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**Title Presentation:**

Towards real-time analysis systems for automated phenotyping of livestock

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**Presentation Summary**

Current food production systems are under debate, because of their effect on animal welfare and the ecosystem. Transitioning food production into a sustainable system plays a key role in achieving the UN sustainable Development Goals of feeding a growing human population in a sustainable manner. However, while the increase in breeding efficiency has reduced the ecological footprint of our food production, societal concerns related to animal welfare are increasing. Surveys have shown that 82% of EU citizens think that more should be done to protect animal health and welfare in livestock production. Good welfare and health of livestock is a prerequisite for providing healthy and safe food and to meet increasing concerns of regulatory authorities, consumers and society. In response to these concerns, the sector is transitioning towards group-housing systems that give animals the freedom to perform a wide range of (social) behaviours. Some of these behaviours indicate good welfare and are considered desirable, whereas other behaviours within groups lead to undesirable side effects.

Phenotyping behavioural traits is significantly more challenging than phenotyping production traits such as body weight or number of eggs. This heavily depends on sufficient and high-quality behavioural measurements, i.e., ‘phenotypes’. Traditionally, phenotyping behaviours relied on human observations which is difficult in a production environment and time-consuming. With the rapid developments in sensor technologies, continuous and large-scale phenotyping of behaviours has become increasingly possible. In the last decade, computer vision (CV) techniques, and particularly deep learning models, have emerged to track individual animals and automatically detect their behaviours. In our ongoing projects IMAGEN and SmartTurkeys, we are developing algorithms to track individually identified pigs, laying hens and turkeys, kept under field conditions in large pens with group-housing. It is particularly essential to maintain accurate individual identification over longer time periods, as knowledge of individual ID is essential for improved animal care, such as removing an identified biter, and for genetic solutions that require linking tracking data to individual genotype. Tracking also provides methods for generating sufficient empirical data on social interactions and networks within large social groups.

The presentation will give an overview of the recent achievements in following animals individually and the difficulties in establishing the long-term unique animal identity. Also, the first results of classifying animal behaviour will be presented. The presentation will then sketch the road towards the last step, which is coupling the behavioural phenotyping to AI-based animal selection with the partners for the first time.