Tracking the Spread of Potato Late Blight (Phytopthora infestans) on a Regional Scale

Firester, Benjamin

Potato late blight, spread by Phytopthora infestans, caused the Irish Potato Famine and still causes about $7 billion of annual crop damage. Tracking and predicting its spread remains problematic. Growers over-spray potato fields with fungicide as a precaution, irrespective of the prevalence or actual risk of blight. Fungicides also kill amphibians and poison the soil for plants. This work created a new mathematical model for the spread of late blight, based on known infection sites, weather, and proximity. The model used directed graphs with nodes representing infected fields, and edges the probability of a node infecting another through weather and proximity. It was run using various weighting parameters to combine the distance and wind-based probabilities. Resulting infection maps were compared to the data showing the spread. Based on how blight spreads, the final weighting parameters were chosen for the model. The model was then used to create a “risk map” showing the likelihood of future infections in nearby fields. It shows areas with a high risk of getting the disease, helping growers decide whether or not to use fungicides. The model could also power an online decision support system to crowd-source infection data from farmers, and help them collectively control blight cheaply and effectively. Since this model only needs infection and weather data, it would be virtually free for farmers to utilize, unlike similar models for other diseases. Knowing where the disease will most likely spread can help farmers prevent over-spraying toxic and expensive fungicides, give accurate knowledge as to when spraying is necessary, and identify regions at risk so that farmers don't use potato seedlings and possibly spread infection.

Awards Won:
Third Award of $1,000