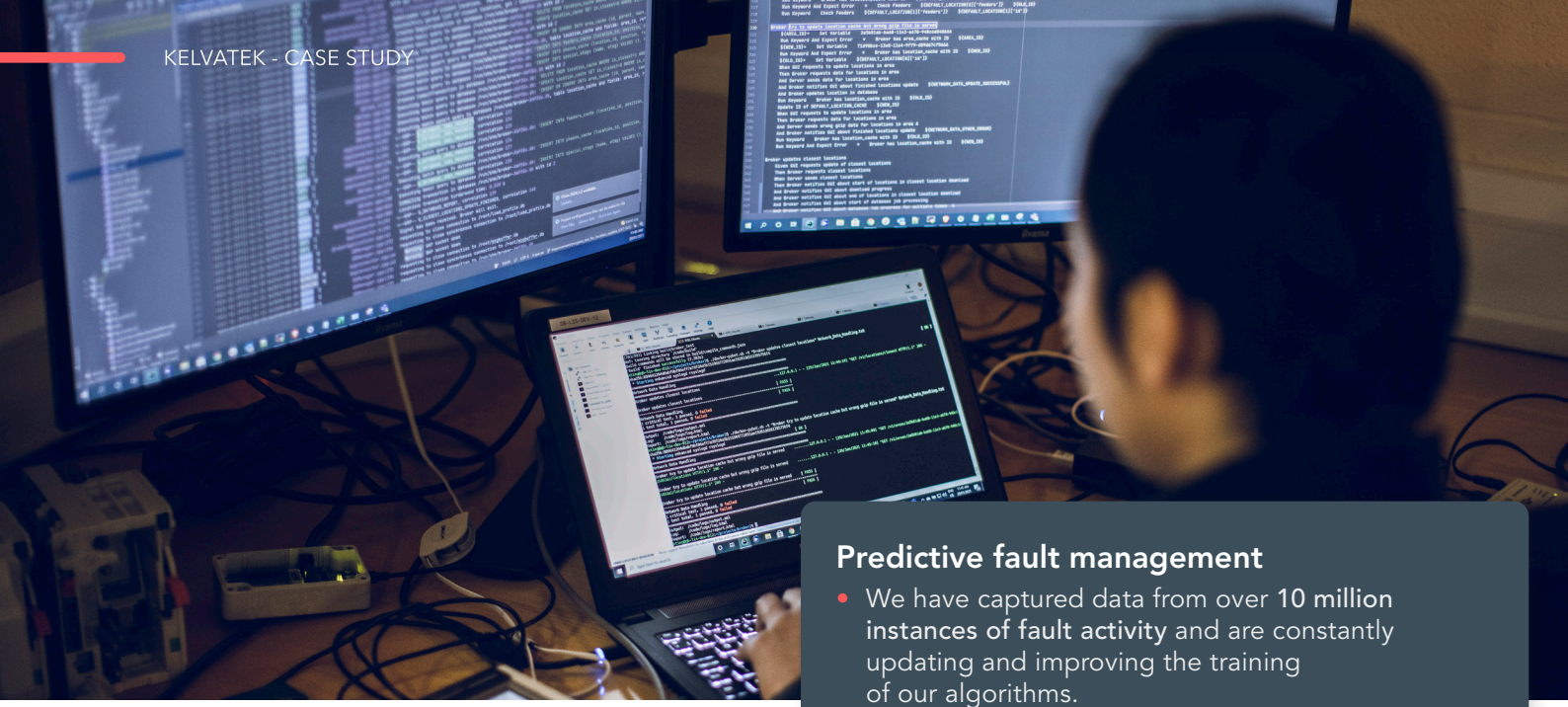


Algorithms on the LV network

Driving actionable information from power flows and faults in LV cables

Over the last 20 years Kelvatek's expert team of engineers, physicists, mathematicians, data scientists and various PhD specialists have been developing innovative methods of analysing the very complex power flows that happen in faulty networks.

Pecking faults, arcing faults, welded faults, phase to phase, phase to neutral and three-phase faults all have different characteristics. On top of that, the dynamics of a fault means that we must use fractions of a cycle of data to analyse the power flows, and there are often many instances of fault activity to analyse. These can vary and may be caused by more than one fault location or fault type.

The fault dynamics themselves are non-stationary processes, which are also affected by large loads on the network, radial, meshed or interconnected network topologies. Because of the depth of our understanding of these power flows and the intricacies of LV networks we have been able to develop compensations and models to account for such complexities.

Connecting data to decision-making

We have accumulated over 50 working years of dedicated research developing and training algorithms that can reliably and consistently analyse, classify, and translate this high-volume, deeply complex data into actionable information.

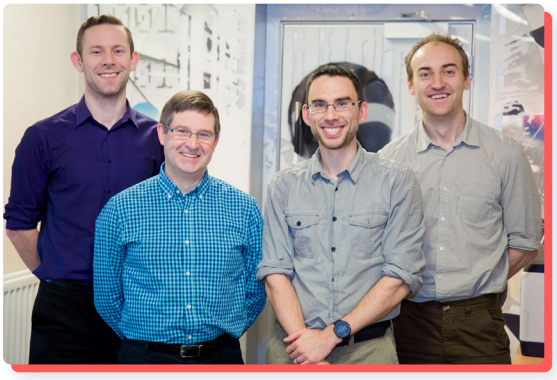
We can now automatically process data from one or all three phases, via our servers through these models. We sort through terabytes of waveform data captured via our proprietary triggering algorithms, aligned with phases and locations to produce a 'distance to fault' to an engineer in the field. This is supported by our SAPIENT engineers who can mark up the DNO's maps and supplement or re-run the algorithms with additional relevant information on recent activity and their own experience of fault-finding in the field.

Predictive fault management

- We have captured data from over **10 million instances of fault activity** and are constantly updating and improving the training of our algorithms.
- **9 out of 10 faults** located in the field come back within the tolerance ranges we have calculated.
- We help prevent in excess of **2,000 permanent faults** developing on the GB network every year.
- Edge computing and intelligent triggering allow detailed fault data to be captured without storing excessive data.

Benefits

- Our algorithms employ a variety of confidence measures aimed at improving the detection rate in the field, thus encouraging customers to pinpoint faults.
- Faults can be located without multiple excavations to "cut and test" the LV cables improving efficiency.
- Planned repairs to networks are far less disruptive to customers and less costly for DNOs than "smoking holes in the pavement" improving the return from regulatory incentives.
- We have accumulated a vast experience of complex load flows in the LV networks of every DNO in GB, with over **15 million hours of data** providing unparalleled visibility of the LV network.



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