

Kyle Lundeen, PE
Daniel Sierra, PE

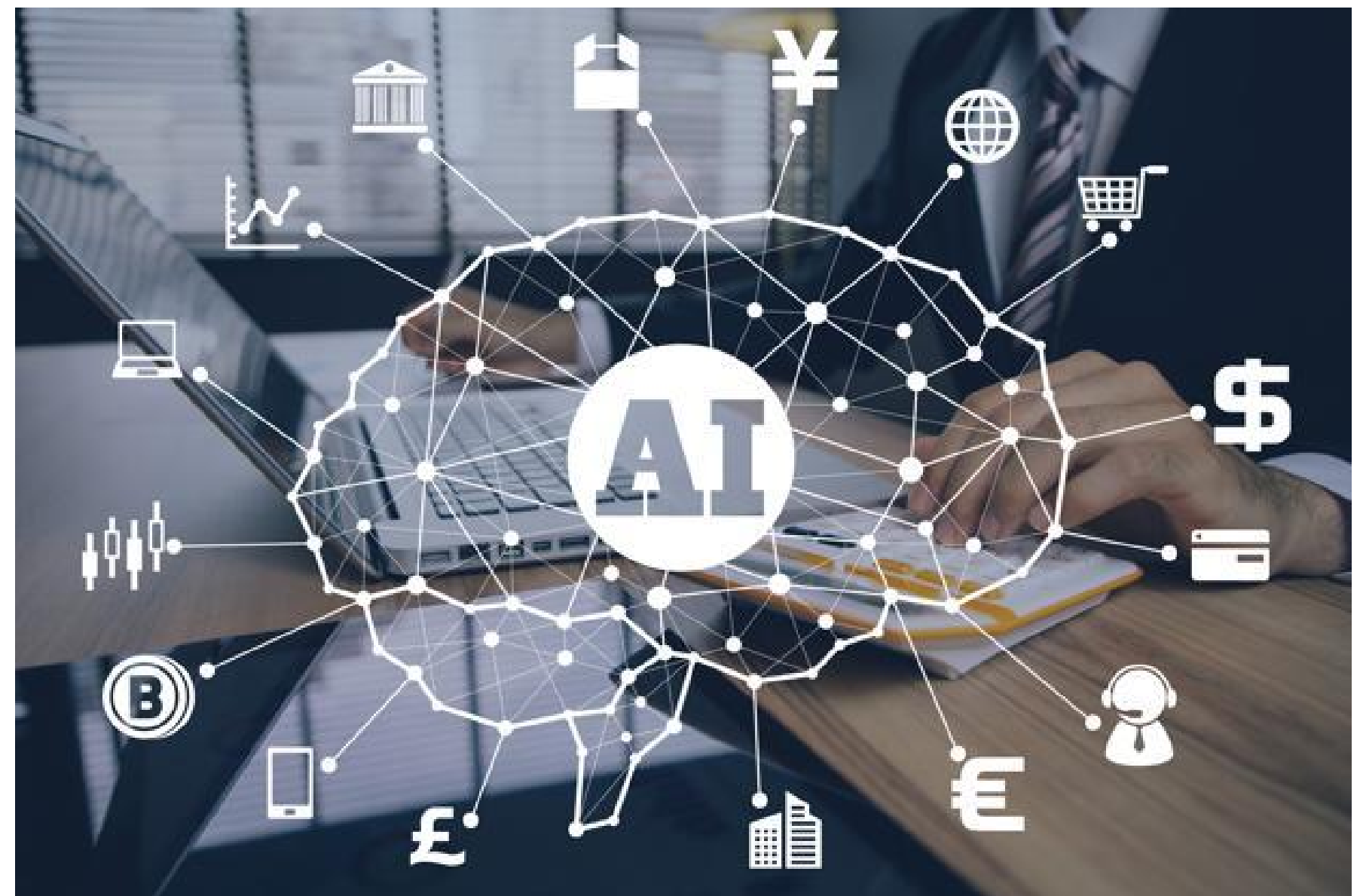
CIGRE
GRID OF THE FUTURE
November 4th, 2019

