Master thesis project at Monivent:

Develop algorithm for detection of spontaneous breathing in newborns

About Monivent
One in twenty newborn babies need help to start breathing at birth by manual ventilation of the lungs. Both under- and overventilation can seriously damage lungs and brain. Although it is one of the least controlled interventions taking place in the delivery room, the healthcare personnel are lacking good tools to evaluate how effective the treatment is.

Monivent is a young medtech company founded almost 10 years ago by students from Chalmers School of Entrepreneurship in collaboration with two neonatologists and a researcher in lung physiology from Chalmers University. Based on the clinicians’ self-experienced need for better control in a very uncertain clinical situation, the team has developed a medical device measuring the airflow to the child directly in the face mask via a sensor module that sends data wirelessly to an external monitor. The caregiver thereby receives immediate feedback, which enables necessary adjustments to support an effective but at the same time gentle treatment of our most vulnerable patients.

Monivent launched this product, the Neo100, in Europe a year ago and the product has generated great interest among clinicians worldwide since then. Together with a non-clinical version of the device for simulation based training on manikins, Monivent now has two products on the market, sold through a network of distributors covering over 25 countries. The company is since 2020 listed on Spotlight Stock Market and its team of 8 are today based at Lindholmen in Gothenburg.

The existing technical solution
The sensor module measures pressure as well as bi-directional flow utilizing the difference in pressure generated over a membrane in the developed face mask (or adapter to be used with any third-party mask). By applying an algorithm to the measured flow, detecting the beginning and end of a ventilation, the measured flow and pressure can be used to calculate several crucial ventilation parameters including volume, peak inspiratory pressure, positive end-expiratory pressure, mask leakage and ventilation rate. These parameters are then presented in real time for each ventilation.
How existing technology may be further improved?
The goal of the manual ventilation treatment is to oxygenate the blood until the baby can breathe sufficiently on its own, or is stable enough to be transferred to a mechanical ventilator. Providing information about the baby’s own breathing attempts helps the caregiver understand how the baby is doing and when the baby is breathing sufficiently and not requiring further breathing support. And if the baby initiates breathing attempts, although still insufficiently, there is a desire to synchronize given manual ventilation with the baby’s own breathing to make this procedure as gentle as possible. For these reasons there is a desire to not only show the ventilation parameters, such as pressures and volume, but to also provide feedback on the baby’s response to the treatment in terms of its own breathing attempts.

Project proposal and aim of the project:
- Analyzing existing clinical data (flow and pressure waveforms) to determine what distinguishes spontaneous breathing
- Developing an algorithm that can automatically detects a spontaneous breath during manual ventilation
- Testing and verification of developed algorithm in bench test setting

You will get to:
- Be a part of solving an applied engineering problem from scratch
- Learn how to interpret pressure and flow waveforms from neonatal resuscitations
- Spend some time at a European university hospital with extensive experience within the field to gain deeper understanding of the interpretation of clinical data
- Work with a small, dedicated and highly supportive team
- Contribute to a more gentle treatment of our most vulnerable patients

Who you are
You’ve likely studied data analysis, signal processing and algorithm development. Ideally you have done this in Python. You have an interest in applying your mind to real world problems in collaboration with people from other disciplines.

Project duration: 20 weeks (but can be extended to one year)
Project start: January 2023
Number of students: 1 or 2 students
Location: Monivent’s office at Lindholmen, Gothenburg, and part time spent at university hospital in the Netherlands
Monivent supervisor: Antti Stålnacke, antti@monivent.se

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Application
Please apply by sending resume, cover letter and transcript of grades to jobb@monivent.se.
Applications will be reviewed continuously.

Looking forward to receiving your application!