A Data-Driven Approach to Fault Location in Mine Electrical Systems

This Developing Innovations Project explored a novel hybrid hardware-software solution for detecting fault locations in hard-to-access power lines using actual field measurement data. The focus was on creating advanced algorithms capable of accurately identifying faults in both buried high voltage feeder cables and medium voltage cables commonly found in potash mines.

The project also contributed to the growing body of research on fault detection and prediction by proposing innovative techniques to identify fault locations using a limited number of measurements—supported by offline simulations of fast transient signals.

Two main offline methods for fault location were investigated: terminal and tracer approaches. Terminal methods use data collected from one or both ends of a cable to estimate the fault location, while tracer methods rely on measurements taken along the length of the cable for greater accuracy. Although offline tools form the basis of many commercial fault detection systems and offer valuable benefits, they can still present challenges. For example, depending on the fault type and cable structure, locating the precise fault may take several hours. These systems also require specialized training and expertise to operate effectively.

This concept not only makes it more effective to troubleshoot electrical cables in real time, but also reduces operational downtime and helps protect workers from inherent electrical risks. By addressing longstanding limitations in current fault detection tools, the project paves the way for more efficient and safer electrical system maintenance in underground mining environments.

The analysis suggests that the software package is fully compatible with the cost-effective hardware setup that has been developed, effectively addressing all the established design requirements.

Proponent: *University of Saskatchewan*
Project Duration: October 2021 to January 2023

Project Cost:	**$302,100**
IMII Contribution:	$152,100
Mitacs Contribution:	$150,000
Industry In-Kind:	$12,000

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