

Weather fluctuations impact **Sirex** and **Leptocybe** pest, which results in **wood loss** in the forestry industry. Modelling the weather impact on these pests were performed using seven techniques. Most of the models overfitted the **Sirex** data. For **Leptocybe** the **SVM** performed the best with a **TP** rate of **22.31%** and **TN** rate of **47.69%**. Future research could investigate new features, for example air quality and humidity.

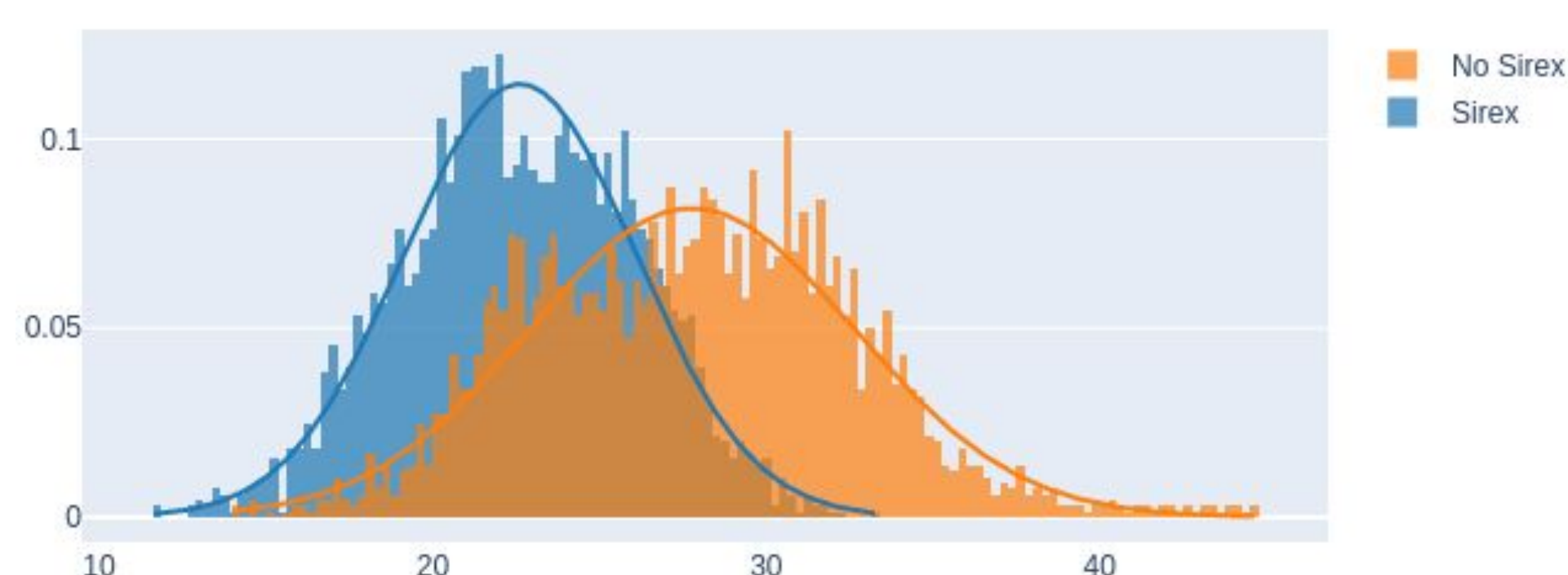
Enabling weather-based decision making for forestry pest and disease management

INTRODUCTION

Climate change has caused fluctuation in weather patterns that directly affects pest and disease activity in the forestry industry, which impacts the yield in wood production. This project aims to identify the impact of weather changes on *Sirex* and *Leptocybe* pests, and provide this information through a web-application to support decision-making.

