# Image restoration using cycle-consistent adversarial networks

# 1)Cycle-consistent adversarial networks improves generalizability of radiomics model in grading meningiomas on external validation

**REVIEW:**

The objective of this work was to develop a radiomics model that could predict meningioma grade based on external validation. In the institutional training set, 257 meningioma patients were included, and radiomic characteristics were derived from T2-weighted and contrast-enhanced T1 images. The combined T2 and T1C models performed better after applying CycleGAN, with an AUC, accuracy, and F1 score of 0.83. CycleGAN can reduce inter-institutional image heterogeneity while maintaining predictive information, according to quantitative measures.

**REFERENCE**:

# Park, Y.W., Shin, S.J., Eom, J. *et al.* Cycle-consistent adversarial networks improves generalizability of radiomics model in grading meningiomas on external validation. *Sci Rep* 12, 7042 (2022). https://doi.org/10.1038/s41598-022-10956-9

**2) Unpaired Low-Dose CT Denoising Network Based on Cycle-Consistent Generative Adversarial Network with Prior Image Information**

# REVIEW:

# This study suggests a cycle generative adversarial network (CycleGAN)-based unpaired LDCT image denoising network without the need for a one-to-one training dataset. The distribution is mapped from LDCT to NDCT using cyclic loss, and the network is merged with prior knowledge from the result of the preprocessing using the LDCT picture to control the production of content. Visual inspection and quantitative evaluation showed that the proposed strategy was superior, as shown by real-data experiments.

# REFERENCE:

# Chao Tang, Jie Li, Linyuan Wang, Ziheng Li, Lingyun Jiang, Ailong Cai, Wenkun Zhang, Ningning Liang, Lei Li, Bin Yan, "Unpaired Low-Dose CT Denoising Network Based on Cycle-Consistent Generative Adversarial Network with Prior Image Information", *Computational and Mathematical Methods in Medicine*, vol. 2019, Article ID 8639825, 11 pages, 2019. <https://doi.org/10.1155/2019/8639825>

# 3)Visual Reconstruction of Ancient Coins Using Cycle-Consistent Generative Adversarial Networks

# REVIEW:

# In this study, a deep learning-based technique is proposed for performing a virtual restoration of an old coin from its image. The two main applications that drive it are the automatic image-based coin type matching and the usefulness of being able to view and examine an old coin in a condition that is more like its original appearance. An empirical analysis shows that the suggested methodology performs well.

# REFERENCE:

# Zachariou, Marios, Neofytos Dimitriou, and Ognjen Arandjelović. 2020. "Visual Reconstruction of Ancient Coins Using Cycle-Consistent Generative Adversarial Networks" Sci 2, no. 3: 52. https://doi.org/10.3390/sci2030052

# 4) Lund jet images from generative and cycle-consistent adversarial networks

# REVIEW:

# Using the Lund jet plane, we present a generative model to simulate radiation patterns within a jet. We contrast our model with other cutting-edge generative methods and demonstrate how a mapping between various jet categories may be made to subsequently alter simulation parameters or the underlying procedure. These findings offer a foundation for drastically cutting simulation durations and improving physical measurement data.

# REFERENCE:

# Carrazza, S., Dreyer, F.A. Lund jet images from generative and cycle-consistent adversarial networks. *Eur. Phys. J. C* 79, 979 (2019). <https://doi.org/10.1140/epjc/s10052-019-7501-1>

# 5) Solar Image Restoration with the CycleGAN Based on Multi-fractal Properties of Texture Features

# REVIEW:

# On the premise that the textural elements of solar photographs are multi-fractals, we suggest a pure data-based approach to image restoration. We reconstruct fuzzy images of the same steady physical process at the same wavelength obtained by the same telescope using the Cycle-Consistent Adversarial Network. With both simulated and actual observation data, we put our technique to the test and discovered that it could boost the spatial resolution of solar photos without sacrificing frame rate. It can be applied as a post-processing technique for solar photos captured by either seeing-limited or ground-layer adaptive optics-equipped telescopes.

