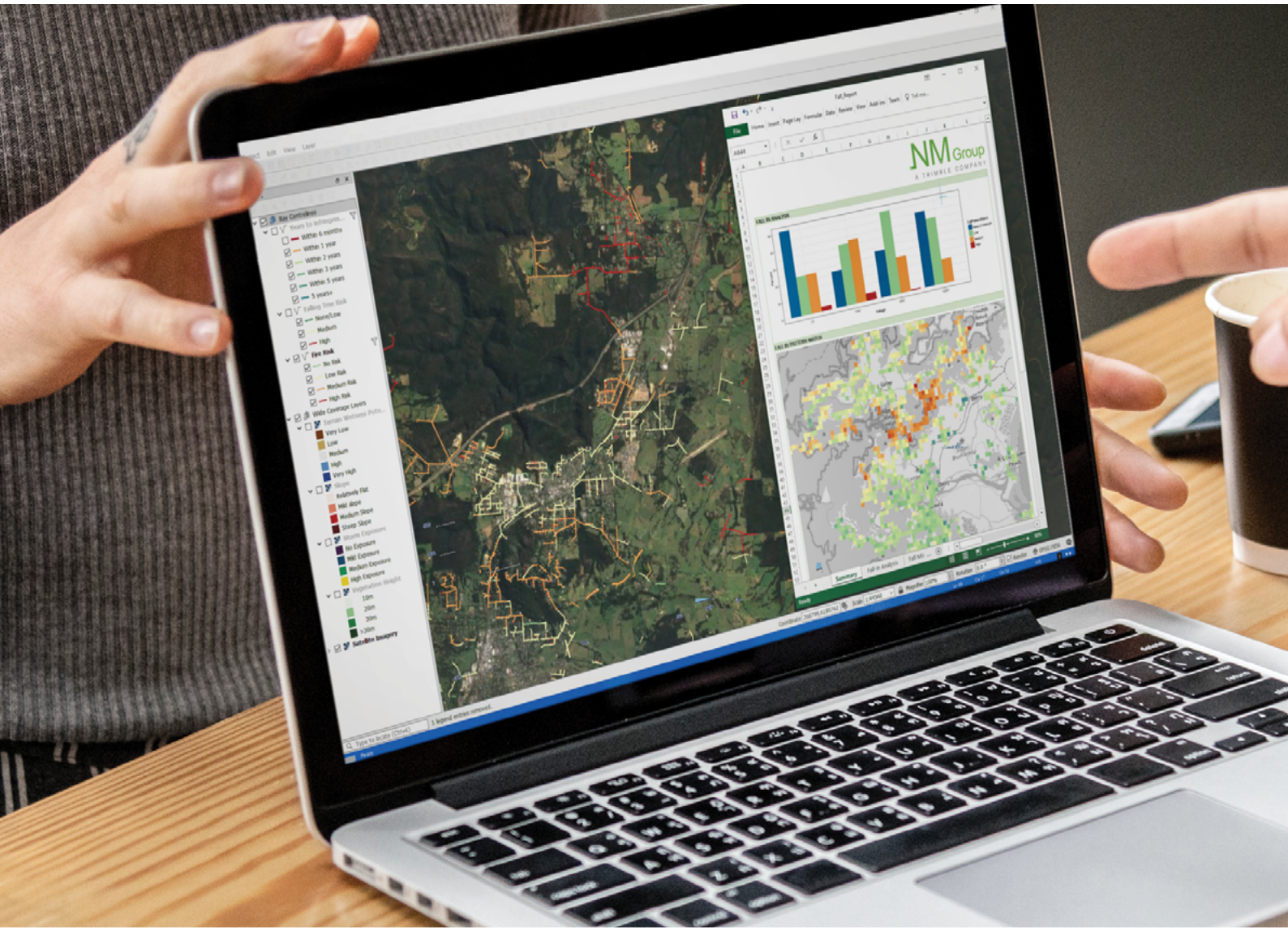
NM Group

A TRIMBLE COMPANY



Vegetation Analytics

Understand network trends

What is Vegetation Analytics?

It is a big data approach to modelling the status and trends of vegetation adjacent to powerlines. We utilise historical information and a suite of analysis tools to look at every tree and calculate its growth, its ability to hit the line and its likelihood of falling. Paired with risk criteria and cost information specific to the network operator, this allows for significantly improved targeting of tree inspections and the design of management programs for trimming/felling which optimise cost, risk or a balance of both.

In practice, we combine existing geospatial datasets, management records of past cutting, environmental and weather data, soil and topographic information, species categorisations, vegetation changes (extent, density) and a range of other sources, to make informed predictions for optimising UVM decisions.

For the network owner/operator, this enables data-driven decision making - where to trim, to what extent, on what cycle? Which trees should be inspected for potential felling or further monitoring? Which parts of the network are most at risk, based on localised vegetation trends, the propensity for fires/storms and the number of customers connected? Being predictive, we want to enable questions such as these at any point in the future - new data simply updates the prediction.

