

SAR-to-Optical image translation

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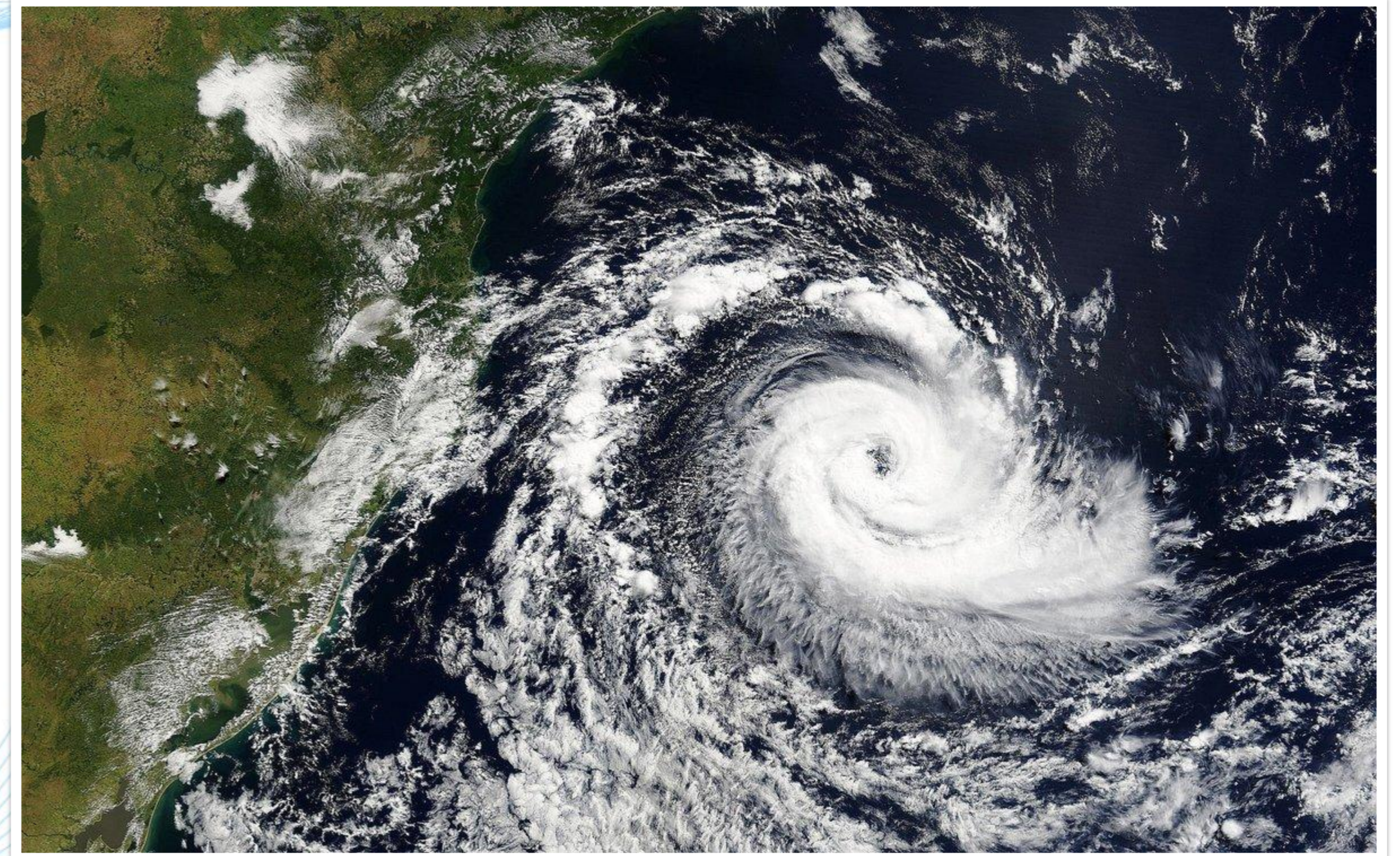
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Agenda

