Deep learning, remote sensing, and utility transmission and distribution asset intelligence

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Outline

• Remote sensing opportunities in utilities inspections

• Deep learning as a tool to improve remote sensing outcomes

• Challenges in using deep learning in utilities

• Strategies for overcoming these
Remote sensing opportunities in utilities

• Benefits
  • Safety
  • Leverage improving economics of collection

• Applications
  • Pole location update and conflation
  • Vegetation management
  • Asset management – inventory, health checks

• Commonality with other areas
  • Substations, solar farms, wind turbines, pipelines, rail, etc.
Opportunities – pole location update

Red linework indicates new improved asset locations after conflation using L3Harris Geiger-mode lidar
Opportunities – vegetation management
Opportunities – inventory and health checks
Deep learning performance – cleverness and data

Revisiting Unreasonable Effectiveness of Data in Deep Learning Era (Google, CMU). arXiv:1707.02968

xkcd 1425
Challenges

- Fragmented data holdings; examples of defects are rare
- Sensitive and restricted data
- Inspections are comprehensive and ‘bundled’
Challenges & Strategies

- Fragmented data holdings; examples of defects are rare
- Sensitive and restricted data
- Inspections are comprehensive and ‘bundled’
- Aggregate data in repository and include data collection in work flows
- Share data – with safeguards
- Add value within existing inspection workflow
- Cheat! Make the problem easier
Strategy – aggregate data

• A central repository helps sharing within an organization.

• In some utilities, certain infractions require an image with the remediation work order.

• Aggregate data in repository and include data collection in work flows

• Share data – with safeguards

• Add value within existing inspection workflow

• Cheat! Make the problem easier
Strategy – share data across industry

- Medical and defense as models for handling sensitive data

- EPRI

- Aggregate data in repository and include data collection in work flows

- **Share data – with safeguards**

- Add value within existing inspection workflow

- **Cheat! Make the problem easier**
Strategy – add value within existing workflows

• Back-office inspections

• Start with semi-autonomous. Build trust.

• Roadmap to continuous improvement

• Aggregate data in repository and include data collection in work flows

• Share data – with safeguards

• Add value within existing inspection workflow

• Cheat! Make the problem easier
Strategy – make the problem easier

- Collection protocols and repeatable collections
- Use more data (example: autonomous cars)
- Aggregate data in repository and include data collection in work flows
- Share data – with safeguards
- Add value within existing inspection workflow
- Cheat! Make the problem easier
Summary. Questions?

• Remote sensing can help make utilities inspections more efficient and safer.

• Deep learning is a useful tool – even before a capability is at human-level.

• Aggregate data naturally, look for ‘piggyback’ opportunities
  • Across industry, across departments, integrate image capture and retention into work flows

• Make the problem easier while still adding value
  • Collection protocols, fit into workflows, use additional data