LiDAR Data Processing for Utility Asset Management and Fire Risk Assessment

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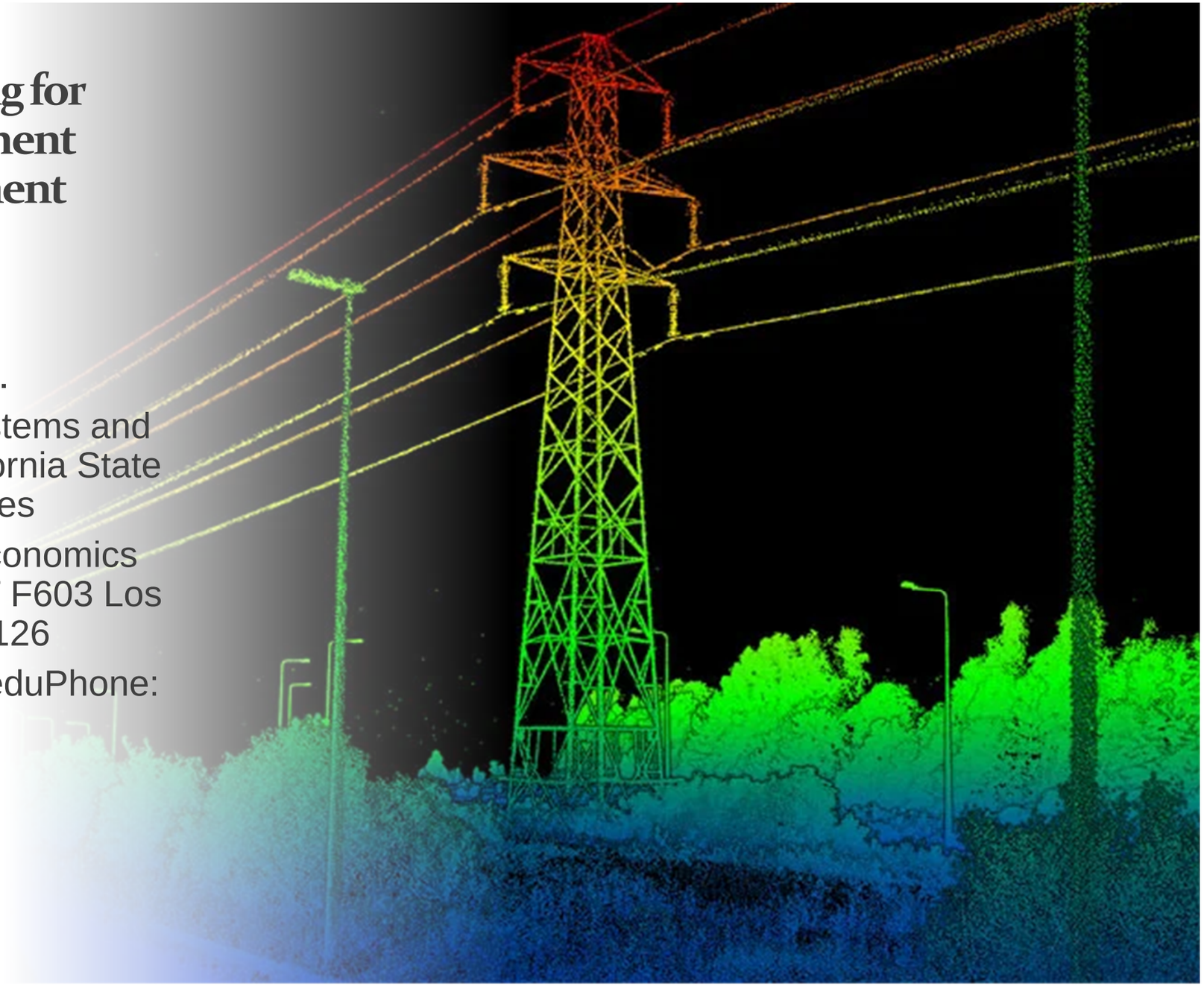
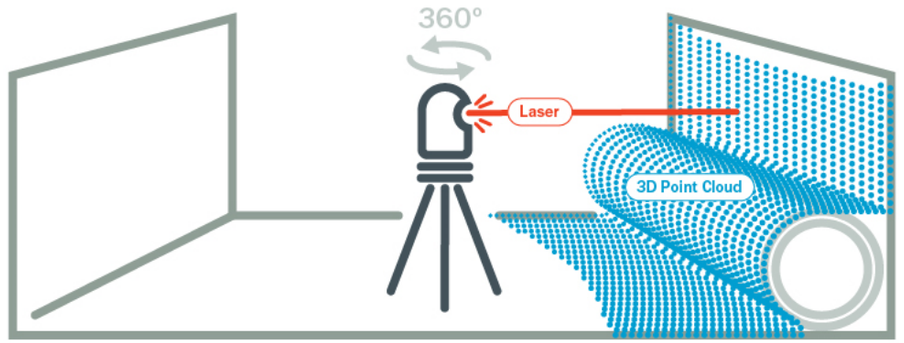


