Supplementary Material

Application of machine-learning algorithms to predict calving difficulty in Holstein dairy cattle

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Supplementary Table S1. Definition of traits used to predict the calving difficulty in Iranian dairy cows.

No.	Trait	Definition/calculation method
1	Birth type	Single birth or twins.
2	Body condition score	A 5-point (1-5) scoring system is used to measure the BCS in the used dairy herds, with a minimum of 1.5 and a maximum of 5.
3	Calf body weight	Body weight greater or lower than 3 standard deviations (SD) from their unadjusted means were removed.
4	Calf sex	Male (for singletons (M) or twins (MM)), female (for singletons (F) or twins (FF), and male-female (for twins (FM))
5	Calving difficulty	A binary trait with 0, normal or unassisted calving, and 1, difficult calving-receiving any help during parturition from farm personnel involvement to surgical intervention.
6	Calving interval	Interval between two consecutive successful calvings.
8	Calving seasons	1- spring (April to June), 2- summer (July to September), 3- autumn (October to December), and 4- winter (January to March)
9	Calving status	A binary variable with 0, normal birth and 1, stillbirth.
10	Dry period	Dry period length before caving with a minimum of 4 day and a maximum of 200 d.
11	Experience of calving difficulty	Any experience of calving difficulty in the previous lactation included in the dataset as a binary variable (1, calving difficulty or 0, otherwise).
12	Gestation length	Interval between successful insemination and calving dates.
13	Herd	Two commercial dairy herds.
14	Previous 305 d milk yield	305 d milk yields greater or lower than 3 standard deviations (SD) from their unadjusted means across years were removed.