- Reason behind image-to-image translation
 - Problems with manufacturing
- Structure of neural network
 - Vanilla GAN and S-Cycle GAN
- Experiments conducted
 - Image translation
 - Cloud removal

Image-to-Image

- Problems with optical images:
 - Weather conditions
 - Hours of darkness



https://avatars.mds.yandex.net/get-zen_doc/176438/pub_5a8545c81410c32cdb85b939_5a8546c455876b90a66af9f2/scale_1200

Image-to-Image

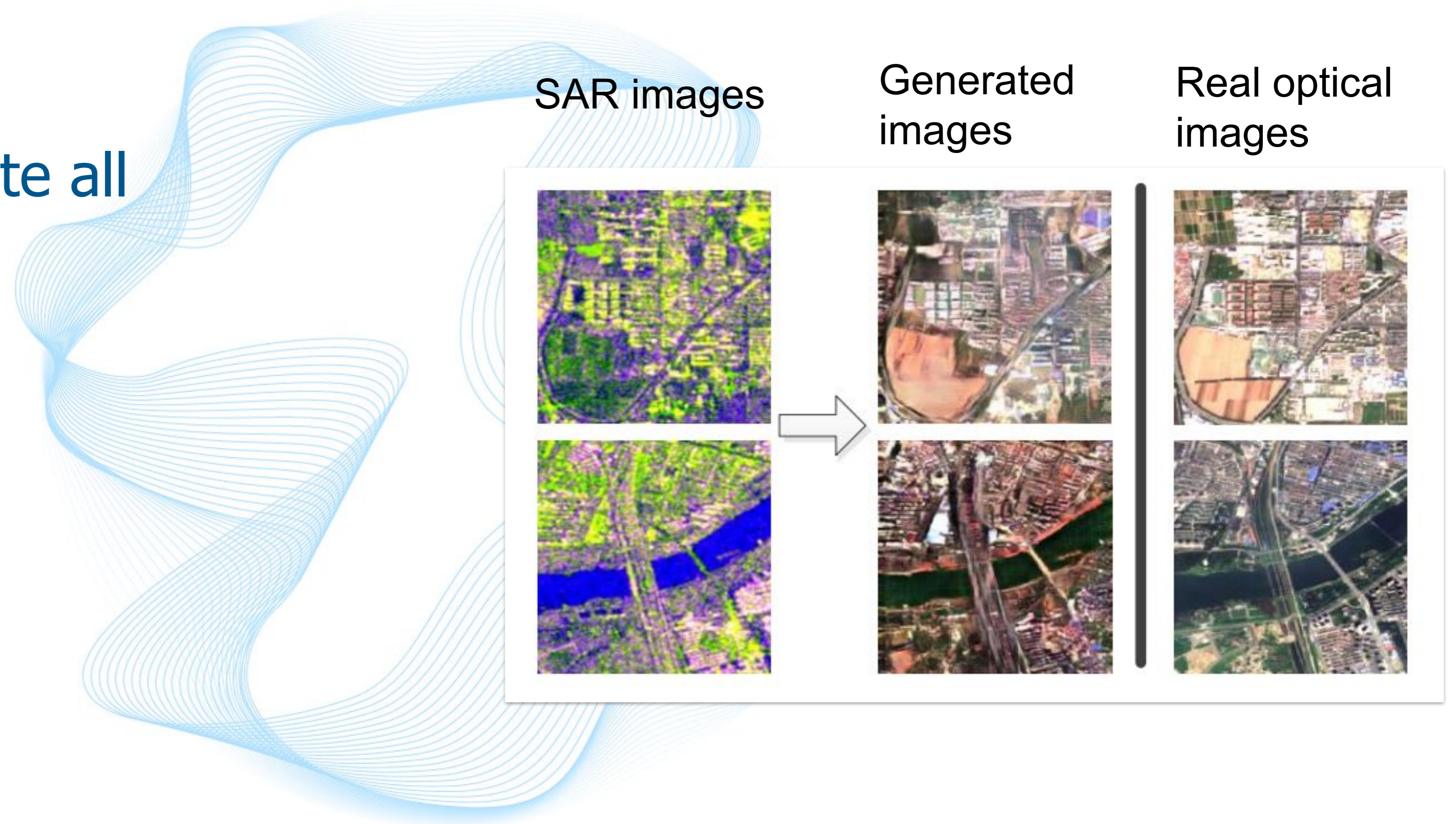
- Problems with synthetic aperture radar (SAR) images:
 - Grainy noise
 - Lack of colours