METHODS

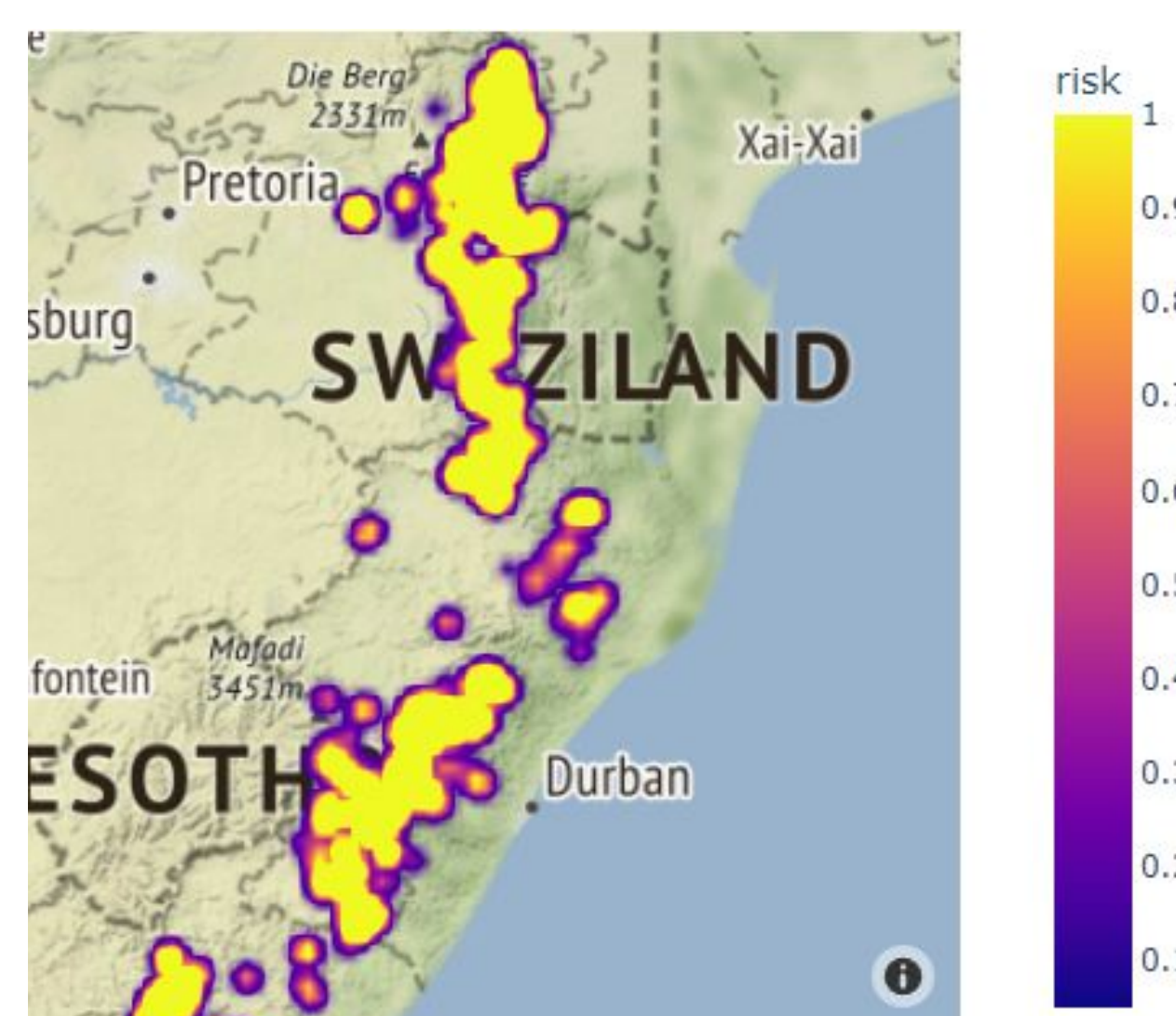
A total of seven modelling techniques were investigated which consisted of linear and non-linear regression, tree-like, and temporal-spatial fixed grids. The figure below is an example of the fixed-grid which shows the PDF of the maximum temperatures of *Sirex* (blue) and *No Sirex* (orange) samples.



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RESULTS

The classification results for *Sirex* and *Leptocybe* are respectively shown in table 1 and 2. The best performing true-positive rate was obtained using Random Forest for *Sirex* and SVM for *Leptocybe*. The figure below shows the predicted risk of pest infestation in the area of Kwazulu Natal and Mpumalanga.



DISCUSSION

Most of the models for the *Sirex* pest contained zero false-positive rate, which indicates the models over fitted the data. The SVM performed the best on the *Leptocybe* dataset. A major limitation was the sparsity of the weather stations, collaborating with industry partners to integrate weather data could be a solution.

Model	TP (%)	TN (%)	FP (%)	FN (%)
Linear SVM	20.47	77.16	0	2.37
GLM	20.47	77.16	0	2.37
ANN	20.18	77.97	0	1.85
Decision Tree	17.29	77.16	0	5.54
Random Forests	22.84	77.16	0	0
Extra Trees	21.80	77.97	0	0.22
Fixed Grid	6.33	72.56	12.14	8.97

Table 1: Sirex results

Model	TP (%)	TN (%)	FP (%)	FN (%)
Linear SVM	22.31	47.69	25.36	4.62
GLM	21.54	47.69	25.38	5.38
ANN	11.54	58.46	14.62	15.38
Decision Tree	21.54	48.46	24.62	5.38
Random Forests	21.54	48.46	24.62	5.38
Extra Trees	15.38	58.46	14.63	11.54
Fixed Grid	3.41	61.95	1.95	32.68

Table 2: Leptocybe results

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