



# UtilityAnalytics®

October 18-20, 2022  
San Diego, CA

WEEK

[UtilityAnalyticsWeek.com](http://UtilityAnalyticsWeek.com)

Hosted by **SDGE**<sup>TM</sup>



# Agenda

- Introduction
- Irish Landscape
- Projects
  - Smart IDM
  - LV Mapping
- Future

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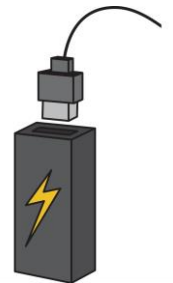
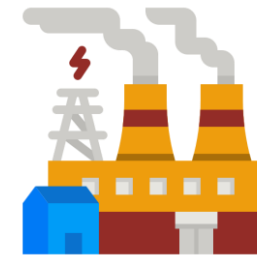
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Energy for generations

## Net Zero Emissions by 2040

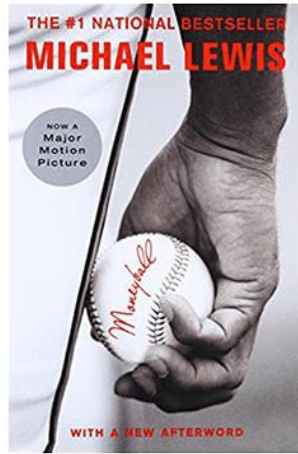
We are harnessing all our resources to make this Brighter Future a reality. This includes making significant investment in our people and working collaboratively with partners to build trust, enhance the lives of our customers and drive economic progress. To this end, ESB is taking urgent and focused action to achieve Net Zero emissions by 2040.



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# About Me



Energy for generations



NEWSLETTER

Planet AI: AI in Energy Digest

Weekly newsletter highlighting the biggest stories of the week in how AI is being used in the energy industry

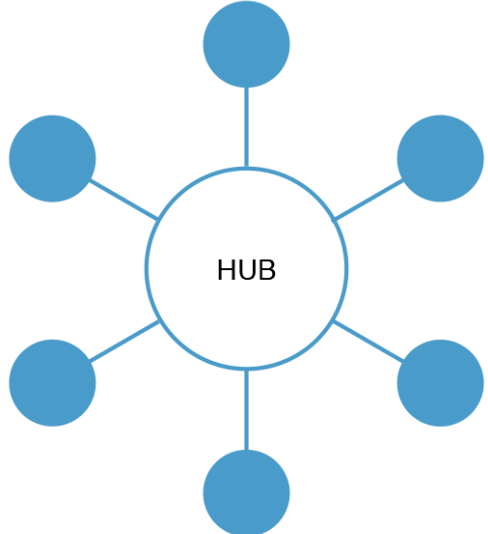


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# DATA ANALYTICS FOR ESB

IT enabling insights for a brighter future



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# California vs Ireland

Population

39.4m VS 5m

Land area

6x



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# Irish Landscape

## 30%

of the Irish population live outside of cities and towns



## 4X

European average of length of network per capita

## 6:1

Ratio of overhead lines to underground cables

Quantity	Description
2.1 million	Wooden Poles
150,000 km	Overhead Line
22,000 km	Underground Cable
242,000	Pole Mounted MV/LV Transformers
21,680	Ground MV/LV Substations
133	110kV/38V or 110MV substations
438	38kV/MV Substations
2.5 million	Meters

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## Projects



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# Smart Image Data Management



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# The Business Challenge

## Context

ESB Networks have undertaken the installation of **2.3 smart meters** in every home in Ireland.

## Caring & Trusted

In line with the ESB values of being Caring and Trusted, each of these installations requires an audit to ensure that they are installed **safely** and **correctly**.

## Automated

The process of inspecting these meters manually would be excessively **costly** and **time-consuming**, therefore it was required to automate this process through the implementation of an innovative AI model.

## Solution

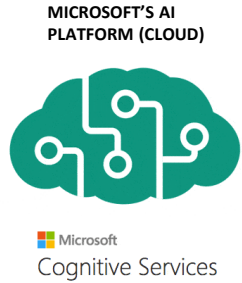
Image classification in order to classify photos of installations taken by contractors as correctly installed or requiring a more robust audit.



