

## Generative Adversarial Networks for X-Ray Computed Tomography

### Questions guiding our research

#### What is X-Ray Computed Tomography (XCT) ?

- It is a widely used, non-destructive imaging technique that produces cross-sectional images of bodies sensitive to X-Ray.

#### How does it work ?

- It relies on exhaustive sampling of the attenuation properties of the scanned material and advanced reconstruction processes.

#### What are some known limitations ?

- The acquisition can be toxic for humans or limiting for exotic geometries, as intense X-Ray exposure can lead to cancers during in-vivo diagnosis and experiments chambers have a fixed size that might limit the information gathering process for certain objects.

#### How do we intend to tackle the problem ?

- In the cases of routine diagnosis, prior knowledge about the scanned object is often known. We have decided to make use of this information to generate data instead of sampling it.

#### What are our tools ?

- We use Generative Adversarial Neural Networks (GAN) , adapted to the case of image inpainting with edge information.

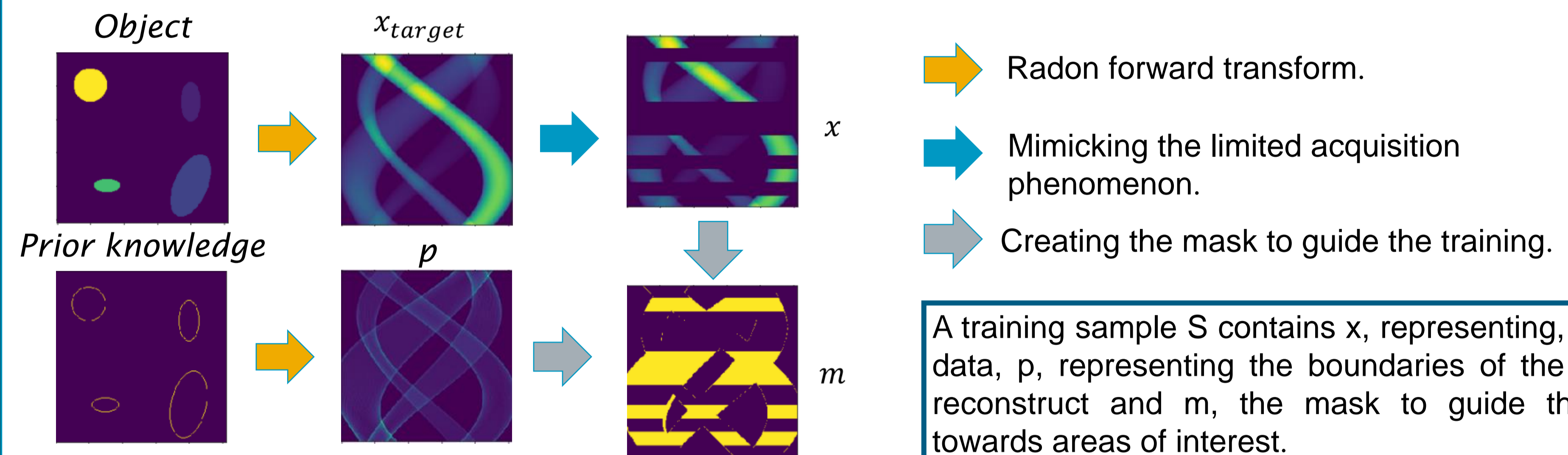
#### What would this research benefit to ?

- Scanning large items, such as plane wings, reducing the toxicity of medical imaging and easing reverse engineering processes.

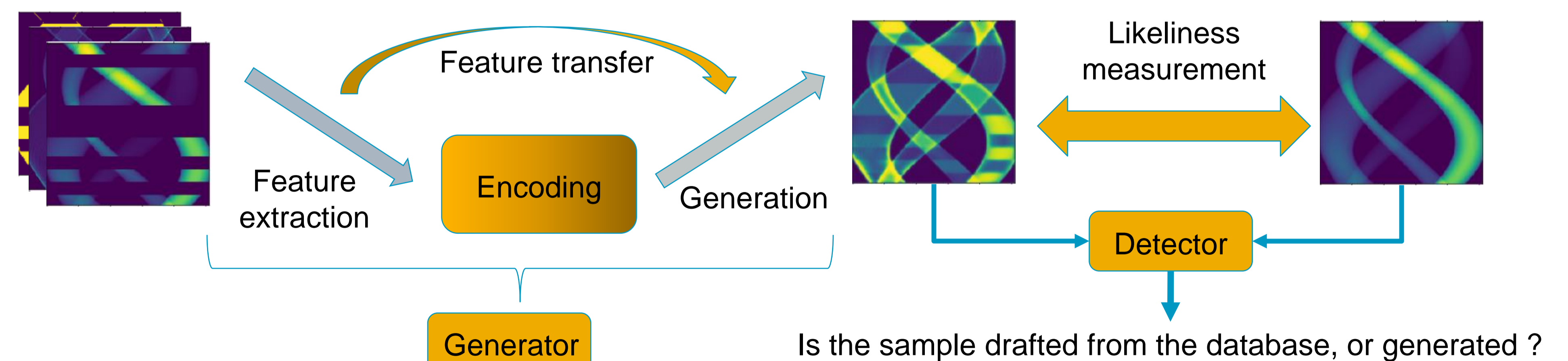
#### What is the future of this work ?

- The improvement of the database through better design and new acquisitions and development of a XCT-specific optimisation problem when the prior knowledge does not match the real acquisitions.

### A data driven method – Database design



### The architecture of the generative process



The generator tries to fool the detector by producing samples close to the ones of the database, guided by the direct measurement of what a given sinogram should look like.