This presentation introduces a LiDAR point-cloud data-processing tool and examines its myriad applications, such as mass asset surveys, vegetation management, and structural-load analysis. We highlight the potential benefits of precise geolocation data extraction from LiDAR point clouds within utility service territories through an exploration of ArcGIS geoprocessing tools.

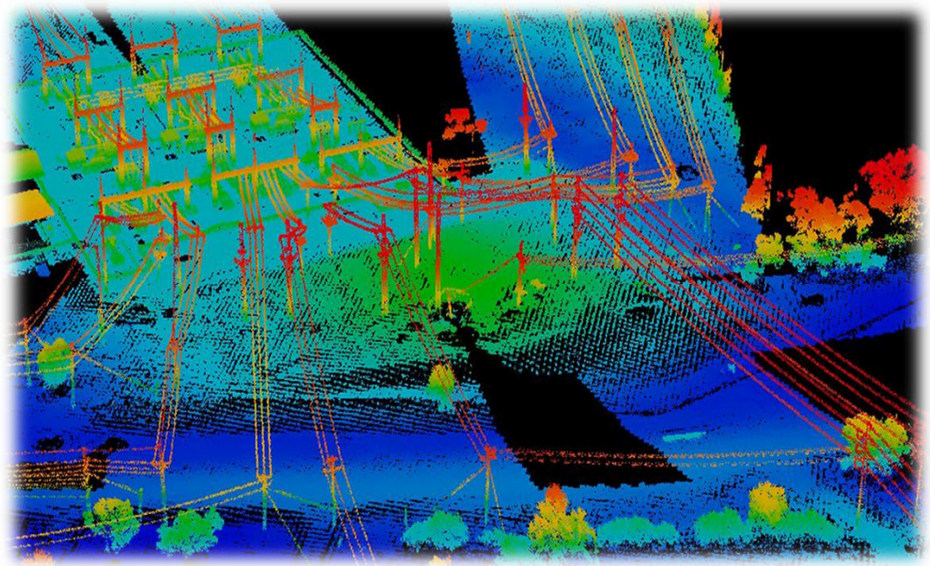
What is LiDAR Scanning?



