

AI for Digital Twin Earth

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The digital and sensing technologies, i.e. Big Data, are revolutionary developments massively impacting the Earth Observation (EO) domains. While, Artificial Intelligence (AI) is providing now the methods to valorize the Big Data. Today the accepted trends assume more data we analyze, the smarter the analysis paradigms will perform. However, the data deluge, diversity, or the broad range of specialized applications are posing new major challenges. From the perspective of the data valorization and applications the multi-mission and related data use for global applications still need more efforts. From the methodological side the challenges are related to, the reproducibility, the trustworthiness, physics awareness, and over all, the explainability of the methods and results.

The presentation introduces and explains solution based on the concept of Digital Twins. A Digital Twin is the convergence of the remote sensing physical mechanisms tightly connected, communicating and continuously learning, from and with mathematical models, data analytics, simulations and user interaction.

The presentation covers the major developments, of hybrid, physics aware AI paradigms, at the convergence of forward modelling, inverse problem and machine learning, to discover causalities and make prediction for maximization of the information extracted from EO and related non-EO data. The majority of EO applications or services require the complementary EO multi-sensor and non-EO data, i.e., sensor fusion and multitemporal observations. This explains how to automatize the entire chain from multi-sensor EO and non-EO data, to physical parameters, required in applications by filling the gaps and generating a relevant, understandable layers of information.

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