RESEARCH PROJECT

Project title:	Artificial Intelligence-powered golf turf maintenance (ADORE)
Project start date: January 2024	**Project completion date:** September 2024
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Funding, kSEK						
	2022	**2023**	**2024**	**2025**	**2026**	**Total**
STERF			250			250
Other sources			107*			107*
Total			**357**			**357**

*Nordic AI Technology, in kind.

Project objectives

- The project objective is to evaluate artificial intelligence (AI)-based time-series modelling techniques for simulation of turf metrics and to answer the research questions: i) what types of data are required and ii) what volume if data is needed to simulate turf quality with sufficient accuracy.
- Given sufficient simulation accuracy, cost and sustainability drivers can be defined for each maintenance action. Combining the AI models, cost and sustainability functions, a generative AI layer can be applied, targeting a future app for generation of optimised turf maintenance prescription taking turf quality, sustainability and maintenance cost into consideration.
- Since successful validation of stand-alone local AI models is a prerequisite, the project scope will not encompass the generative layer or evaluation of transfer learning, i.e. the project will not evaluate to what extent data from one golf course can be leveraged on other golf courses. Domain experts state that properties of the underlying turf soil physics can be extrapolated, given i.a. common grass, geo and soil characteristics, which brings a solid case for evaluating transfer learning in future projects.

Project summary and status January 2024

Despite rising turf maintenance challenges, related to e.g. climate change, fungicide and pesticide restrictions and cost inflation, turf maintenance is to a large extent a manual and non-optimised process. Turf care optimisation is complex and multivariate, i.e. it depends on multiple and co-varying parameters, including maintenance, soil properties and environmental parameters. Hence, optimisation of turf maintenance using domain knowledge and physical experiments alone is unfeasible. A digital and data-driven approach, powered by AI will be evaluated for identification of sustainability and playability optimal turf maintenance prescription in the endless space of possible maintenance configuration combinations. AI modelling will be applied for simulation of future turf properties, including playability and stress metrics, as a function of current turf state, a maintenance scheme and environmental data. Since continuous data collection is resource-consuming, the project aims to identify the data type/s and data volume required to make accurate predictions and to assess whether AI-generated turf maintenance prescription is viable.