Scene-aware Super Resolution

Tutors: Daniel Ponsa (daniel@cvc.uab.cat), Robert Benavente (robert@cvc.uab.cat)

Super-resolution (SR) denotes the task of enhancing the quality and detail of images beyond their original resolution, adding information and sharpness. It is essential in many domains (earth observation, process monitoring, ...) since it boosts the performance that can be achieved from raw acquired data. There exist many SR methods in the state-of-the-art. However, although these methods achieve remarkable results, they are generic scene-agnostic methods. That is, they do not take advantage of knowledge about the specific physical scene observed in images.

We are working on a novel strategy of developing scene-aware SR methods, conditioning their processes with highly specific information about the observed physical entity. In this project we propose to work on this topic, exploring one of the following strategies that we have in our roadmap:

- the use of textual prompts describing the content of an image at different levels of abstraction using a corpus of a specific domain.
- the use of a priori knowledge about the materials present in the scene. The spectral signatures of observed materials will condition super-resolution tasks, by integrating spectral unmixing in their formulation.

The tasks to be performed by the student are the following ones:

- Study the state of the art of SR methods and the related conditioning techniques.
- Design experiments to evaluate context-aware SR methods.
- Develop computational models of conditioned SR methods.
- Asses the quality achieved by the different explored alternatives.