Reproducibility –> 문제 없음, 코드 공개 필요 없을 것으로 보임

Weaknesses

1. No comparison between SOTA methods (DW-GAN, …) (Reviewer 4)
2. No FLOPs / # of parameters comparison (Reviewer 7)
   * We provide only execution time of ours / optimization based methods
3. Too much hyper-parameters (Reviewer 7)
   * No ablation on those hyper-parameters
4. Performance gap (Reviewer 7)
5. Some writing opinions (Reviewer 5)

* Two tables – to one page
* Renaming Figures 5 and 6

Response?

1. Provide comparison to SOTA methods?
   * Even not comparable results – not helpful
   * Justify the performance gap based on self supervision is non-trivial process
   * *Final version에서 recent works를 추가하겠다 (공간이 있으면)*
2. FLOPs / # of parameters
   * Providing these is easy
   * Is it a new experiment?
3. Hyper-parameters, and their ablation
   * We are also finding way to reduce hyper-parameters.
   * We found hyper-parameters emprically, and saw that not much difference among different hyper-parameters setting.
   * Ablation – experiment ?
4. Performance Gap
   * Same as question 1
5. Writing opinions
   * Agreed

Rebuttal instructions

* 2 pages
* The author rebuttal is optional and is meant to provide you with an opportunity to rebut factual errors or to supply additional information requested by the reviewers. It is NOT intended to add new contributions (theorems, algorithms, experiments) that were absent in the original submission and NOT specifically requested by the reviewers. You may optionally add a figure, graph or proof to your rebuttal to better illustrate your answer to the reviewers' comments.

Reviewer 4

* **1. [Summary] In 3-5 sentences, describe the key ideas, experimental or theoretical results, and their significance.**
  + Resorting to the physical priors of Atmospheric Scattering Model, this paper designs a lightweight self-supervised image dehazing network. The proposed approach is able to achieve a better generalization capacity on different data domains, and has a faster inference speed compared with existing methods.
* **2. [Strengths] Consider the significance of key ideas, experimental or theoretical validation, writing quality, and data contribution. Explain clearly why these aspects of the paper are valuable. Short bullet lists do NOT suffice.**
  + 1) The proposed idea is simple and interpreable.  
    2) Experimental results show that their method can achieve comparable perofmance with a more faster inference speed.
* **3. [Weaknesses] What are the weaknesses of the paper? Clearly explain why these aspects of the paper are weak. Please make the comments very concrete based on facts (e.g. list relevant citations if you feel the ideas are not novel). If applicable, please indicate key issues and questions which, if well addressed during the 1-page rebuttal, might influence you to change your rating.**
  + 1) The authors only compare an old supervised method and miss some recent works, such as [1], [2].  
    [1] Dong, Hang et al. “Multi-Scale Boosted Dehazing Network With Dense Feature Fusion.” 2020 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) (2020): 2154-2164.  
    [2] Fu, Ming Sun et al. “DW-GAN: A Discrete Wavelet Transform GAN for NonHomogeneous Dehazing.” 2021 IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW) (2021): 203-212.
* **4. [Reproducibility] Is the method described in this paper reproducible?**
  + The paper includes information that would make it possible to reproduce the methods and experiments
* **5. [Overall rating] Paper rating (pre-rebuttal)**
  + Borderline
* **6. [Justification of overall rating] What are the most important factors in your rating?**
  + My main concern is that they missed the SOTA methods in their experiments. They only choose a classic method (DehazeNet) as their baselines, while there are many recent works that handle various data domains well (see weaknesses).