<https://2.bp.blogspot.com/-e1eA2Va5i8I/WDN8DbaNZHI/AAAAAAAAACDE/ly7IKndXyUY5J6tCH0Wcpy9HW31kn2kygCLcB/s1600/intensity.JPG>

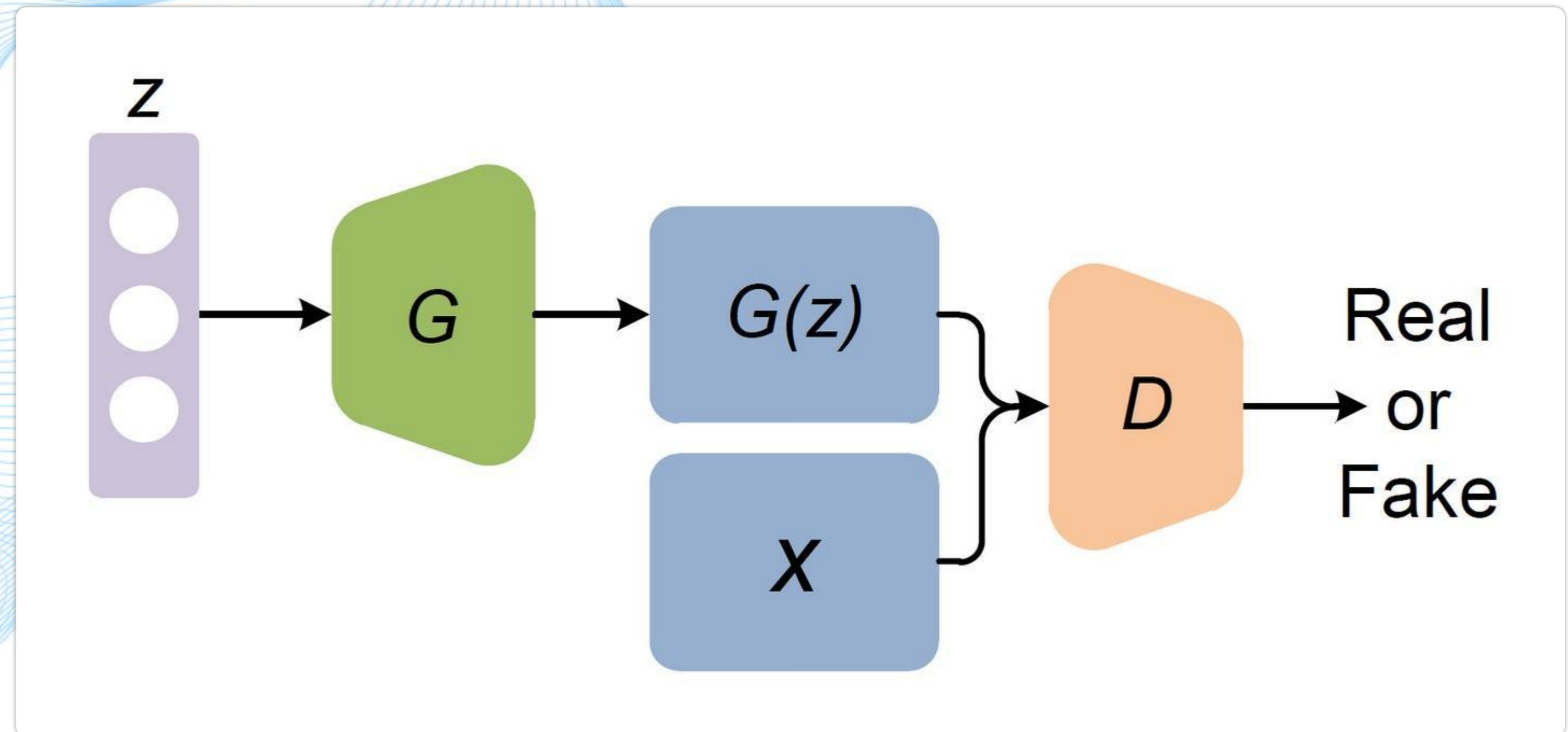
Image-to-Image

- The way to mitigate all problems at once



GAN Structure

- Discriminator (D) identify images
- Generator (G) create image from noise

