Goals of HYPR TEAM

1. Placing HYPR, I-HYPR, and HYPR-LR within a mathematical framework which will allow us to study their properties in relation to other well known non-linear reconstruction algorithms. Examples of these algorithms are maximum a-posteriori (MAP) estimation and the maximum likelihood expectation minimization (ML-EM) algorithm. These algorithms, like HYPR, use prior information on the object being reconstructed. They are extensively used in nuclear medicine where the data is intrinsically undersampled. We will also consider more general algorithms in the inverse problems literature.
2. Understanding the artifacts (modeling errors) and in the extreme, the pathological cases in which the algorithms will fail (worst-case scenario).
3. Characterizing the noise amplification and resolution of the HYPR algorithm through simulations and analytic approximations.
4. Using any results we obtain to improve the algorithms in terms of noise, resolution or robustness.