Probabilistic model based iterative CT

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Computed Tomography (CT) reconstructs images from attenuation data

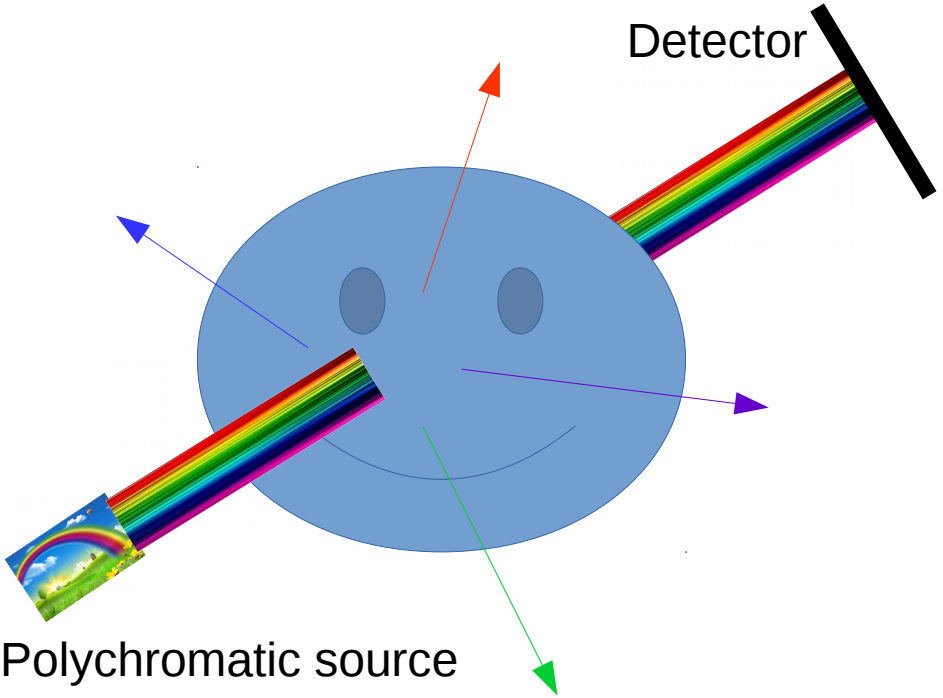
Usually, an energy independent, deterministic and linear relation between data and image is used

This leads to heavy image artifacts especially in the presence of metals since:

1. The source output, attenuation and detection are all energy dependent

2. Scattering is not modelled

3. Noise is not modelled accurately



Probabilistic forward models

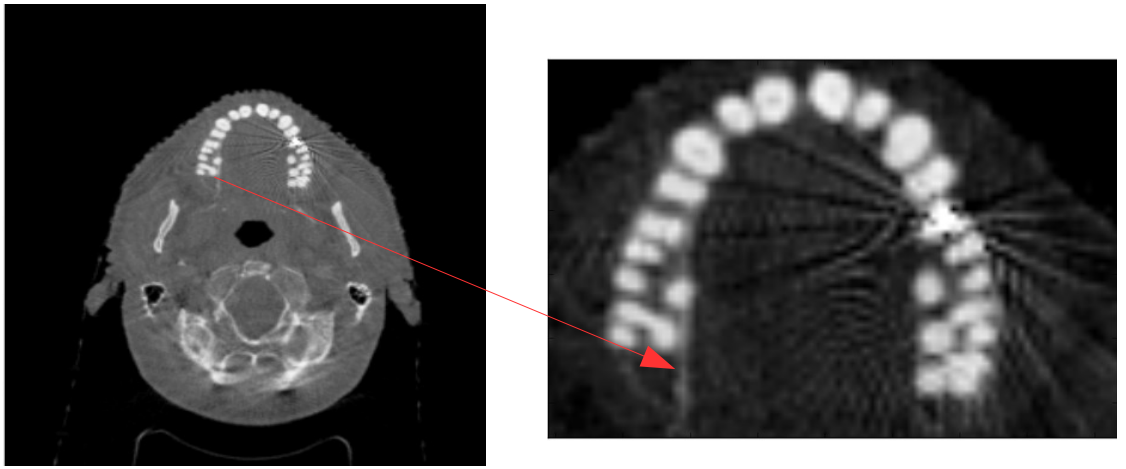
More accurate forward models are iterative and probabilistic

CT becomes probabilistic inference, where we infer the vector of image values $\underline{\mu}$ from the vector of measurements $\underline{n}$. One could maximise the log likelihood:

$L(\underline{\mu}) = \log(P(\underline{n}|\underline{\mu})) + \log(P(\underline{\mu}))$

The posterior term relates the image coefficients to the image while the prior term contains regularisation and prior information.

I seek to develop algorithms that include accurate physics in the posterior term and include MR images in the prior term to get rid of metal artifacts.



Where can I benefit from semi-supervised learning methods? Come tell me and hear my thoughts!

Left: Artifact contamination due to dental filling