Assistants & The Future of Utility Operations & Maintenance



Agenda

- O&M Workforce
- Digital Assistants Today
- Applications to the Utility Industry
 - Machine Vision
 - Acoustic Analysis
 - Big Data
- Call to Action
- Q&A



O&M Workforce Trends

U.S. Department of Energy Projections:

- ▶ 50% of current energy industry workforce will retire in 5-10 years
- ▶ Average age of energy industry employee is over 50.
- ▶ Utilities can fill the gap with
 - Internal training
 - External hiring
 - Artificial Intelligence
 - Digital Assistants



Digital Assistants Today

- Apple Siri
- Amazon Alexa and Echo
- Google Voice Assistant
- Bank of America Erica



Simple Interface with User

What can I help
you with?

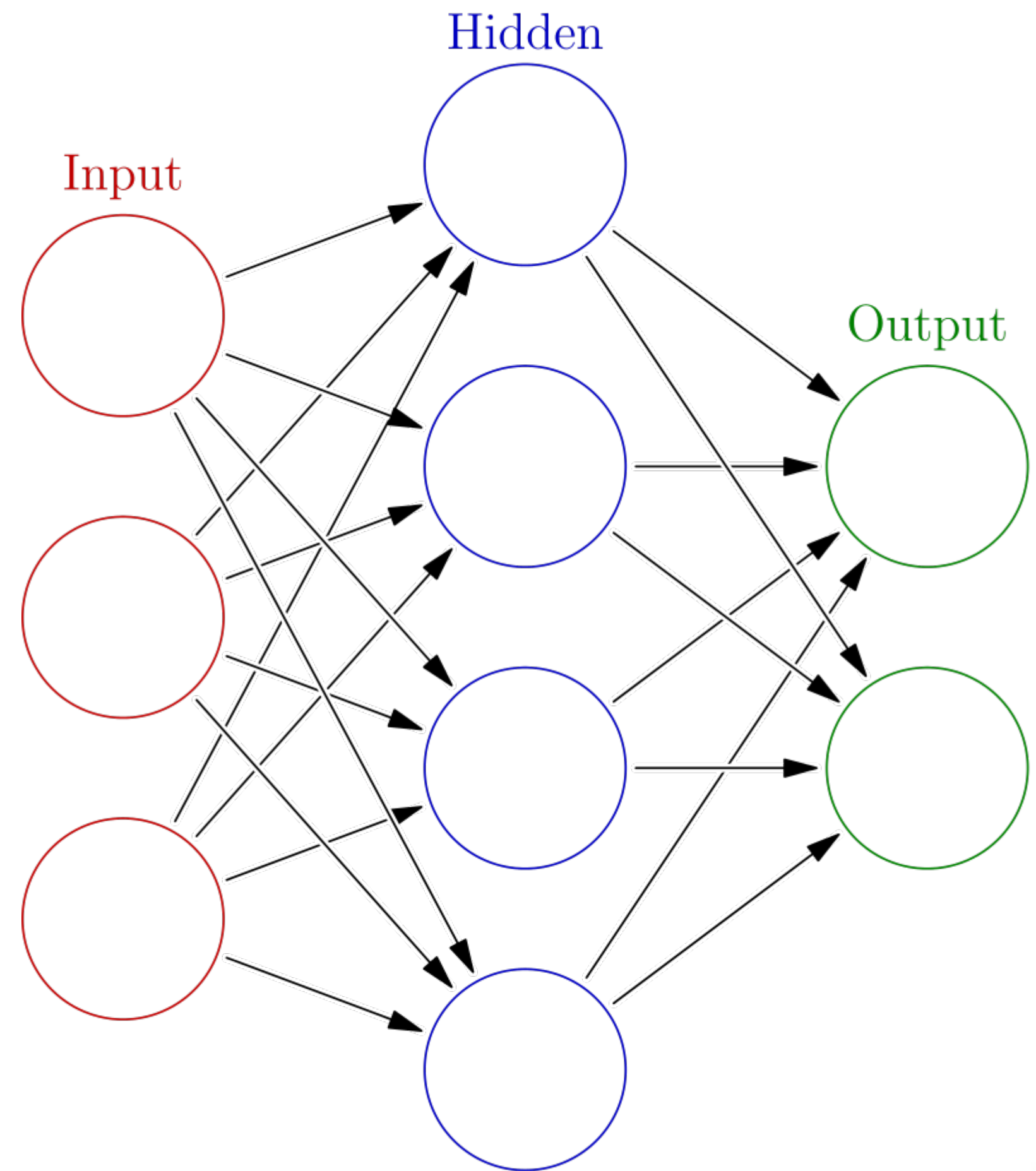
