Field Day: Incorporating Domain Knowledge in Genetic/Genomic Prediction & Analysis Models

AG2PI
Agricultural Genome to Phenome Initiative

Iowa State University · The University of Arizona · University of Idaho · University of Nebraska Lincoln

Integrating crop models and whole-genome prediction in plant breeding pipelines

Dr. Diepenbrock will describe integration of crop growth models (CGM) and whole-genome prediction (WGP) in a large maize breeding experiment, with field evaluations at several sites in the U.S. Corn Belt and in managed stress environments. In that context, CGM-WGP exhibited predictive abilities that were superior to or at parity with those of WGP in all four quadrants of prediction (tested and untested genotypes, tested and untested environments). CGM-WGP also enabled the examination of potential strengths and vulnerabilities of certain parental combinations with regards to physiological traits and final yield performance. She will also describe early stages of work to integrate 3-D biophysical models and artificial intelligence-enabled sensing into pre-breeding/genomics workflows.

Integrating biological models into genomic evaluation of livestock

Although genomic selection has substantially enhanced genetic progress in livestock, current genomic prediction methods are based on empirical linear statistical models of relationships between genotypes and phenotypes, which typically provide good predictions for the conditions (genetic and environmental) that prevail in the training data, but suffer from poor extrapolation to other conditions. The use of these black box prediction approaches is despite the availability of substantial knowledge and associated mechanistic models of the physiological and biological processes that underlie animal performance under different conditions. To overcome these shortcomings of current genomic prediction methods, Dr. Dekkers' research focuses on integrating these mechanistic models into methods for genomic prediction, with an application to the integration of nutritional growth models for pigs.

About the presenters:

Christine Diepenbrock is an assistant professor in the Department of Plant Sciences at University of California-Davis. She obtained her Ph.D. in plant breeding and genetics from Cornell University and subsequently worked on the Predictive Agriculture team at Corteva Agriscience™ before moving to UC-Davis in 2019.

Jack C. M. Dekkers is a C.F. Curtiss Distinguished Professor in the Animal Science Department at Iowa State University. He grew up in the Netherlands and earned B.Sc. and M.Sc. degrees from Wageningen Agricultural University, and a Ph.D. in animal breeding from the University of Wisconsin. Before coming to ISU in 1997, where he leads the Animal Breeding and Genetics group, he was faculty at the University of Guelph, working with the Canadian industry on genetic improvement of dairy cattle.

April 20, 2022

10:30 AM–12:00 PM

(Central Time, UTC–5)

Purpose: Demonstrate how different models may be integrated to improve genomic prediction.

Register for this Zoom virtual meeting:

https://tinyurl.com/AG2PI-FD17

Upon registration, wyou will receive a confirmation email with information about joining the meeting.

A recording will be available at a later date at: **ag2pi.org/**

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