Project focus: discuss the performances of FBP algorithm (parallel ray) and evaluate image reconstruction quality with respect to noise and filter methods.

Details:

- Briefly review the applications of FBP algorithm and image reconstruction from projections.
- Use the function `phantom` to generate Shepp-Logan phantom
- Simulate the image acquisition and reconstruction processes with `radon` and `iradon` functions respectively
- Discuss how reconstruction performances vary according to
  - different filtering methods seen during class
  - number of simulated projections with `radon` function
  - (optional) image dimensions
  - Level of simulated noise over the image before using `radon` function (i.e. original image and image corrupted by gaussian noise)
- Add noise to the starting image, describing its physical interpretation, how it affects the reconstruction performances and what solutions can be implemented as post-processing steps
- You are required to implement your FBP algorithm over the Shepp-Logan phantom image. Optionally, once you have completed the previous steps, you can try to extend these considerations either to:
  - `imChest.mat` as example of FBP application over a CT image
  - 3D extension of the Shepp-Logan phantom (download function at https://it.mathworks.com/matlabcentral/fileexchange/9416-3d-shepp-logan-phantom)

Dataset:

- Built-in `phantom` matlab function

Optional dataset to extend FBP performances and considerations:

- `imChest.mat` as example of FBP application over a CT image
- 3D extension of the Shepp-Logan phantom (download function at https://it.mathworks.com/matlabcentral/fileexchange/9416-3d-shepp-logan-phantom)

Tips:

- For the discussion of reconstruction performances, vary only one parameter at a time (i.e. keep fixed number of projections and level of noise, while vary the filtering method)
- Chapter 3 of "Principles of Computerized Tomographic Imaging" and other references provide a technical background of the problem
- Besides traditional image reconstruction metrics such as MSE and RMSE, you can also quantify reconstruction quality along image profiles of interest (see Chapter 3 of "Principles of Computerized Tomographic Imaging")