Enabling Technologies

- Neural Networks
- Natural Language Processing Algorithms
- Vast Quantities of Data
- Large Storage Capabilities



Enabling Technologies

- Vast amounts of data
- Labeled training and test data sets
 - Pictures
 - Sounds
 - Numeric and Text Data
- Refine estimation and prediction algorithms
- Backpropagation and adjusting parameters



Applications to Utility Industry

- Smart Phones and Tablets
- Enhanced with Digital Assistants
- Support Field Workers
- Troubleshoot Issues
- Provide Analysis and Recommendations



Applications to Utility Industry

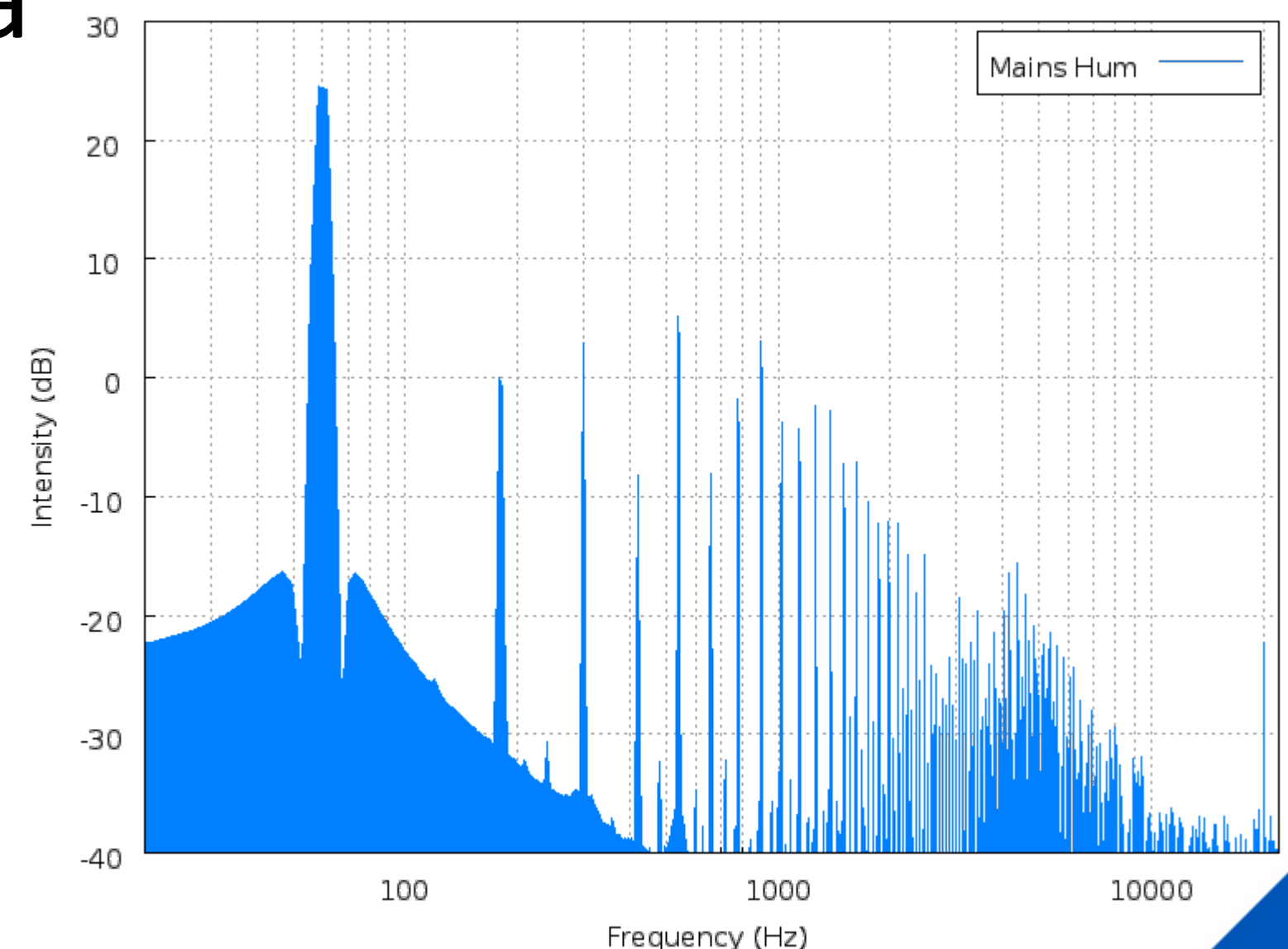
- Machine Vision
 - Identify malfunctioning equipment
 - Identify contamination
 - Inspect vendor quality