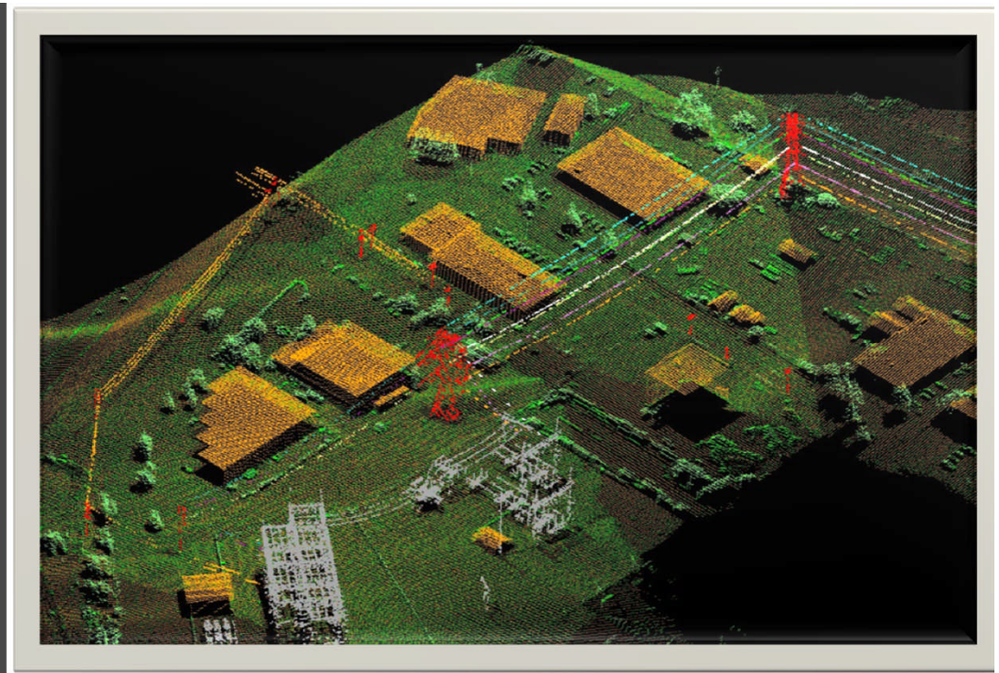
Light Detection and Ranging
Measures distance to all points in line of sight

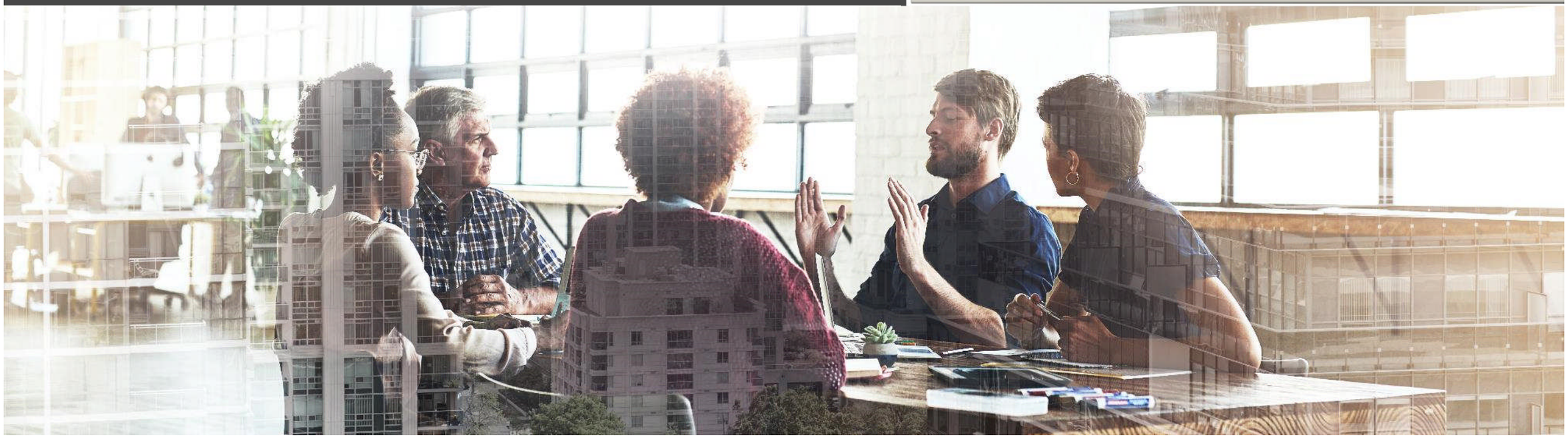
Produces a 3D Point Cloud
Target distance and direction of virtually millions of points around the sensor

