# ARTIFACT REDUCTION in CT IMAGES

HU-MATHS-IN
Hungarian Service Network for Mathematics in Industry and Innovations

**CHALLENGES: Health, demographic change and wellbeing**

**Productive sector: Health care**

**The Industrial Problem**

In computer tomography the reconstructed CT images suffer from different types of errors causing artifacts, which may obstruct the proper diagnosis.

## Health care

*Research group*

**Numerical, Harmonic Analysis and Signal Processing**
**Department of Numerical Analysis**
**Eötvös Loránd University, Faculty of Informatics**

Eötvös Loránd Tudományegyetem

Applied harmonic analysis, approximation theory, orthogonal transforms, numerical methods, discretization, fast algorithms, signal and image processing

*Company*

**Mediso Medical Imaging Systems, Hungary**

Mediso Medical Imaging Systems

Mediso Medical Imaging Systems is a dynamic supplier of Nuclear Medicine and modern Hybrid Imaging techniques to the healthcare and medical research institutions of the world.

SZÉCHENYI 2020
MAGYARORSZÁG KORMÁNYA
Európai Unió
Európai Strukturális és Beruházási Alapok
BEFEKTETÉS A JÖVŐBE

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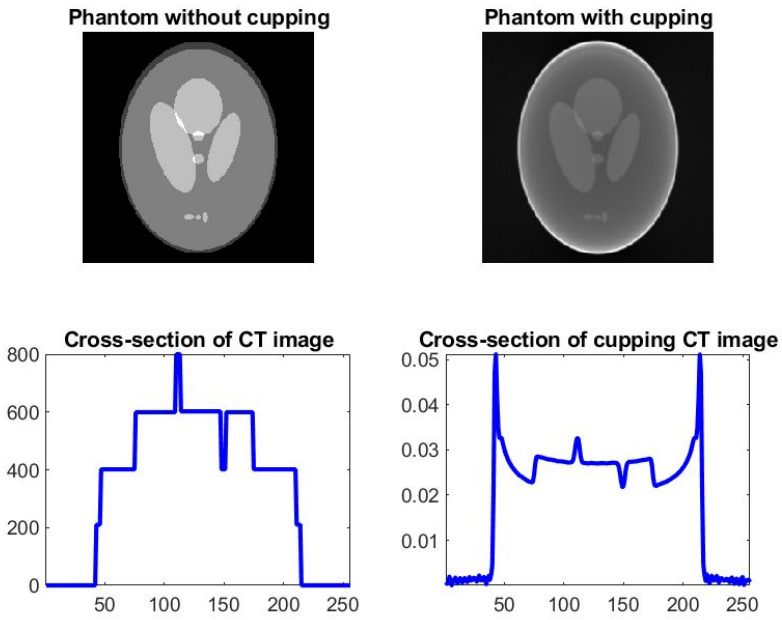
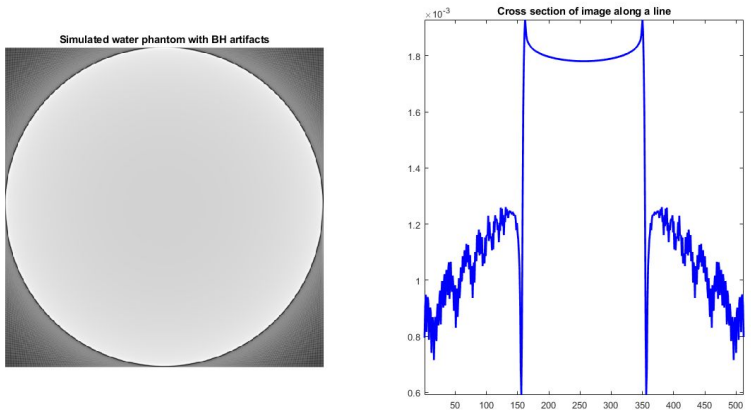
## Challenges & Goals

- To set up a suitable model
- To develop efficient optimization method for the system parameters
- To develop a method for cupping artifact reduction that beats state-of-the-art
- To support the calibration of CT equipments