Applications to Utility Industry

- Acoustic Analysis

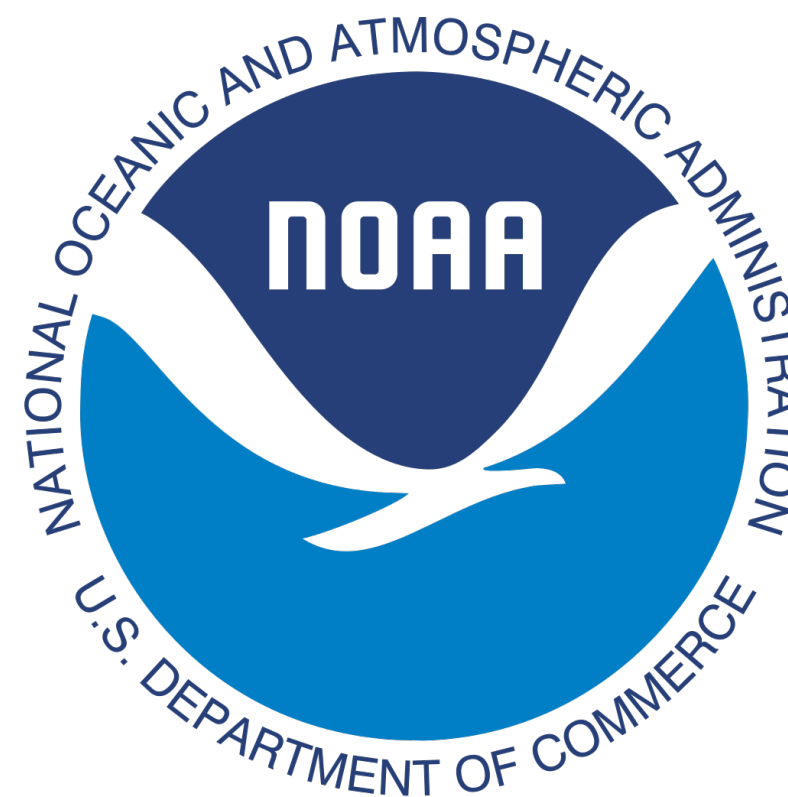
- Collect samples of baseline transformer hum
- Collect samples of malfunctioning equipment
 - Internal Assets
 - Manufacturer test data
- Create analysis engine
- Predict maintenance



Applications to Utility Industry

- Big Data

- Aggregate and analyze numerous data sets
- Combine variables to make informed predictions
 - Weather Data
 - Vegetation, Wildlife & Forestry Data
 - Seismic Data
 - Air Quality Data

