of typical frontside magnetograms. Here we generate farside solar magnetograms from STEREO/Extreme UltraViolet Imager (EUVI) 304-Å images using a deep learning model based on conditional generative adversarial networks (cGANs). We train the model using pairs of Solar Dynamics Observatory (SDO)/Atmospheric Imaging Assembly (AIA) 304-Å images and SDO/Helioseismic and Magnetic Imager (HMI) magnetograms taken from 2011 to 2017 except for September and October each year. We evaluate the model by comparing pairs of SDO/HMI magnetograms and cGAN-generated magnetograms in September and October. Our method successfully generates frontside solar magnetograms from SDO/AIA 304-Å images and these are similar to those of the SDO/HMI, with Hale-patterned active regions being well replicated. Thus we can monitor the temporal evolution of magnetic fields from the farside to the frontside of the Sun using SDO/HMI and farside magnetograms generated by our model when farside extreme-ultraviolet data are available. This study presents an application of image-to-image translation based on cGANs to scientific data.

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[구 SS-09] Application of Deep Learning to Solar Data: 6. Super Resolution of SDO/HMI magnetograms

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The Helioseismic and Magnetic Imager (HMI) is the instrument of Solar Dynamics Observatory (SDO) to study the magnetic field and oscillation at the solar surface. The HMI image is not enough to analyze very small magnetic features on solar surface since it has a spatial resolution of one arcsec. Super resolution is a technique that enhances the resolution of a low resolution image. In this study, we use a method for enhancing the solar image resolution using a Deep-learning model which generates a high resolution HMI image from a low resolution HMI image (4 by 4 binning). Deep learning networks try to find the hidden equation between low resolution image and high resolution image from given input and the corresponding output image. In this study, we trained a model based on a very deep residual channel attention networks (RCAN) with HMI images in 2014 and test it with HMI images in 2015. We find that the model achieves high quality results in view of both visual and measures: 31.40 peak signal-to-noise ratio(PSNR), Correlation Coefficient (0.96), Root mean square error (RMSE) is 0.004. This result is much better than the conventional bi-cubic interpolation. We will apply this model to full-resolution SDO/HMI and GST magnetograms.

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[구 SS-10] Generation of global coronal field extrapolation from frontside and AI-generated farside magnetograms

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Global map of solar surface magnetic field, such as the synoptic map or daily synchronic frame, does not tell us real-time information about the far side of the Sun. A deep-learning technique based on Conditional Generative Adversarial Network (cGAN) is used to generate farside magnetograms from EUVI 304Å of STEREO spacecrafts by training SDO spacecraft's data pairs of HMI and AIA 304Å. Farside(or backside) data of daily synchronic frames are replaced by the Ai-generated magnetograms. The new type of data is used to calculate the Potential Field Source Surface (PFSS) model. We compare the results of the global field with observations as well as those of the conventional method. We will discuss advantage and disadvantage of the new method and future works.
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[구 SS-11] Relative Contribution from Short-term to Long-term Flaring rate to Predicting Major Flares

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