**Will you Help Change Radiology…?**

**Creating a Very Novel Approach to Radiology using**

**Deep Neural Networks / Generative Networks**

**Looking for Very Ambitious Master Students to push the envelope…**

**INTRODUCTION – LOOKING AT RADIOLOGY AFRESH!**

Genera (Generative Radiology) is an AI startup founded by two diagnostic imaging industry veterans. The starting point of Genera is the belief that a very novel way of generating radiology images may be much more efficient, at a much lower ‘expense’ to the patient. For decades images have been generated using CT, MRI or X-RAY and analysed using AI.

Genera believes that a minimal image set of CT or MRI is all that is needed to then apply generative networks to create the information needed to correctly diagnose the patient, using much less contrast media, much less X-radiation.

This means less health impact on the patient, the possibility to have even more correct diagnoses (thus not sending patients onwards for further workups, which is costly and brings anxiety to them).



*MRI image of woman’s breasts with showing contrast injection[[1]](#footnote-1)*

**WHAT YOU WILL BE DOING – PUSHING SCIENCE, CREATING ALGORITHMS THAT WORK!**

Under both the guidance of Professor Kees Vuik as well as Genera’s CTO you will heavily contribute to the proof of concept. Your output will be both to build a scientific framework as well as to contribute to algorithms which Genera will put through clinical evaluations. The specific goal is to create a minimal usage of contrast medium, resulting in a DCA – Digital Contrast Angiography set of images.

Your tool sets include using Deep Generative Models such as Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs) or any other novel generative approach. With the Genera team of experts (RadboudUMC and other European Research Centers) you will strategize on the optimal pathways going forward and then work on making this reality.

Genera is tool-agnostic and you are expected to contribute deeply on choices of tools used.

As you and the team advance artificial/synthetic diagnostic images (deep images) will be created and compared with actual images from the same imaging modality. This step will prove in a side-by-side comparison that deep images will be equivalent to actual images. The quality of the algorithm will need to be measured with image similarity metrics to prove the algorithm robustness. All of this constitutes Phase-I of Genera’s strategic plan.

In Phase-II the algorithms are put through the tests of actual clinical studies.

**THE RELEVANCE TO SOCIETY – LOWER BURDEN TO PATIENT’S BODY – LOWER COST – BETTER SCREENING FOR BREAST CANCER BY REFERRING MANY FEWER PATIENTS**

Genera’s vision is to provide a range of algorithms over the coming years. For now the focus is on DCA. Relevance to society: People with chronic kidney disease (CKD) have a 30 to 40 percent higher risk of developing CIN (contrast-induced nephropathy – disease of the kidney due to injection of contrast media) after receiving contrast dye than do people without CKD. CIN is associated with a sharp decline in kidney function over 48 to 72 hours after receiving contrast dye. In addition to other possible risks (such as an anaphylactoid reaction and contrast extravasation), CIN is a major complication of contrast media use. CIN has been reported to be the third leading cause of acute kidney injury (AKI) in hospitalized patients in the United States (behind pre-renal kidney injury and nephrotoxic medications).

With DCA Genera aims to provide solutions that would largely minimize the usage of contrast media.

Furthermore, the solutions you are contributing to will positively impact the hospitals and clinics that operate the nearly 100,000 CT and MRI scanners (in USA, EU, China and Japan alone) and the patients being scanned on them.

**Literature:**

Karim Armaniousa, Chenming Jiang, Marc Fischer, Thomas Kustner,Tobias Hepp, Konstantin Nikolaou, Sergios Gatidis, and Bin Yanga. MedGAN: Medical image translation using GANs.

Computerized Medical Imaging and Graphics, 79, 2020, 101684.

Salome Kazeminia, Christoph Baur, Arjan Kuijper et al. GANs for Medical Image Analysis. <http://livingreview.in.tum.de/GANs_for_Medical_Applications/> . arXiv:1809.06222v3 [cs.CV] 9 Oct 2019.

**Contact:**

Kees Vuik, c.vuik@tudelft.nl

1. Source: <https://www.disnola.com/why-is-a-breast-mri-needed/> [↑](#footnote-ref-1)