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# Our Innovative Approach



## Predictions

Tag	Probability
PostInstallation	99.9%
PreInstallation	0.1%
OpeningRead	0%
ClosingRead	0%

## Predictions

Predictions are shown in red

Tag	Probability
7	91.4%
6	90.7%
5	78.6%
7	87.9%
0	89.0%



## Dataset Development

- Worked closely with the business to develop SLAs for installation contractors to standardise multiple photographs to be taken on site
- Categorized meters and developed a data store of 1000s of meter images which were manually tagged by the data science team

## Environment Development

- Worked with Cloud team in ESB to set up entirely Azure cloud based architecture
- Full scale application developed that allowed contractors to submit photos for auditing
- Developed in a fully agile approach with PoC -> MVP -> Full Delivery

## Model Development

- Using Microsoft Azure Cognitive Services, developed an image classification model to classify images
- Over 5,000 images were used to train 3 models within the image lifecycle

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# The Results & Next Steps

- AI Checks performed 3 millions checks on over 700,000 installations completed to date
- > 90% accuracy rate
  - <1% False Negative Rate

## Value Add

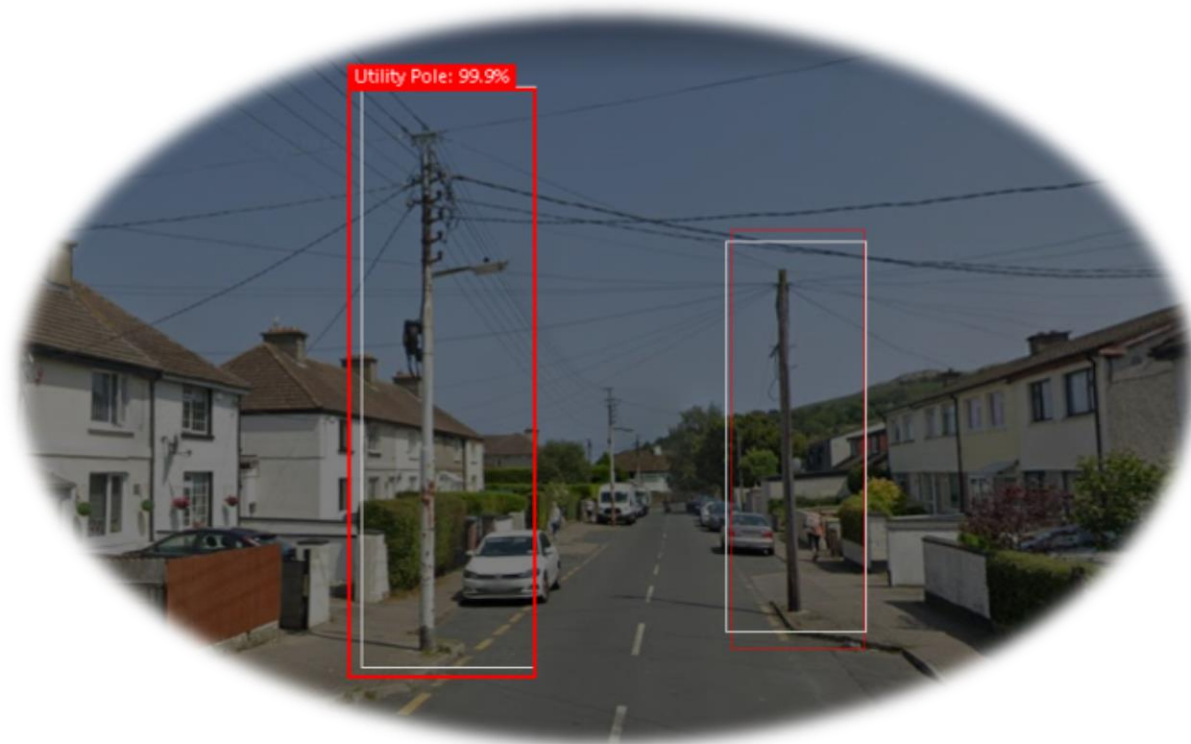
- Leveraging new and emerging technologies aligns with ESB's strategy
- Keeps customers at the heart of the solution
- Pioneering project has led to the development of other AI projects using similar technologies



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# LV Mapping



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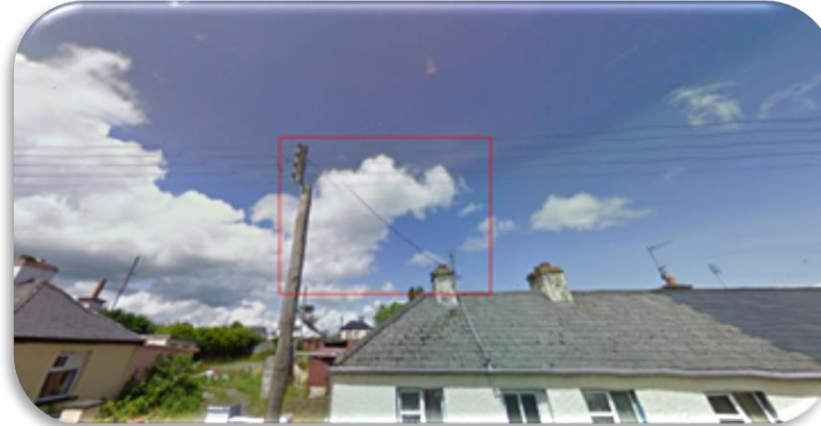
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# Background



