# Guide to start and run the model

This is a guide on how to run the cardiovascular and respiratory system, which is presented in the article: "Algorithmic distinction of ARDS and Heart Failure in ICU data from medical embedded systems by using a computer model.pdf" by Fonck et al. [1].

In order to open and run the project you need to have [MATLAB R2020b](https://de.mathworks.com/products/matlab.html) including Simulink installed.

The model itself can be found in the model-folder and is split up into various Simulink model files, where different components and equations are modelled. An overview can be found in the file model\_structure.xlsx.

The data, which was used to evaluate the classification from [1] is stored in evaluationData.m including 10 deidentified patients from a project internal database. There are various vital parameters and laboratory results used (see documentation in the file).

To run the model and plot the results you need to run the function “evarun” from evarun.m. The function needs the following parameter:

* runtype: one of the following runtypes
  + ‘evaluation-fixed’ – a 10 min run with fixed patient data defined in initptin.m
  + ‘evaluation-short’ – a 10 min run with passed patient id(s)
  + 'evaluation-medium' – a 30 min run with passed patient id(s)
  + 'evaluation-long’ – a 600 min run with passed patient id(s) (note that this runtype has not been tested thoroughly and may result in unexpected model behavior)
* i0: Id of the first patient, which data is used as initial input (1-10 based on the patient list in the evaluation data)
* i1: Id of the last patient, which data is used as initial input (1-10 based on the patient list in the evaluation data)

Important notes:

* i0 !< i1
* If you want to simulate a single patient use i0 = i1
* Even though the evaluation-fixed uses fixed values the function needs i0 and i1 in the current implementation.
* Example run: evarun(‘evaluation-short’, 1, 3) which starts a 10 min simulation for the patients 1, 2 and 3.

The results of the simulation can be seen directly in the model (Data Inspector or various output-fields). Additionally, some parameters are plotted using the functions in “evaplot.m”. Note that the folder “plots” needs to be created beforehand.

This is a software/model for research purposes only. If you notice any errors or have any questions, please refer to the associated GitHub or contact the corresponding author ([fonck@embedded.rwth-aachen.de](mailto:fonck@embedded.rwth-aachen.de)).

[1] S. Fonck, S. Fritsch, S. Kowalewski, R. Hensen and A. Stollenwerk, "Algorithmic distinction of ARDS and Heart Failure in ICU data from medical embedded systems by using a computer model"