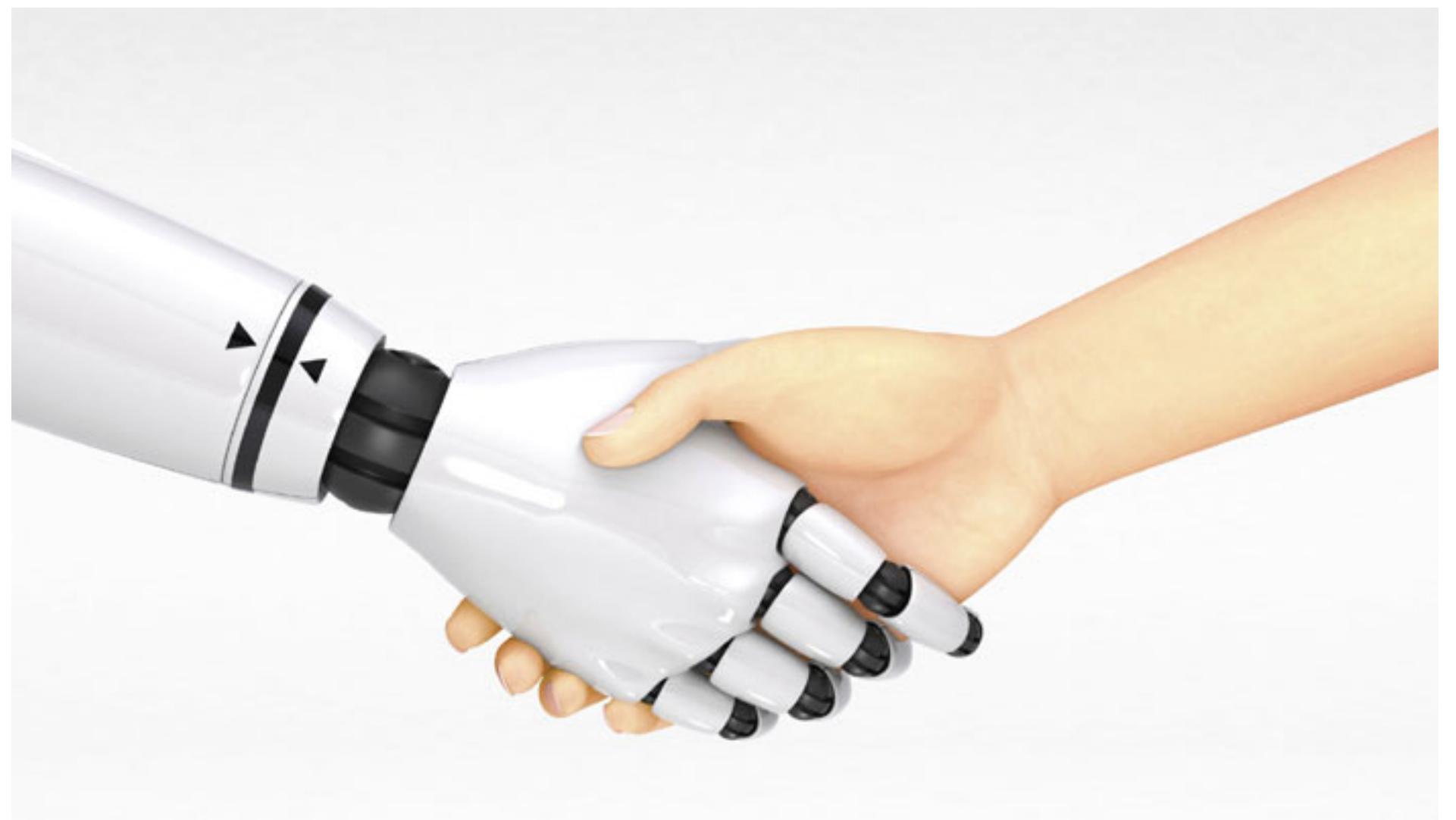


Applications to Utility Industry

- Benefits of Digital Assistants and Combined Data
 - Assist utilities in the shortfall of experienced workers
 - Predictive maintenance and replacement
 - Estimated time-to-failure
 - Early warning and safety
 - Refinement and learning with incoming data
 - Broader experience than a single person
 - Availability and immediate assistance in field

Time to Act

- Consider pilot programs
- Purchase or develop off-the-shelf voice recognition application
- Tailor application to specific company needs
- Collect images, sounds, data to create training and testing data sets
- Refine & Repeat