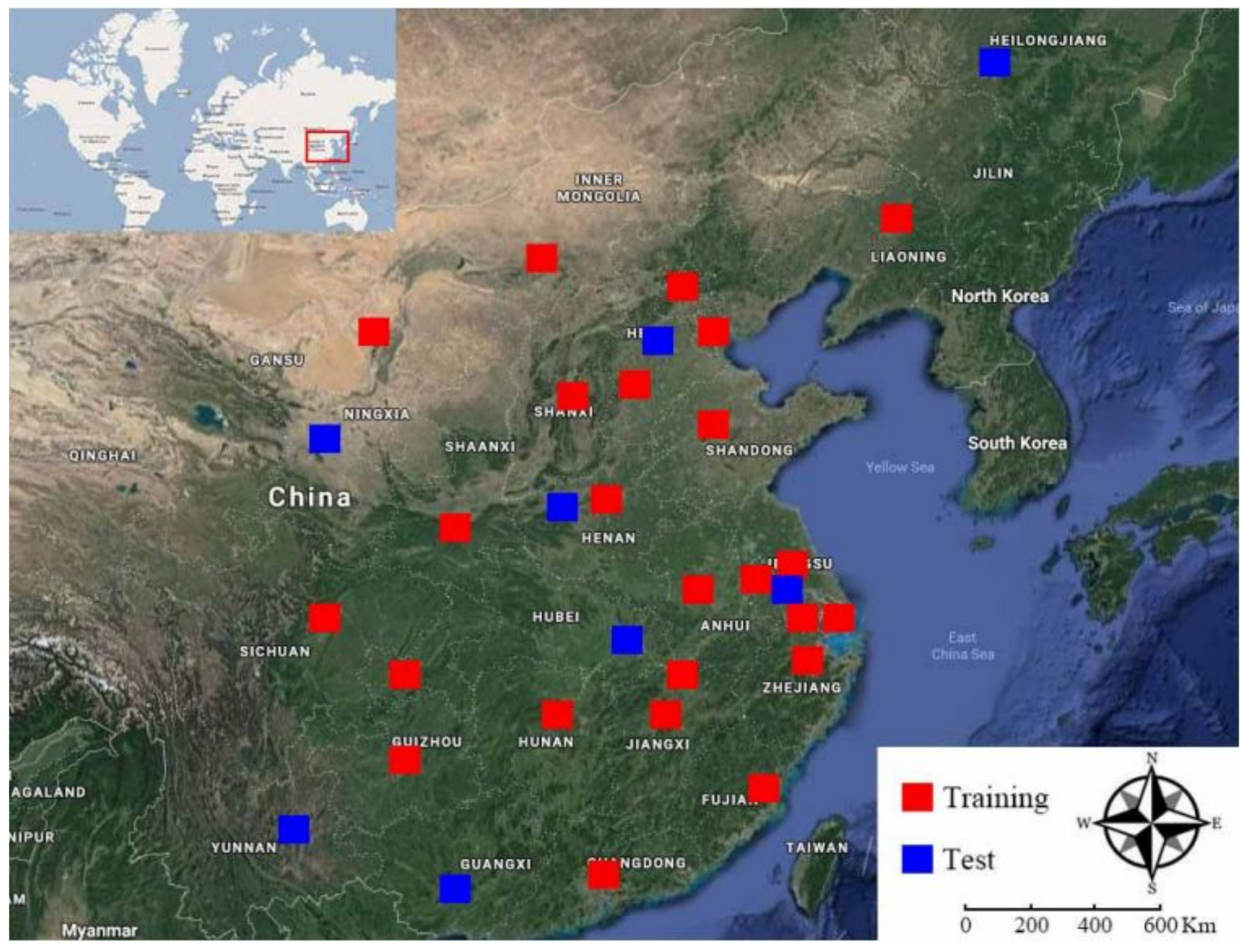


<https://qiita-user-contents.imgix.net/https%3A%2F%2Fqiita-image-store.s3.ap-northeast-1.amazonaws.com%2F0%2F567823%2F8c19ec3d-693d-e5c1-070c-ce69f1a16d58.jpeg?ixlib=rb-1.2.2&auto=format&gif-q=60&q=75&w=1400&fit=max&s=06c4a34575c9c4963f0f7076eb8f4b72>