Key benefits

- **Make use of existing geospatial data from any LiDAR provider**
- **Ensure ongoing compliance by prioritising work to where compliance is most** likely **to be breached**
- **Identify and report on which spans have trees on the network and how close they are to OHL**
- **Risk-rank trees based on likelihood to fall versus local fall patterns (analysis has shown >80% success rate in modelling)**
- **Identify an optimal strategy of pruning vs tree removal**
- **Quantify scope of work for contractors, increasing cost certainty and better value contracts**
- **Model vegetation growth rates per span to optimise (and often lengthen) cutting cycles.**

Functionality

Inventory

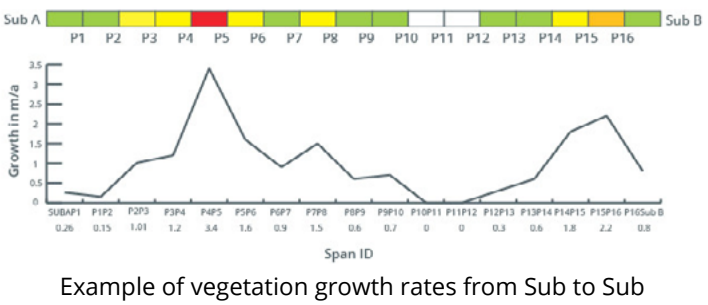
Enables the identification of exactly which spans have trees, how many and how close they are to the line. It also helps define the best course of management, i.e. if there are many high-risk trees then removal is likely to be more cost effective than pruning and vice versa. This enables more cost effective maintenance cycles.

Growth rates

Providing utility specific measurements of vegetation growth rates to optimise (and often lengthen) cutting cycles as necessary. Thereby reducing the cost of patrols and cutting with no increased risk exposure.

Tree fall risk

By identifying trees that are most at risk of falling into the line and causing an outage. Tree fall analysis using LiDAR has traditionally highlighted any tree that is 'geometrically close enough to fall' as a risk. Our approach extracts much more value from the LiDAR dataset to model local topographic, meteorological and vegetation structural factors that contribute to tree failure and extrapolates this to any potential threat. This allows for identification of trees more



Example of vegetation growth rates from Sub to Sub

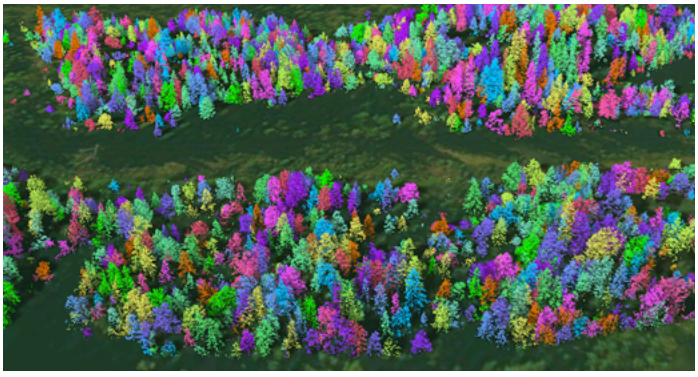
at risk of failure, modelling the local and environmental patterns and historic tree fall events.

Academic research

Between 2015 and 2017, NM Grop undertook a Knowledge Transfer Partnership with prestigious Durham University. This two-year research project looked at developing robust vegetation modelling methods using LiDAR and other remote sensing methods. Building on NM Group's decades of remote sensing and vegetation management experience the KTP developed cutting-edge risk analysis built on robust academic principles. The result was the creation of Vegetation Analytics.

Big Data and machine learning

Predictive risk analytics are completed using statistical regression modelling. This enables the testing of different variables to identify statistical significance. Once established, we can then look into the data to find locations that exhibit these same factors – and therefore a strong indicator that tree fall will occur. To do this manually on a variety of massive datasets can be hugely onerous, so NM Group use machine-learning techniques to automatically sort through the 'big data'. This allows NM Group to use powerful computational processing to crunch through big data volumes to quickly and automatically build precise models which deliver accurate results. Utilities can use the outputs from these models to identify and avoid risks hidden somewhere within these large data volumes and highlight cost-saving opportunities.



Top: Vegetation canopies seperated out in LiDAR data.
Bottom: Tree fall-in defects per span using predictive modelling

Proven benefit

Working with an East Coast Australian distribution network, our team were able to inventory the trees on the network, model growth patterns per span and risk-rank trees based on their match to local fall patterns. Quantitative testing of this tree-fall model on historical tree failure indicated an 80% success rate in the model's prediction ability. Other benefits came in helping ur client to clearly identify which spans should be pruned versus cutting down vegetation. This has greatly helped in reducing contractor costs through better-defined work packages.Our client has seen this project as being an important part of their drive to reduce vegetation management OPEX by 40% and move towards a risk-based approach to vegetation management.

"Having well organised and high-quality data is a key input to this type of project which uses powerful data analytics, cloud processing and machine learning techniques to optimise our vegetation maintenance programme..."

Vegetation Control Manager

About NM Group

Our geospatial technologies help deliver clearance assessments, vegetation mangement reporting and asset health assessments. We help network operators demonstrate complaince, improves reliability and ensure the safe operation of their power assets.

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