An Coimisiún  
um Rialáil Fóntais  
**Commission for  
Regulation of Utilities**



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# Challenges

## 90k Miles

Overhead lines managed by  
our networks division

## 2.5m

Customers  
Nationwide

## > 2m

Poles

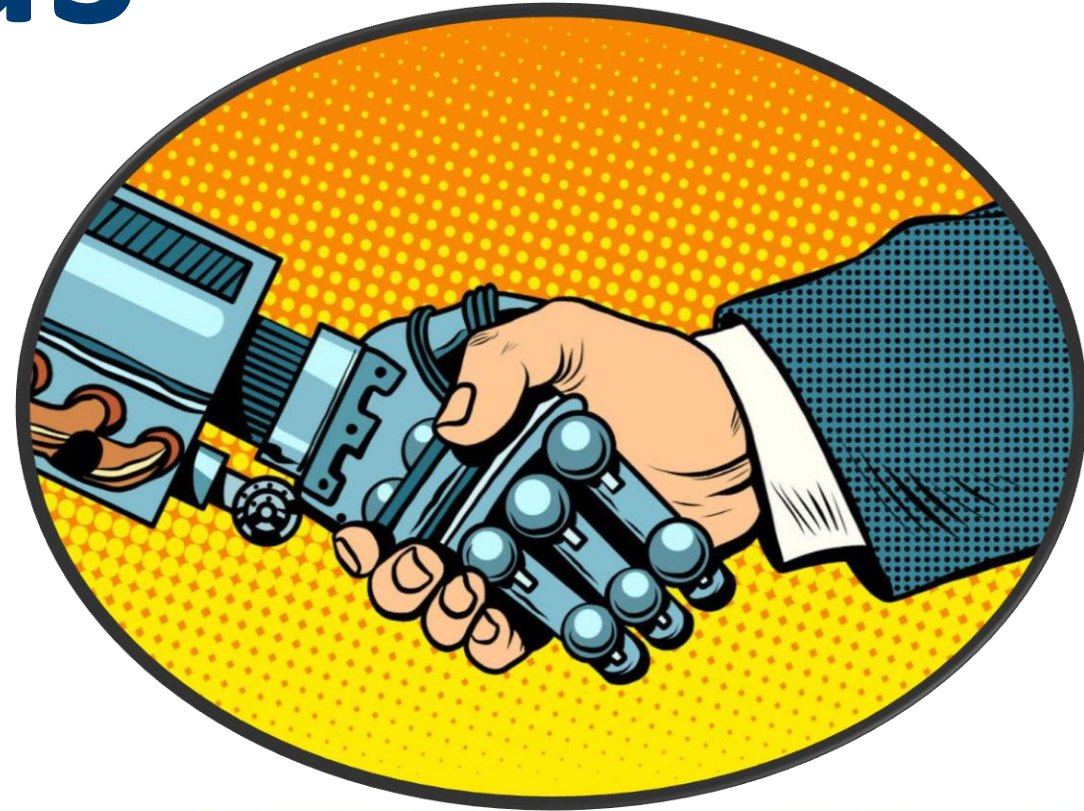


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# “Can AI help us out here?”

- Business



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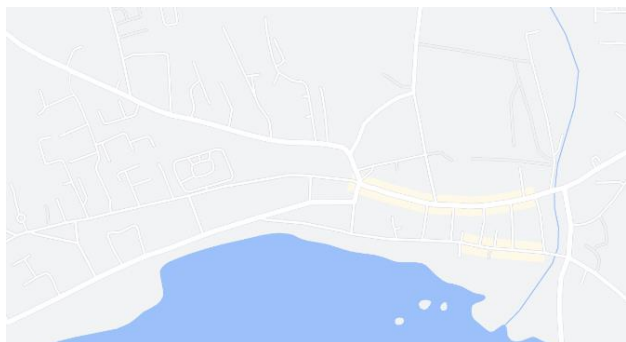
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# Development Process



