

LIM (Leather in Motion) is a French company which one of the commitments is to focus on innovation to promote the well-being and integrity of sports horses. With our Health & Science entity, we are especially involved in veterinarian research with the National Veterinary School of Alfort (EnvA) through a Joint Laboratory, the CWD-VetLab, dedicated to innovation in the field of horse performance and health.

Designed to assist veterinarians in the daily clinical diagnosis of locomotor disorders, EQUISYM[®] is a system composed of of 7 wireless IMUs (tri-axial accelerometer, tri-axial gyroscope) placed on the head, the withers, the pelvis, and the 4 cannon bones of the horse. It provides quantified locomotion data and guides the diagnosis of lameness with objective indicators based on the calculation of asymmetries between left and right limbs during locomotion at the trot, according to different conditions of movement (on straight line, in circles...) and different surfaces.

Several scientific studies pointed out that the type of surface (hard, soft, treadmill...) could impact the anatomical structures (Crevier-Denoix *et al.*, 2010), the kinetics of the horse limbs' (Chateau *et al.*, 2013) and the locomotor asymmetries observed in the horses (Pfau *et al.*, 2021). In practice, the locomotor variation arised from the type of surface and observed by the veterinarian is essential to the diagnosis and the choice of the best treatment for the underlying lesion (Denoix, 2014). The automatic detection of the type of surface is then of major interest to analyse the horse movement with the EQUISYM[®] system.

Based on our labelled database, composed of signal data (acceleration, angular velocity) and transversal parameters extracted from the signals, the candidate will develop an algorithm enabling to predict the type of surface. According to the results and the evolution of the project, the methodology could be applied to others parameters.

Your missions :

- Search and monitor the literature (any scientific or methodological content relevant to the topic)
- Define an appropriate statistical methodology to predict the type of surface with the data available
- Develop an automated tool to predict the type of surface with the data available

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References:

- 1. Crevier-Denoix N, Robin D, Pourcelot P, et al. Ground reaction force and kinematic analysis of limb loading on two different beach sand tracks in harness trotters: Ground reaction forces on sand. Equine Veterinary Journal. 2010; 42:544-551. doi:10.1111/j.2042-3306.2010.00202.x
- 2. Chateau H, Camus M, Holden-Douilly L, et al. Kinetics of the forelimb in horses circling on different ground surfaces at the trot. The Veterinary Journal. 2013;198:e20-e26. doi:10.1016/j.tvjl.2013.09.028
- 3. Pfau T, Persson-Sjodin E, Gardner H, Orssten O, Hernlund E, Rhodin M. Effect of Speed and Surface Type on Individual Rein and Combined Left–Right Circle Movement Asymmetry in Horses on the Lunge. Front Vet Sci. 2021;8:692031. doi:10.3389/fvets.2021.692031
- 4. Denoix JM, Biomécanique et gymnastique du cheval, Paris : Vigot, 2014.