team nam: cvmix
- Team leader nam: Bo Yang
- Team leader address, phone number, and e: No. 219, Ningliu Road, Nanjing, Jiangsu, China, +86 18036383345, e-mail 1178729321@qq.com
- Chenghua Li;Xi Zhang;Jingxiang Chen
- Team website URL (if any): None
- Affiliation: Nanjing University Of Information Science technology
- User names and entries on the NTIRE 2023 Codalab competition: yangbo
- Best scoring entries of the team during development/validation phase: 1
- Link to the codes/executables of the solution: Team 14's official repository
- You can get a demo, test, and train script:Team 14's whole project.

## 4.2. Method details

**Methods:**

For this denoising task, we found that the noise level is fixed at 50. Then we decide to use the deep learning method to learn how to recover clean images from noisy images.We compare the existing methods. For the common, they are divided into two kinds of methods: CNN and Transformer. We compared the advantage and disadvantages of the methods above.

We decided to use NAFNet as our baseline to do the task of denoising.NAFNet is based on the network of Restormer and turning the Transformer block to NAFNet block has the SOTA performance in many image restoration tasks. The block assimilates CNN's feature, which is to use convolution to get global information. At the same time, the NAFNet block also uses the Channel Attention mechanism. Channel Attention is kind attention used to know which feature map channel is important to focus on.

Based on NAFNet, we divided the denoising task into 2 stages. The first stage is the main phase to recover images to clean one, then the images will be sent to the second stage. The second stage is focused to recover the detail. We use the default settings in NAFNet with 64 as the first-stage settings. Then we add residual in the bottleneck of the U-net framework to enhance the recover detail ability.We reference the NAFNet in our project.See at end of this factsheet.

**Pipeline:**

The pipeline can bee seen in 1.

**Training strategy:**

For the training strategy, we use AdamW optimizer in betas[0.9,0.9] scheduler is CosineAnnealingLR strategy to reduce lr and the initial lr is 5E-4, batch size per GPU is 4, patch size 384. We only use the data that the denoising competition provided, that is DIV2K LSDIR.

**Experimental results:**

We use DIV2K(801-900) as the test set, all the tested images are added with noise level 50 AWGN. The average PSNR is 30.59 SSIM is 0.86. You can get a demo, test, and train script:Team 14's whole project.

Our method has 261M params;132G FLOPs;44GB GPU memory consumption;678M activations.

We use DIV2K LSDIR as our data set. We crop the original images into patch size 384 pixels, batch size 384 per GPU, and lr is set 5E-4 initially.

We use the original DIV2K validating data set. Our method is better than the original NAFNet and EDT.

## 5. Other details

- Planned submission of a solution(s) description paper at NTIRE 2023 workshop.
- General comments and impressions of the NTIRE 2023 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.

[1] [2]

## References


[1] Liangyu Chen, Xiaojie Chu, Xiangyu Zhang, and Jian Sun. Simple Baselines for Image Restoration. *arXiv e-prints*, page arXiv:2204.04676, Apr. 2022. 3

[2] Xiaojie Chu, Liangyu Chen, Chengpeng Chen, and Xin Lu. Improving Image Restoration by Revisiting Global Information Aggregation. *arXiv e-prints*, page arXiv:2112.04491, Dec. 2021. 3