Build a breathing simulator using Generative AI

In pneumology, it is of interest to use system identification on the human respiratory system to inform medical practitioners on the patient's state of health. This is achieved by having a machine such as a ventilator hooked to the patient and exciting his/her respiratory system with a specific excitation. However, it can be proven that patient activity, such as breathing, distorts the data and prevents accurate parametric identification. There is thus a need to model human breathing, seen as a stochastic process.
In this thesis you will explore how generative AI can contribute to modelling human breathing. The goal is to compare your results with a Gaussian Process approach and outperform it.
To this end, you will explore using various techniques such as Diffusion Models, GANs, VAE or other methods. You will have to gather your dataset based on equipment available at the ELEC department, namely the DemcAir ventilator manufactured by Demcon Macawi. In a first step, you will use simulated data from the Gaussian Process approach.