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Topic: **NeRF in Industrial Design and Architectural Heritage**

Held by **Valeria Croce**,
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Venue: April 2024

Abstract:

Neural Radiance Fields (NeRF or NeRFs) are to date emerging as a novel method for synthesizing novel views of complex 3D scenes, leveraging an artificial neural network to optimize a volumetric scene function using a set of input views. While these rendering techniques are gaining increasing interest in various domains as innovative methods for novel view synthesis and image-based reconstruction, their potential application to Industrial Design and Architectural Heritage remains unexplored. The seminar will provide a comprehensive overview of NeRF (Neural Radiance Fields), from conceptual fundamentals to practical applications in cultural heritage, encouraging active student participation through case study analysis.

Session 1 (4 hours): In the first part of the seminar, Ph.D. students will be introduced to Neural Networks and to the specific functioning of NeRF. Basic principles and operations will be shown, exploring key concepts such as implicit representation of geometry and radiance prediction. The historical development of NeRF will be traced, from initial implementations to latest advancements and variations.

Session 2 (4 hours): In the second part, current challenges in NeRF will be discussed, including scalability, computational complexity, and handling dynamic scenarios, particularly in comparison to more established image-based reconstruction techniques such as photogrammetry. The Ph.D. student will analyze how NeRF can be used in the digitization and 3D reconstruction of cultural heritage, including monuments, statues, archaeological sites, and industrial design object.

Specific applications, via Nerfstudio or LumaAI, will be tested by the students on some significant case studies. The focus will be on improving the rendering of translucent and reflective surfaces, objects with homogeneous textures, and elements with intricate details.

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