GAN Structure

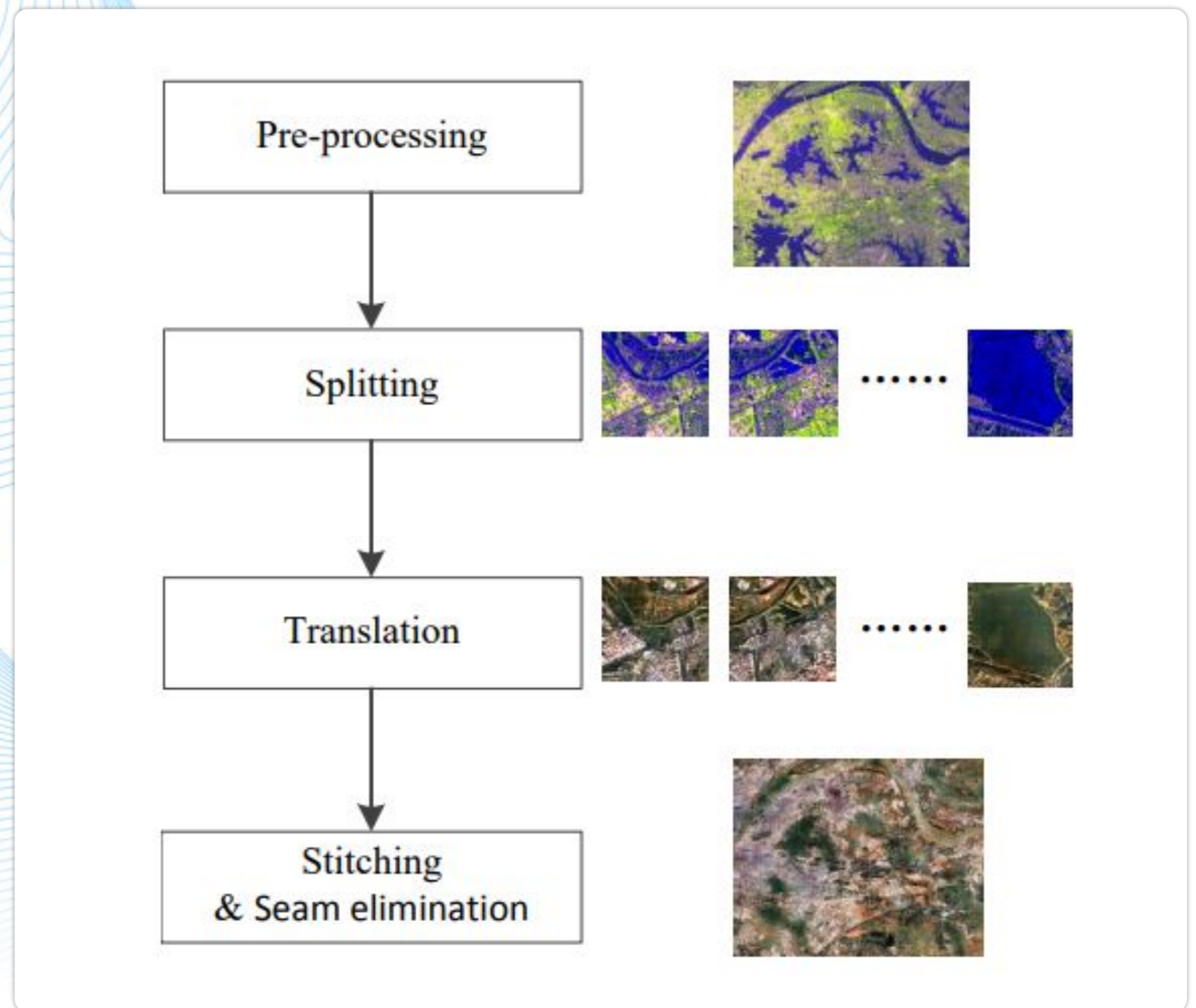


- Red rectangles: scenes for training
- Blue rectangles: scenes for test



GAN Structure

- Division into smaller patches
- Translation from SAR to optical
- Stitching pieces the image



Experiments and results

Image translation:

