CTG Challenge

(part of the 2017 SPAM in Labour workshop)

Summary: *A validation database containing intrapartum recordings at least one hour long, from a singleton, term pregnancies originating from three different hospitals in the UK, France, and the Czech Republic is presented here. There are 300 high-quality recordings, 20% of them with pH<7.05.*

Introduction: Cardiotocography (CTG) is a monitoring of fetal heart rate and uterine contractions. Since 1960 CTG is routinely used by obstetricians to assess fetal well-being. Many attempts to introduce methods of automated signal processing and evaluation of the CTG have appeared during the last 20 years. However, despite two recent clinical trials (INFANT, FM-ALERT), there is still no significant progress in the clinical environment.

Can we agree where are we at right now and what are the biggest challenges for the future?

Goal: To evaluate state-of-the-art algorithms for prediction of low umbilical artery pH at birth from intrapartum CTG recordings using a provided evaluation dataset.

Challenge Data: The dataset for the challenge is provided as a validation set only. There is no indication of outcome (class). This unique set of anonymized recordings originates from three different hospitals (**JR Hospital**, Oxford, UK; **HFME Lyon**, France; **FN Brno**, Czech Republic) and consists of 300 recordings.

Following characteristics are common for all data in the dataset:

- Intrapartum
- Singleton
- Mature (gest. week > 36) fetuses
- Congenital anomalies and small for gestational age babies excluded
- CTG records are more than 60minutes long
- CTG record ends less than 10min before birth
- Less than 15% of data in the FHR signal is missing in the last 60 minutes
- Out of the 300 records
- 20% of recordings have pH<7.05

Each *.mat file consists of the following variables:

- fhr – fetal heart rate recording
- toco – uterine contractions recorded using the tocography
- info.fs – sampling frequency of fhr and toco signals (4Hz)
- info. ind_stageII – sample on which the second stage of labour in the recording starts
- info.id – id of the recording (name of the file)

Training data: We expect that the participants have access to their proprietary database for training. Another option for training is to use the open-access CTG database.

Organization of the challenge:

Two phases of the challenge are anticipated:

1. June/2017 – 17/09/2017 (automated methods):
   Automated evaluation of recordings using *descriptive features* (e.g. FIGO based automated features, entropy, PRSA, non-linear, or any other method imaginable) and *machine learning* or *statistical* approaches evaluating the viability of the methods.
   Deadline for the initial submission: 17/09/2017
   Deadline for submissions and a short algorithm description paper: 22/10/2017

2. 25/09/2017 - 22/10/2017 (clinical experts)
   Clinical evaluation of the selected (based in part on outcomes of the submitted results) cases. We will provide clinicians with electronic pdf printouts of the CTG recordings in the EU/US/NL format.
   Files made available: 25/09/2017
   Deadline: 22/10/2017

Based on results of both two phases we will compile the "SPAM 2017 workshop discussion set" - a selection of the most interesting recordings to focus on during discussion at the workshop. And during the workshop in Oxford, we will be looking forward to the presentation of results by each participating team, presentations of clinical insight, and discussion on selected recordings.

Submission format: Submission template in csv format is enclosed. Please use the filename as identification as suggested in the template file. The name of the recording is followed by your algorithm's prediction either 1 (pH<7.05) or 0 (normal pH). The submission is made by sending an email to ctg.challenge2017@gmail.com with enclosed csv and a subject reading Submission: CTG Challenge 2017.

Scoring metric: Geometric mean of sensitivity and specificity will be computed and sent back as a reply to your submission email.

$$g_{mean} = \sqrt{sensitivity * specificity}$$

Challenge participation: At least one member of the team is expected to register for the workshop. Each team is expected to send (to the ctg.challenge2017@gmail.com) a short pdf with a description of used algorithm and relevant references. We will make them available before the start of the workshop to have an even more interesting discussion.

Allowed number of submissions: The number of submissions is limited to 5. And there can be maximum of 1 submission per week. So please start early!

Important links:

- Challenge database
- Submission file template in *.csv format
- Challenge web page
- Registration page for the SPAM in Labour workshop