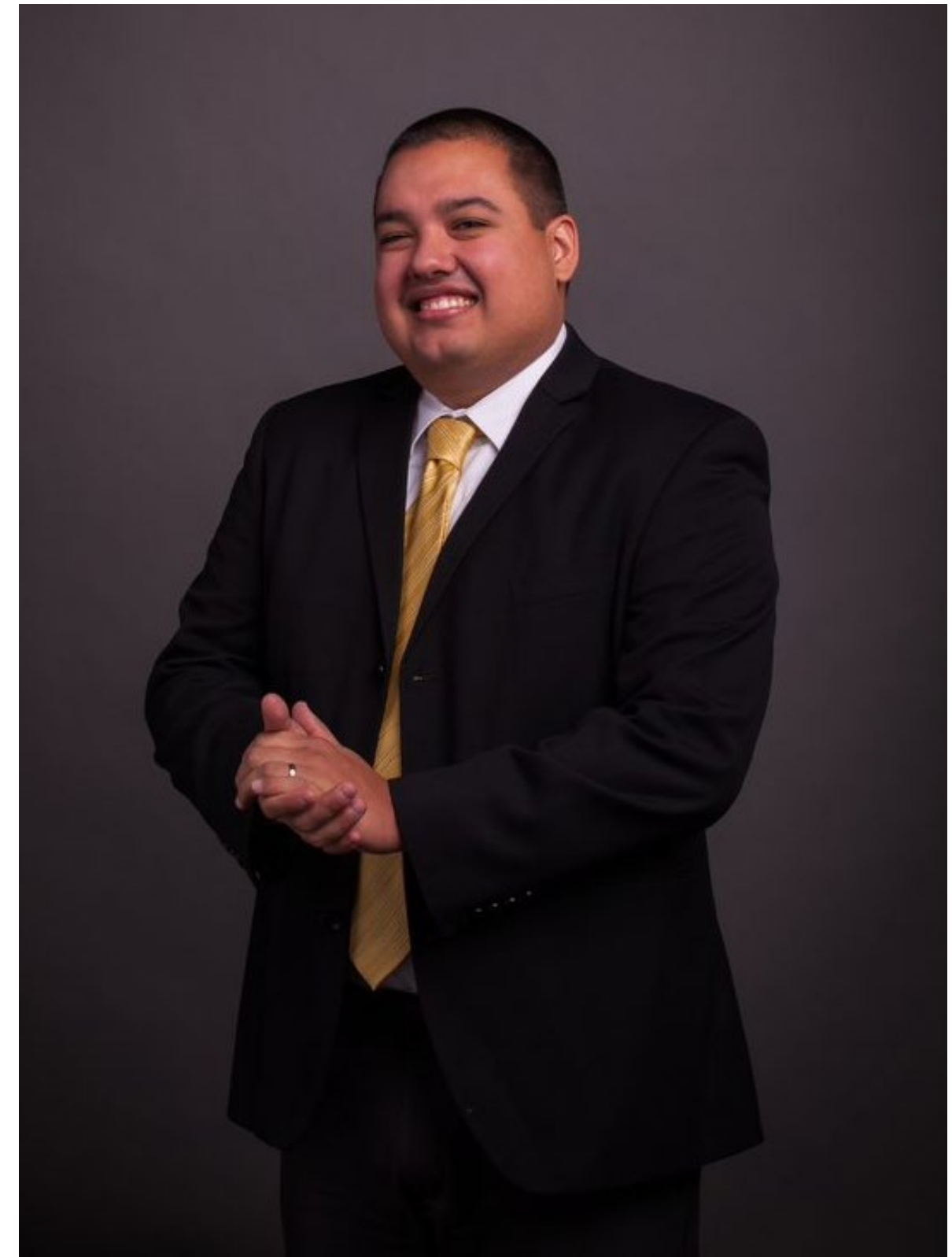


Comments or Questions ?



Kyle Lundeen, PE
krlundeen@burnsmcd.com

Thank you!



Daniel Sierra, PE
dsierra@burnsmcd.com