SAR Signal Model

The 2-D complex-valued signal obtained with the synthetic aperture represents the phase history of the imaged target and is obtained through the integration of the reflected signal along the elevation direction: Sinusoidal model for the 2-D complex SAR signal.

\[ Y = \alpha(f_0, f_2) \cdot \exists \cdot \alpha \]

Experimental Data

- TerraSAR-X SM scene: which covers the city of Bucharest, in Romania
- Database of 14.532 image patches obtained by applying a regular grid over the original image (SCL/InSAR). The databases were constructed in such way so that we could ensure a very large variability and diversity of scene classes, types of landcover, urban architecture and other man-made targets.
- The complex image resolution is of 1 m, thus each patch covers 200 x 200 meters on the ground. This size allows for large structures to be visible in their urban context, making it easy for the user to identify and classify the structures which are present in a certain patch of interest. Each tile in test database has a representative label, which indicates the position of the tile in the original image, the dominant class of the tile and the most significant secondary class.

Using solely the SLC data we can separate with a good approximation the urban areas from non-urban areas. However, large inter-class confusions appear when trying to discriminate between different scene classes within the general Urban area class. The usage of the phase information allows us to delineate with better approximation not only between urban and non-urban areas in the scene, but also between different types of strong scatterers (typically buildings).