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0.1 Project Outline

0.1.1 Project Phases

Phase 1: Problem Analysis

- **Exploratory Phase:** *The purpose of this phase is to gain a broad knowledge regarding mechanical ventilation, and the way it affects the physiology of the respiratory system*
- **Structured Phase:** *In this phase, structured literature searches and possible interviews will be employed, in order to understand the clinical aspects of the problem*
- **Defining The Problem:** *The result of this phase will be a problem statement*

Phase 2: User Requirements

- **User requirements:** *Based on the problem analysis, a set of clinically relevant user requirements will be derived*

Phase 3: Modeling

- **Data Source:** *How was the data collected, which patient demographics, inclusion/exclusion criteria, study type and other relevant aspects.*
- **Empirical vs. Knowledge Based:** *This phase uncovers the pros and cons of the two modelling approaches in relation to the uncovered problem, in order to make an informed choice of modelling approach.* ***Since this is a data driven project, empirical methods are assumed to be applied at the date of this writing.***
- **IF KNOWLEDGE BASED APPROACH:** *Describe the physiological variables and concepts of interests, and how they relate to a clinical setting*
- **IF EMPIRICAL APPROACH:** *Describe the empirical approach employed, how the applied statistical and mathematical tools relate to clinically relevant physiology, and how this modelling could be applied in a real-world setting*
- **Relate models to DSS** *From the provided knowledge of previous DSS, relate how the models fit into the rest of the system.*

- **Assumptions:** *Describe the assumptions necessary for the model to be implemented. E.g. which measurements would clinicians provide, which are provided as output from other models etc.*

Phase 4: System requirements

- **Functional- and nonfunctional- requirements**
- **Requirement specification** *A requirements specification (RS) document will be created, containing every user-, functional- and nonfunctional- requirement.*

Phase 5: Iterative Implementation

- **Implementation:** *The proposed model will be implemented in the newest stable Python release*
- **Unit Testing:** *Every functional unit of the implemented model will be tested against system requirements.*
- System Testing: The fully implemented system will be tested against system requirements.

Phase 6: User requirement testing and results

- **User requirement testing:** *The implemented model will be tested against the user requirements. Depending on choice of approach (empirical or knowledge based), this will require a set of test scenarios based on clinical relevance, as well as testing the models performance on collected data.*

0.1.2 Methods

- **Structured Literature Search:** *The structured literature search will primarily be based on the PubMed database, and provide insights into current state of the art (SOTA) within physiological modelling of* P_{ESO}
- **Modelling approaches:**
- **IF EMPIRICAL APPROACH**
  - *Exponential Profiles, Power-Law profiles and ANALYSIS.*
- **IF KNOWLEDGE BASED APPROACH**
  - *Compartmental Modelling, Finite Element models (not likely but possible).*

- **Semi-Structured interview:** *In addition to the Structured literature search, a semi-structured interview with an ICU clinician or someone of similar expertise may provide valuable insights*
- **V-Model:** *The V-Model will be used a process support model. The benefits of it is that it provides project coherency (clear steps with a clear beginning and end), it ensures appropriate testing for every requirement, and every step is encapsulated with a clear input-and-output.*

1 | Bibliography