Reviewer 5

* **1. [Summary] In 3-5 sentences, describe the key ideas, experimental or theoretical results, and their significance.**
  + 1. It merges physical prior knowledge and self-supervision on the dehazing task.  
    2. A lightweight CNN, enabling the application to real-time systems.  
    3. It is well generalized over data domains.
* **2. [Strengths] Consider the significance of key ideas, experimental or theoretical validation, writing quality, and data contribution. Explain clearly why these aspects of the paper are valuable. Short bullet lists do NOT suffice.**
  + 1. The merge of physical prior knowledge and self-supervised deep neural network makes the proposed model physically meaningful, explainable, and generalized well over data domains.  
    2. Proposed method is self-supervised and can be trained on a dataset that has only hazy images (without corresponding clear images).
* **3. [Weaknesses] What are the weaknesses of the paper? Clearly explain why these aspects of the paper are weak. Please make the comments very concrete based on facts (e.g. list relevant citations if you feel the ideas are not novel). If applicable, please indicate key issues and questions which, if well addressed during the 1-page rebuttal, might influence you to change your rating.**
  + 1. Some technique detained not well ckecked or not correctly delivered. (e.g. line 206: the inequation should be J\_sat > I\_sat, not the opposite. Line 251-252: T should be a Tensor or a 2d matrix whose elements range from 0 to 1. However the statement in the paper describe T as a scaler in the range of 0 to 1.) Please double check all the content to avoid such mistakes.  
    2. Experiement results are not well illustrated, or miss important information to support the conclusion. (e.g. Table1, top result not highlighted. In Section5.3 Result-Experiment Results: execution time of diff. models are compared, however these data are not included in the table. Line 436: 'As shown in Tables 1 and 2...' reader need to refer to 2 different tables in 2 pages, which is not convenient. Line 444: not found Effect of eqn (23) in tables. Fig 5 and 6: maybe reconstruct title? like, 'Dehazing results on real hazy images using indoor and outdoor SSDN.') Please go through the Results section and refine the way you present your result to make sure the reader can catch the main idea.
* **4. [Reproducibility] Is the method described in this paper reproducible?**
  + The paper includes sufficient information that would make it easy to fully reproduce the methods and experiments
* **5. [Overall rating] Paper rating (pre-rebuttal)**
  + Weak Accept
* **6. [Justification of overall rating] What are the most important factors in your rating?**
  + The key ideas, and writing quality.

Reviewer 7

* **1. [Summary] In 3-5 sentences, describe the key ideas, experimental or theoretical results, and their significance.**
  + This paper proposes a self-supervised framework for single-image dehazing. The method consists of a feed-forward CNN backbone that takes input an RGB image, and outputs dehazed image, transmission map and arilight image. The network is trained with reconstruction loss based on the Atmospheric Scattering Model (ASM), prior loss and regularization loss. Since no GT pairs of hazy and clean images are needed, the network can be trained on real-world hazy images that are more widely available. The method is validated on both synthetic and real datasets. The performance of the proposed method is on-par with the compared un-supervised methods, although not as good as the supervised methods.
* **2. [Strengths] Consider the significance of key ideas, experimental or theoretical validation, writing quality, and data contribution. Explain clearly why these aspects of the paper are valuable. Short bullet lists do NOT suffice.**
  + +Because the reconstruction loss is based on ASM, the estimated dense images are physically meaningful and consistent with the physical model.  
      
    +Since not GT pairs of clean and hazy images are needed, it is easier to collect dataset for training  
      
    +The proposed method is more robust to non-uniform haze than the compared methods, as shown in the supplementary.
* **3. [Weaknesses] What are the weaknesses of the paper? Clearly explain why these aspects of the paper are weak. Please make the comments very concrete based on facts (e.g. list relevant citations if you feel the ideas are not novel). If applicable, please indicate key issues and questions which, if well addressed during the 1-page rebuttal, might influence you to change your rating.**
  + - Although the author claims that the model is light-weight, there is no # of parameters or FLOPs shown in the paper, and comparison with other feed-forward methods without test-time-optimization  
      
    -There are lots of loss terms used for training, all with their own weights. As a result, it is hard to tune those hyper-parameters to achieve the optimal performance.  
      
    -No ablation study on the weights losses are performed. As a result, the reader only gets a vague idea on the effects of the three ‘non-leaf’ losses in Eq.28. Inside each of those losses, we don’t know which weights matter more than the others. Additional ablations on those losses would be helpful.  
      
    -There is still a performance gap from the supervised methods. The performance is no better than unsupervised methods (YOLY).
* **4. [Reproducibility] Is the method described in this paper reproducible?**
  + The paper includes information that would make it possible to reproduce the methods and experiments
* **5. [Overall rating] Paper rating (pre-rebuttal)**
  + Weak Accept
* **6. [Justification of overall rating] What are the most important factors in your rating?**
  + Although there is still a performance gap from the supervised feed-forward method, learning a robust feed-forward model without GT pairs is non-trivial. This paper is a valid step towards this direction, making the collection of training samples much effortless. Thus I would recommend the acceptance of the paper.