Grab Location



Generate coordinates of roads

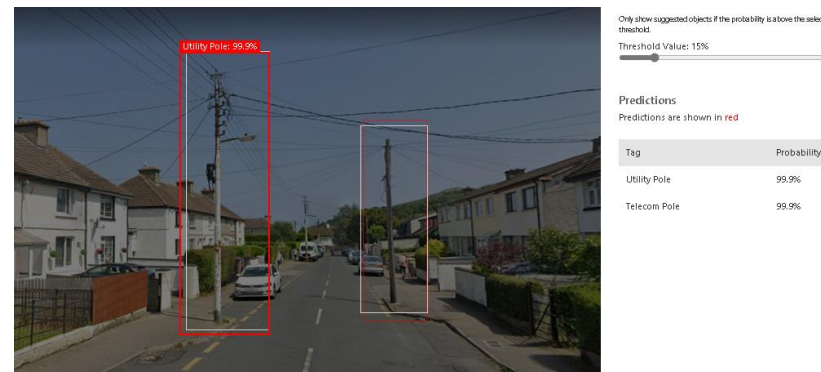


Script to "walk" the street



Microsoft  
Cognitive Services

Pass images to Azure Custom  
Vision Model

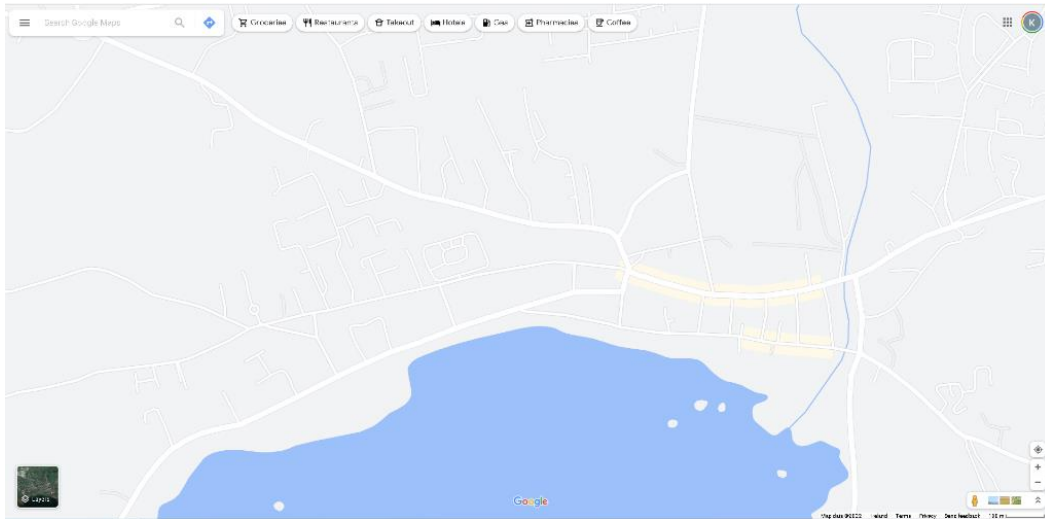


Classify poles & grab coordinates

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# Finding Roads



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# Finding Roads



lat	lon	direction	id	EndLat	EndLon
53.19921	-8.57846	81.91297	12	53.19934	-8.57694
53.1993	-8.57675	84.28257	13	53.19933	-8.57632
53.19788	-8.57807	96.71137	14	53.19771	-8.57569
53.20092	-8.56302	135	15	53.20093	-8.56291
53.19759	-8.58042	68.19283	16	53.19845	-8.57684
53.19947	-8.57393	80.49655	17	53.19948	-8.5738
53.19786	-8.58783	76.77827	18	53.19794	-8.58727

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# Finding Poles



Before



At



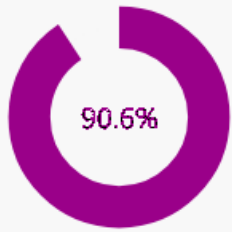
After

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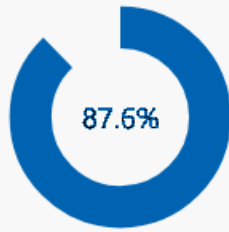
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# Plotting Results

