Czech Technical University in Prague
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Master's thesis

Improving the knowledge engineering methods for early detection of cow heat

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Abstrakt

Tato práce se zabývá výzkumem včasné detekce říje krav na moderních automatizovaných farmách. Jejím cílem je porovnat vybrané techniky znalostního inženýrství s referenčním řešením. Mezi zkoumané techniky patří především: Naive Bayes kernel, Decision tree, ARIMA a Coxova regrese.

Výsledky ukazují, že je možné vylepšit jak přesnost, tak sensitivitu referenčního řešení. Nejzajímavějšího výsledku bylo dosaženo za pomoci klasifikátoru Naive Bayes kernel, který dosahuje o 12 % lepší přesnosti, zatímco sensitivita je stále o 2 % vyšší než sensitivita referenčního řešení.

Nedílnou součástí je také předzpracování dat, jehož cílem je odstranění šumu a extrakce příznaků. K odstranění šumu z dat byly použity metody klouzavý průměr a Butterworthův filtr.

Klíčová slova Naive Bayes, Decision tree, Random forest, ARIMA, Coxova regrese, klouzavý průměr, Butterworthův filtr, detekce říje

Abstract

The aim of the thesis is a research of early detection of cow heat on modern automated farms. The main goal is to compare several knowledge-based

engineering techniques with reference solution. Specifically Naive Bayes kernel, Decision tree, ARIMA and Cox's regression techniques are used for the experiments.

Results show that it is possible to outperform precision as well as sensitivity of reference solution. The most interesting result suggests that precision can be outperformed by Naive Bayes kernel by 12% while sensitivity stays 2% higher than sensitivity of reference solution.

No less important is also the data preprocessing step which aims to remove noise and extract features from the data. The techniques used for removing the noise and smoothing the data are Moving average and Butterworth filter.

Keywords Naive Bayes, Decision tree, Random forest, ARIMA, Cox's regression, Moving average, Butterworth filter, heat detection

Poznámka

Tato práce byla vytvořena za pomoci informací a dat poskytnutých společností Lely Industries N.V., Cornelis van der Lelylaan 1, NL-3147 PB Maassluis, Nizozemí. Její obsah je dostupný pouze v tištěné formě na adrese: České vysoké učení technické v Praze, Fakulta informačních technologií, Thákurova 9, 160 00 Praha 6, Česká republika.

Note

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