# Project for Propulsion academy

## Background

When the signals over the cycle are behaving ideally, meaning that HR increases just before ovulation and skin temperature just after the ovulation it is rather easy to build a well performing algorithm to detect ovulation.

However, many of the cycles do not display this ideal behavior. We would need to recognize which cycles have a good behavior and which ones don’t.

It is also possible that other types of behavior are frequent and can be classified in different groups. One could imagine to have different algorithms for different groups.

Examples of such groups could for example be:

* Cycle starts out with very low temperature and HR and increases as planned
* Cycle starts with high temperature and HR and continuously decreases until shortly before ovulation.
* Temperature increases much slower after ovulation than expected
* HR increases after ovulation but quickly falls back down again

One group will of course be signals with seemingly random behavior.

The findings are important to us for several reasons:

1. The possibility of changing algorithm according to signal pattern
2. Recognizing bad cycles to inform the user that the results can’t be trusted

## Task

Based on the feature behaviors over the menstrual cycle, cluster (or classify in another manner) the different cycles into different groups.

## Data

The data provided are heart rate, breathing rate and skin temperature features over the menstrual cycle for many women measured during our clinical study.

The start of a menstrual cycle is defined as the first day of the menses and the last day is the day before the next menses. The first day of the cycle is cycle day 1 and next day is cycle day 2 and so on. Please note that data can be missing anywhere in the cycle so always use the first and last day of cycle as it is in the explicitly given parameter.

The data you are given includes cycle day, date of first day of cycle and date of last day of cycle.

Each woman has a unique identification number and her cycles are numbered starting with 0.

## Bonus task

Different women have different regularity of their cycles, some women can have very regular cycles of 28 days. Some can have three cycles of 26 days and then one cycle of 21 days, then again 26 days, other women can jump anywhere between 20 and 36 days for every cycle. Looking at previous cycle lengths, would it be possible to predict