*Simulated phantoms with and without cupping aritfacts*

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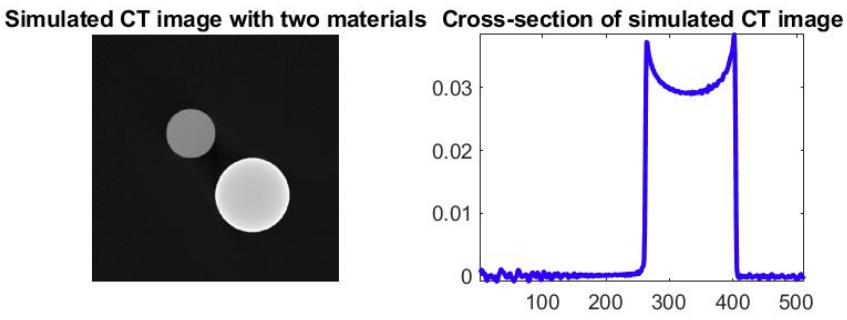
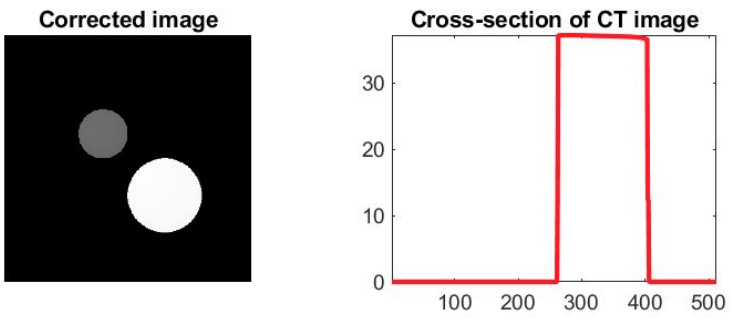
**Mathematical and computational methods and techniques applied**

- Suitable reformulation of existing mathematical models
- Developing an efficient optimization method by using variable projections
- Numerical simulations performed on phantoms in the single and multi material cases
- Comparison with the state-of-the-art methods




*Two materials with cupping*




*Removed cupping artifact*

# CATCHY TITLE of the SUCCESS STORY

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## Results & Benefits to the company

- Results

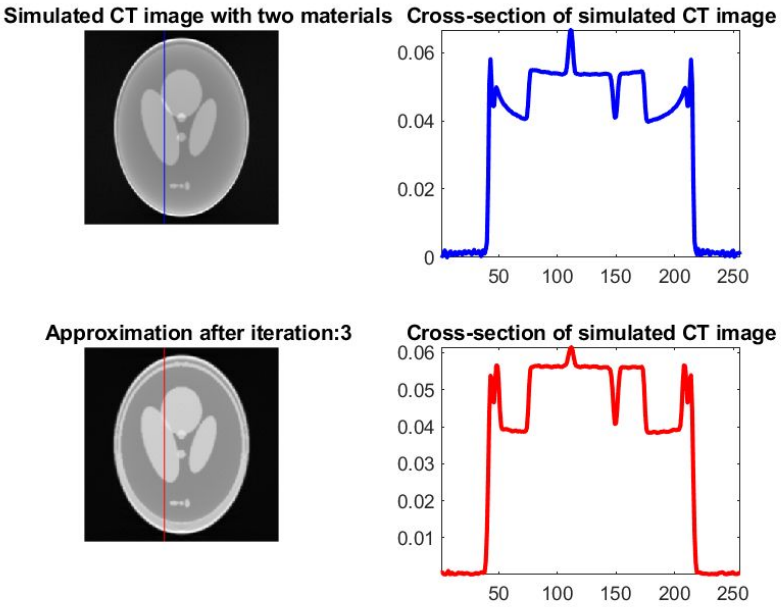
New cupping artifact reduction method was developed

The proposed method is simpler and faster than existing methods

- Benefits

The single material algorithm supports calibration of CT equipments

The general case correction algorithms can be used correct artifact-ridden scans while the system is in day-to-day use.




*Approximating CT images with cupping artifacts*

An efficient method was developed for the reduction of the so-called cupping artifacts caused by beam hardening on CT images