Multi-Data
LiDAR scanning provides dimensional data in addition to visual data



LiDAR Point-Cloud Processing



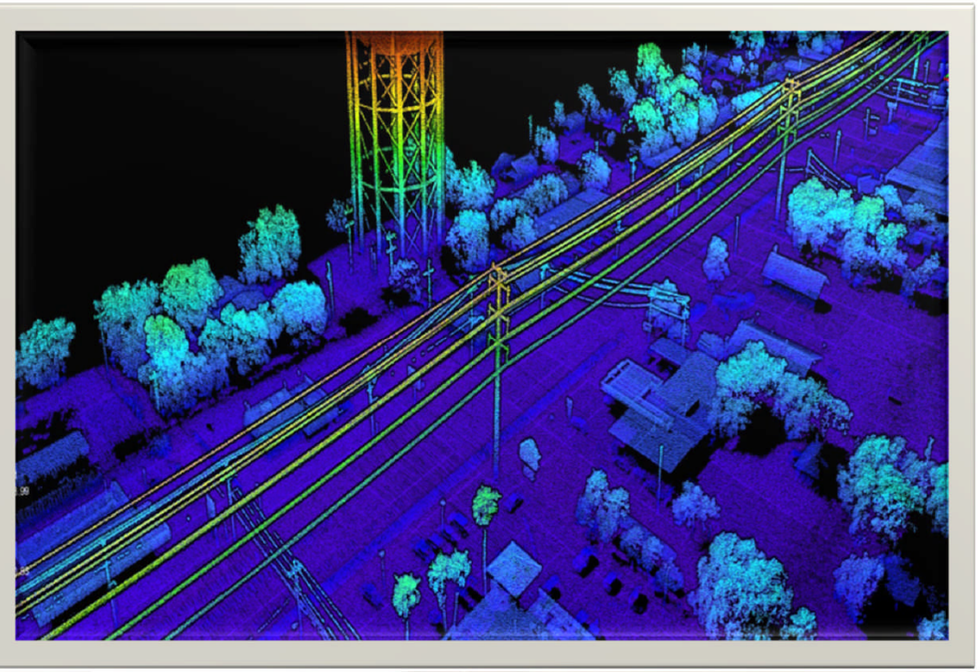


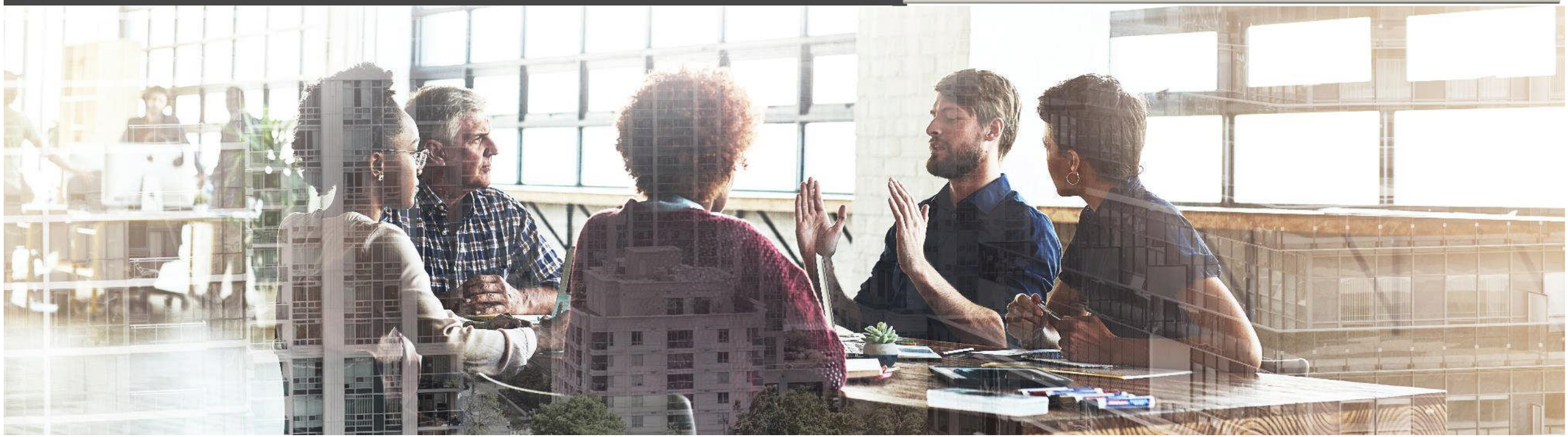
Background and Reasoning

This project demonstrated a proof of concept for a LiDAR point-cloud data-processing tool. The project focused on the process of using ArcGIS software and a deep-learning framework to classify point-cloud data into several categories: ground, building, noise, high vegetation, wire conductor, and transmission tower.

The classification was accomplished by training the model on a small set of data similar to the larger real-world dataset. Then the model was applied to the full dataset, where it successfully separated ground and other points from those of interest, wire conductors, transmission towers, and high vegetation at risk of affecting the power lines.

Data-Accuracy Validation





California Senate Bill 901 and Utility Inspections

In 2018, California passed Senate Bill 901 mandating utility companies to implement wildfire-mitigation plans.

These plans require regular visual inspections of assets like power lines, poles, transformers, and substations.

Inspection frequency varies from 12 to 24 months for routine maintenance to 3 to 5 years for comprehensive examination.

Inspections are challenging due to remote and rugged locations, limited access, and difficult terrain.

Sending inspection crews to these areas is time-consuming, costly, and may not capture all necessary information for assessing asset condition and performance.

Overcoming Challenges with LiDAR Technology

Enhancing Asset Management with LiDAR Technology

Utility companies employ LiDAR to address inspection challenges.

LiDAR uses laser pulses to measure the location of objects in three dimensions and their reflectivity.

LiDAR captures high-resolution point-cloud data of utility assets and surroundings for accurate monitoring.

This technology enables utility companies to identify, locate, and monitor assets more efficiently.

However, processing and analyzing LiDAR data require specialized software and expertise.