- Example of ready picture
- Example of translated patch

SAR images

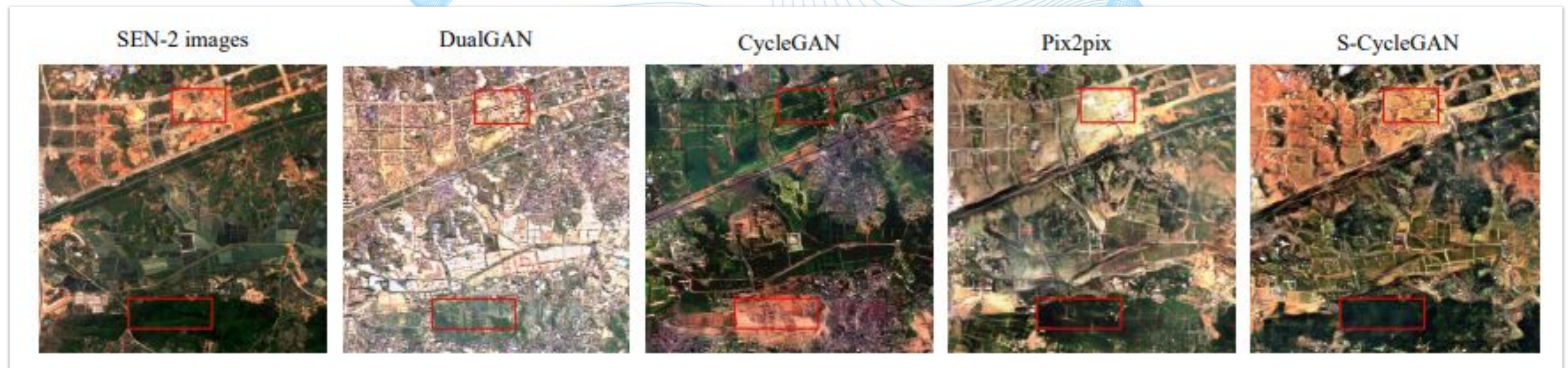
Generated images

Real optical images



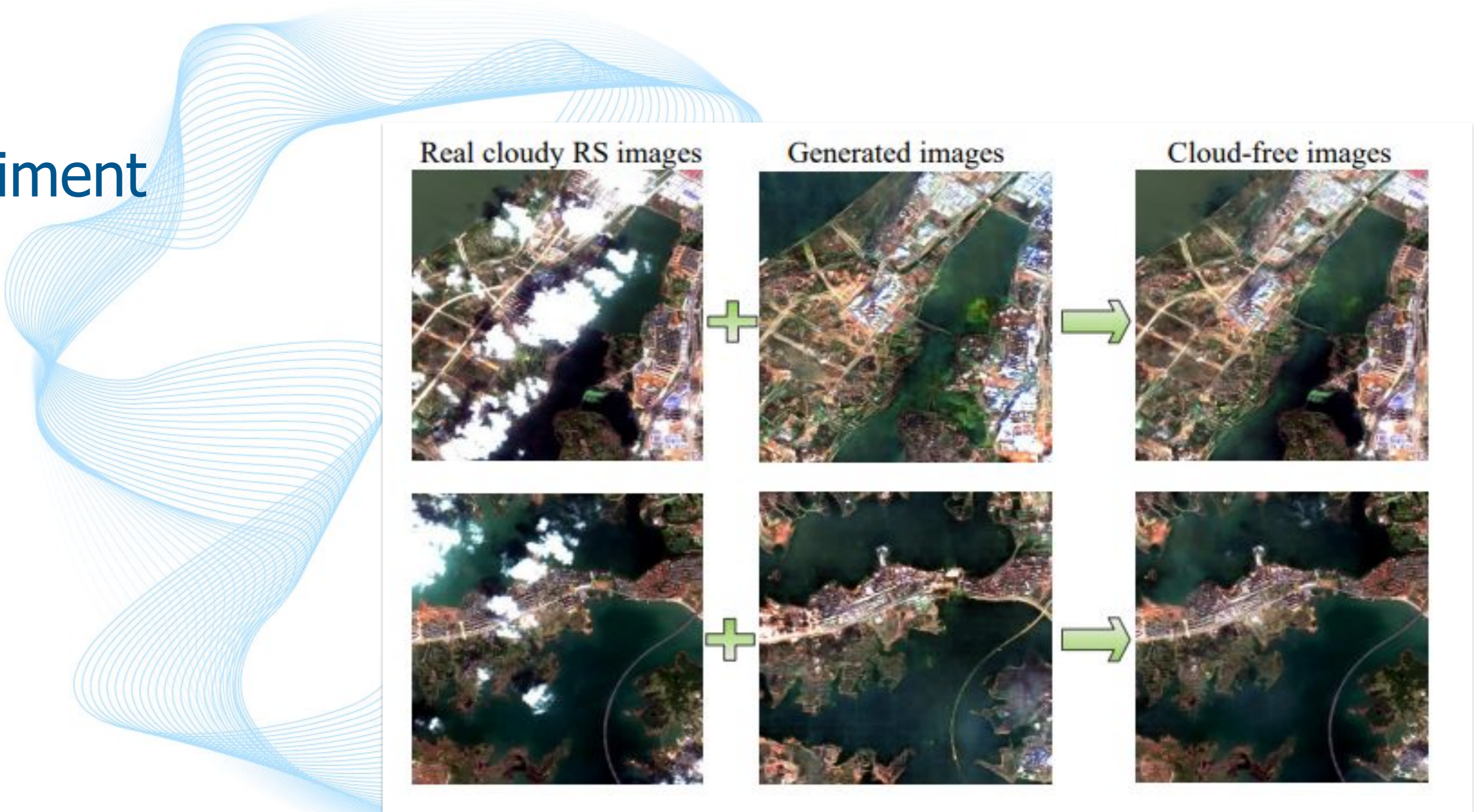
Experiments and results

Comparison of various approaches



Experiments and results

Cloud removal experiment



Summary

- Worthwhile and important problem has found it's solution
- Modern and elegant methods were used
- Mind-blowing results were presented

References

- <https://www.researchgate.net/publication/335648375> SAR-to-Optical Image Translation Using Supervised Cycle-Consistent Adversarial Networks
- <https://neurohive.io/ru/osnovy-data-science/gan-rukovodstvo-dlja-novichkov/>
- [https://neerc.ifmo.ru/wiki/index.php?title=Generative Adversarial Nets \(GAN\)](https://neerc.ifmo.ru/wiki/index.php?title=Generative_Adversarial_Nets_(GAN))
- <https://arxiv.org/pdf/1701.07875.pdf>