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## Master Thesis, Infotech Research Thesis

### Generative adversarial networks for medical, radar and acoustic applications

#### Generative Adversarial Networks

Generative Adversarial Networks (GANs) is a new branch of deep learning which was developed recently in 2015. It is being hailed by many field experts as “the next frontier in deep learning” due to its potential in unsupervised learning (learning without labelled data) and its ability to create a common framework for several applications with no hand crafted loss function. In GANs, two networks are pitted against each other and trained jointly. The generator network acts as a team of counterfeiters trying to generate fake data that resembles the input data without detection. On the other side, the discriminator network is analogous to the police, trying to detect the counterfeit data. Competition drives both networks to improve their methods and learn more about the features of the input data. GANs have been recently applied successfully in several applications including unsupervised image translation, domain adaptation, image in-painting and semi-supervised classification.

#### Proposed Topics

The proposed topics aim to bridge the gap between theoretical GANs knowledge and hot state-of-the-art applications in the fields of medical image processing, automotive radar applications (autonomous driving) and acoustic speech enhancement:

- Organ-specific biological age estimation based on 3D MR scans
- Attention-based visualization of deep regression networks
- Unsupervised automotive radar enhancement/translation via Cycle-MedGAN
- Adversarial in-painting for the auto-completion of acoustic spectra

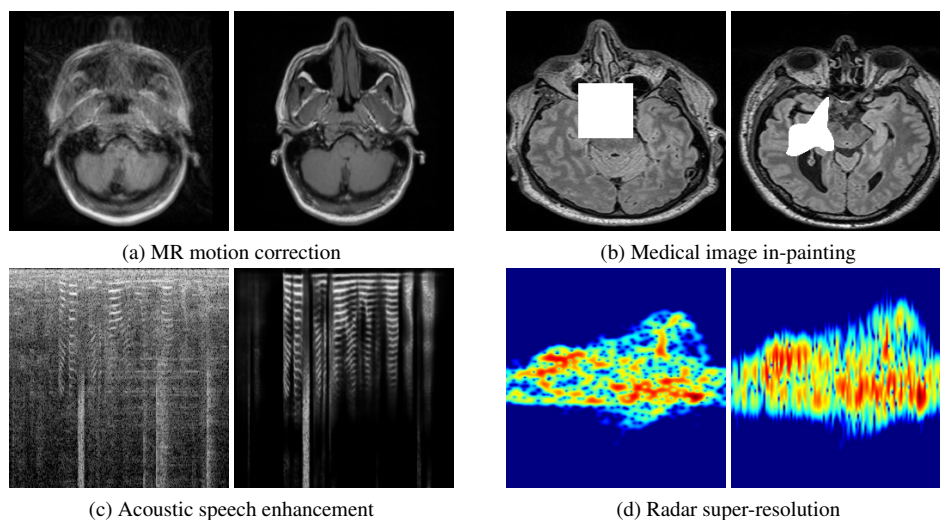


Abbildung 1: Example of prior GAN-related applications by former students in different fields

#### Prerequisites

- Above all highly motivated, independent and structured way of working
- Willing to go the extra mile for the possibility of writing publications
- Good English (spoken and written)
- Programming expertise in Python is beneficial

For more information, please check relevant publications at: [researchgate.net/profile/Karim\\_Armanious](https://researchgate.net/profile/Karim_Armanious)

Interested applicants should send their curriculum vitae and list of grades to: [karim.armanious@iss.uni-stuttgart.de](mailto:karim.armanious@iss.uni-stuttgart.de)