OBUS – Fetal Presentation Overview

Summary

An AI model capable of determining a fetus's orientation in the uterus holds significant clinical importance, particularly in prenatal care and labor management. Accurate knowledge of fetal position—whether the baby is head-down (cephalic), breech, or transverse—is critical for anticipating delivery complications and planning appropriate interventions. Note that cephalic is the safest fetal orientation and represents the least risk, whereas breech and transverse orientations represent significantly more risk during delivery.

Traditional methods to determine fetal presentation like manual palpation or ultrasound require skilled practitioners and can be time-consuming or inconsistent. An AI model trained to analyze imaging data could provide fast, reliable, and standardized assessments, improving diagnostic accuracy and reducing the burden on healthcare providers.

Moreover, such a model could enhance access to quality prenatal care in underserved or remote areas where experienced sonographers or obstetricians may not be readily available. By integrating AI into portable ultrasound devices, clinicians could receive immediate assessments of fetal orientation, enabling timely detection of abnormal presentations and facilitating referrals to specialized care when needed. This not only improves maternal and fetal outcomes but also supports more equitable healthcare delivery across diverse populations.

Babies start moving in the uterus between 16 and 22 weeks of pregnancy. In many cases, they will continue to change position until around 36 weeks. It is only after this gestational age that fetal presentation becomes relevant to monitoring pregnancy risk and specifically risks to the mother or baby during delivery.

Fetal position and orientation have been grouped into 5 categories in the FAMLI data set as shown in Table 1.

Presentation	Meaning
cephalic	Baby’s head is pointing down towards the cervix
breech	Baby’s head is pointing up towards the uterine fundus
transverse	Baby’s body is lying horizontally

variable or N/A	Baby is moving or in unspecified orientation
oblique	Baby's orientation is midway between cephalic/breech and transverse

Table 1. Categories of fetal orientation and their meanings.

Owing to the lack of significant numbers of exams in the transverse and oblique presentations, it was decided to group all the non-cephalic presentations into one category. Therefore, the Fetal Presentation model predicts whether the baby's orientation is cephalic or non-cephalic, functioning as a binary classifier. The output of the Fetal Presentation model is a prediction (in the form of a score between 0 and 1). A score threshold must be applied to determine the fetal presentation classification. This could be expanded to produce a continuous score roughly indicating the likelihood of cephalic vs. non-cephalic presentation.

Through experimentation, it was determined that vertical sweeps (R, M, L, etc.) provide more discriminating power than horizontal sweeps (C1, C2, C3, etc.). Therefore, the input data both during training and inference are restricted to all vertical sweeps from an exam. Please refer to [0.1 OBUS Data Description].

Accuracy assessment

The accuracy of the fetal presentation (FP) classification model is assessed using several machine learning metrics. To simplify the discussion, we note the label convention adopted for model development and evaluation. The majority class—cephalic—is denoted as negative, and the minority class—non-cephalic—is denoted as positive. The relevant metrics are (a) accuracy (TN+TP)/(TN+FP+FN+TP); (b) sensitivity TP/(TP+FN); (c) specificity TN/(TN+FP); (d) precision (also called purity and positive predictive value) TP/(TP+FP); and (e) AUC-ROC (area under the ROC curve), which is independent of classification threshold. The exam level result is computed by averaging over the output scores for the vertical sweep videos comprising an exam.