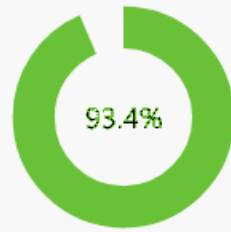
Precision  $\uparrow$



Recall  $\uparrow$

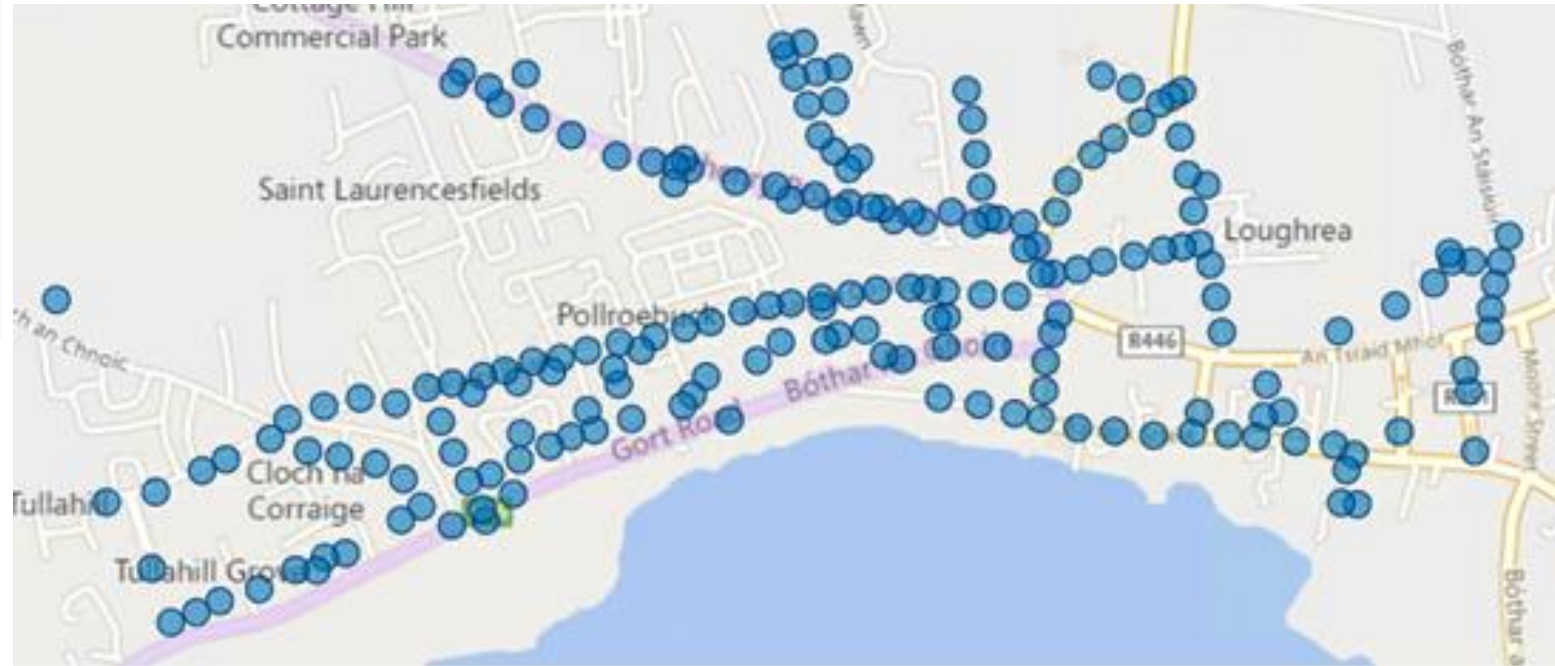


mAP  $\uparrow$



## Performance Per Tag

Tag	Precision $\wedge$	Recall	A.P.	Image count
<a href="#">Street Light</a>	97.2%	97.2%	99.9%	131
<a href="#">Utility Pole</a>	90.6%	85.7%	91.0%	262
<a href="#">Telecom Pole</a>	82.1%	79.3%	89.2%	146



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# Benefits



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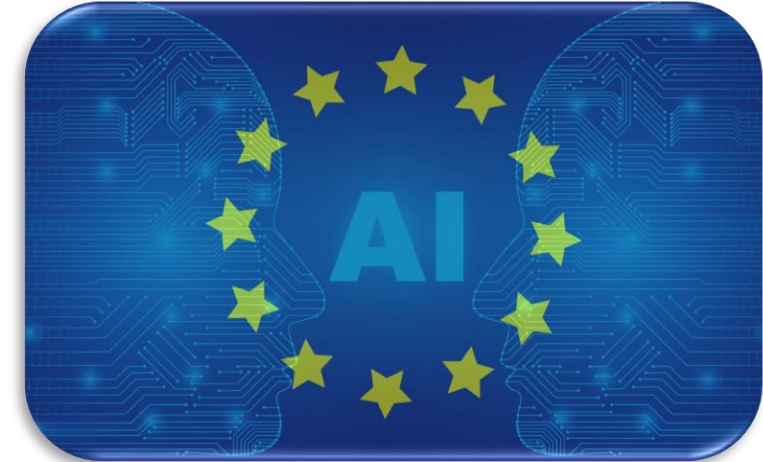
## Future Work



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# Future Work



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**Thank You**

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