**A general framework for static and dynamic tomography with regularity constraints.**

**Biomedical application to Cone Beam Computerized Tomography (CBCT) and Positron Emission Tomography (PET).**
**Astrophysical application to Solar Rotational Tomography (SRT).**

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Cone Beam Computerized Tomography (CBCT) and Positron Emission Tomography (PET) Scans are medical imaging devices that respectively provide anatomical and functional information of the patient.
Solar Corona Tomography, or Solar Rotational Tomography (SRT), aims at reconstructing in 3D the largescale structures in slow motion of the solar corona, an optically thin medium.

These similar problems require to solve ill-posed inverse problems that are incorporating regularization constraints. The models considered in our approach come directly from the physics of the acquisition devices and from the physics of the problem that are considered, They take into account the specificity either of the Poisson noise, either of the Gaussian noise.

We propose various fast numerical schemes to compute the solution and consider non differentiable regularizations (total variation, wavelet l1-regularization). Solvers are based on proximal theory that provide efficient iterative schemes.

Concerning the biomedical tomographic problems, results are obtained on simulations and real data acquired by the ClearPET/XPAD PET/CT demonstrator developed at CPPM. They indicate that the proposed algorithms compare favorably with respect to well-established methods and provide a first estimate of the dose reduction that can be considered.
Concerning the solar corona tomographic problem, our first results prove the relevancy of the approach and are satisfactory.