# REFERENCE:

# Yi Huang1, Bojun Cai1, and Dongmei Cai. “Solar Image Restoration with the CycleGAN Based on Multi-fractal Properties of Texture Features” The Astrophysical Journal Letters,vol.881,no 2(2019)

# 6) sciCAN: single-cell chromatin accessibility and gene expression data integration via cycle-consistent adversarial network

# REVIEW:

# SciCAN is an adversarial method that unsupervisedly integrates single-cell chromatin accessibility and gene expression data. In 5 scATAC-seq/scRNA-seq datasets, it was compared to 5 other approaches and performed consistently well across all datasets. It was also used with 10X Multiome data, and the preservation of biological linkages via the integrated representation was proven. In addition, it was utilised to find cells that responded in similar ways to various perturbations in these various modalities.

# REFERENCE:

# Xu, Y., Begoli, E. & McCord, R.P. sciCAN: single-cell chromatin accessibility and gene expression data integration via cycle-consistent adversarial network. *npj Syst Biol Appl* 8, 33 (2022). <https://doi.org/10.1038/s41540-022-00245-6>

# 7) Millimeter-Wave Image Deblurring via Cycle-Consistent Adversarial Network

# REVIEW:

# This study suggests a deblurring technique based on Cycle GAN that can figure out how to map blurred MMW images to focussed ones. An identity loss and a mean squared error loss (MSE loss) are included to lessen the impact of shaking blur. The experimental findings show that the suggested strategy can effectively reduce blurring in MMW images.

# REFERENCE:

# Liu, Huteng, Shuoguang Wang, Handan Jing, Shiyong Li, Guoqiang Zhao, and Houjun Sun. 2023. "Millimeter-Wave Image Deblurring via Cycle-Consistent Adversarial Network" Electronics 12, no. 3: 741. https://doi.org/10.3390/electronics12030741

# 8) Generating Paired Seismic Training Data with Cycle-Consistent Adversarial Networks

# REVIEW:

# In recent years, deep learning-based seismic data interpretation has drawn interest and concentration, with training data being essential. We suggest label-to-data networks based on cycle-consistent adversarial networks to acquire realistic seismic training data. These networks create synthetic seismic data that fits the random labels and has properties that are similar to the real seismic data from unlabeled real seismic data and random labels. The effectiveness of the suggested approaches is quantified in the created data, and test results show that the generated data are trustworthy and may be used for seismic fault detection.

# REFERENCE:

# Zhang, Zheng, Zhe Yan, Jiankun Jing, Hanming Gu, and Haiying Li. 2023. "Generating Paired Seismic Training Data with Cycle-Consistent Adversarial Networks" Remote Sensing 15, no. 1: 265. <https://doi.org/10.3390/rs15010265>

# 9) Unsupervised Image Dedusting via a Cycle‑Consistent Generative Adversarial Network

# REVIEW:

# For image dedusting, we suggest an end-to-end cyclic generative adversarial network (DCycleGAN) that does not require training on pairs of sand-dust and matching ground truth images. In order to guide the generator via corresponding discriminator adversarials, we construct a jointly optimised guided module (JOGM). Extensive trials show that the suggested network model outperforms state-of-the-art methods, efficiently removes sand particles, and has greater clarity and image quality.

# REFERENCE:

# Gao, Guxue, Huicheng Lai, and Zhenhong Jia. 2023. "Unsupervised Image Dedusting via a Cycle-Consistent Generative Adversarial Network" Remote Sensing 15, no. 5: 1311. https://doi.org/10.3390/rs15051311

# 10) Multi-Level Cycle-Consistent Adversarial Networks with Attention Mechanism for Face Sketch-Photo Synthesis

# REVIEW:

# In order to address the issues of losing important facial information and a lack of realism in synthesised images produced by existing approaches, this research suggests an unsupervised model. Convolutional block attention, a multi-level cycle consistency loss function, and a multi-scale feature extraction module are all part of the model's CycleGAN architecture. The model's facial details and edge structures are clearer and more realistic, and its peak signal-to-noise ratio and structural similarity performance indices are significantly better than those of other approaches, according to qualitative experiments on the CUFS and CUFSF public datasets.

# REFERENCE:

# Ren, Danping, Jiajun Yang, and Zhongcheng Wei. 2022. "Multi-Level Cycle-Consistent Adversarial Networks with Attention Mechanism for Face Sketch-Photo Synthesis" Sensors 22, no. 18: 6725. https://doi.org/10.3390/s22186725