Many companies outsource this task to third-party vendors, increasing expenses and reducing control over data quality and security.

Resolving Small-Structure Details

Operational Efficiency and Cost Saving

Developing in-house LiDAR data processing capabilities empowers utility companies to reduce dependency on third-party vendors, streamline data-management workflows, and control processing costs. By investing in advanced geospatial technologies, organizations can achieve greater operational resilience and long-term sustainability.

Refinement of Point-Cloud Classification: Enhance accuracy through advanced algorithms.

Fine-Tuning Classification Models: Optimize based on real-world feedback.

Quality Assurance and Validation: Ensure alignment with ground truth data

Integration of Additional Data Sources: Combine datasets for comprehensive insights.

Optimization for Fire Risk Assessment: Prioritize maintenance and mitigation efforts.

Final Takes

Conclusion

The implementation of LiDAR data-processing tools for utility asset management and fire risk assessment presents significant opportunities for enhancing operational efficiency, improving asset visibility, and mitigating wildfire hazards. Through the exploration of ArcGIS geoprocessing tools and advanced classification algorithms, this paper has demonstrated the feasibility and potential benefits of leveraging LiDAR technology to extract actionable insights from point-cloud data.

KEY FINDINGS

Utility Asset Management Enhancement:

- Streamline asset surveys and maintenance processes with accurate data.
- Improve operational efficiency and reliability of utility infrastructure.

•**Fire Risk Assessment Improvement:**

- Proactively identify high-risk areas and implement targeted mitigation strategies.
- Enhance community safety and resilience against wildfire threats.

•**Operational Efficiency and Cost Savings:**

- Reduce dependence on third-party data-processing vendors.
- Control costs and optimize resource allocation for long-term sustainability.

•**Future Directions:**

- Address scalability and cybersecurity challenges for broader adoption.
- Foster collaboration between stakeholders to drive innovation in LiDAR technology.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