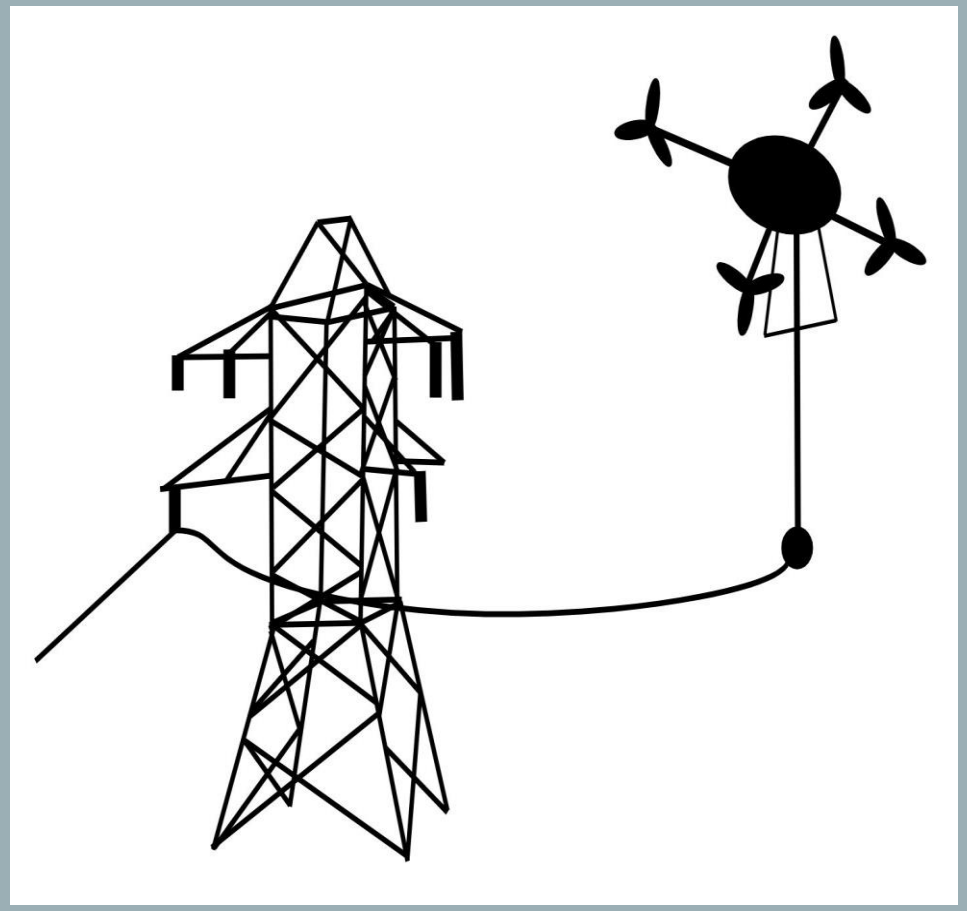

ARTIFICIAL INTELLIGENCE AND UNMANNED AERIAL VEHICLE APPLICATIONS ON ELECTRICAL POWER SYSTEMS

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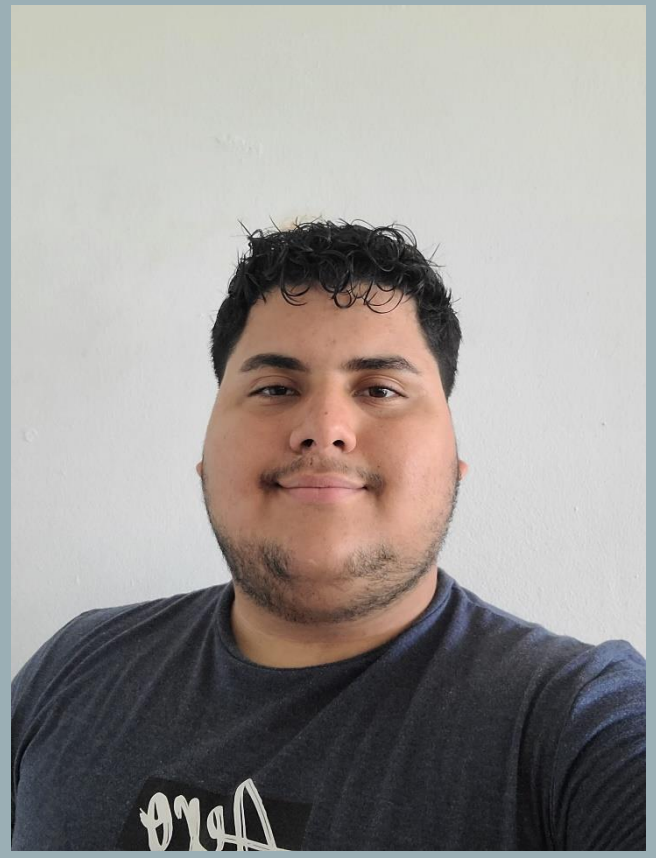
ABOUT ME



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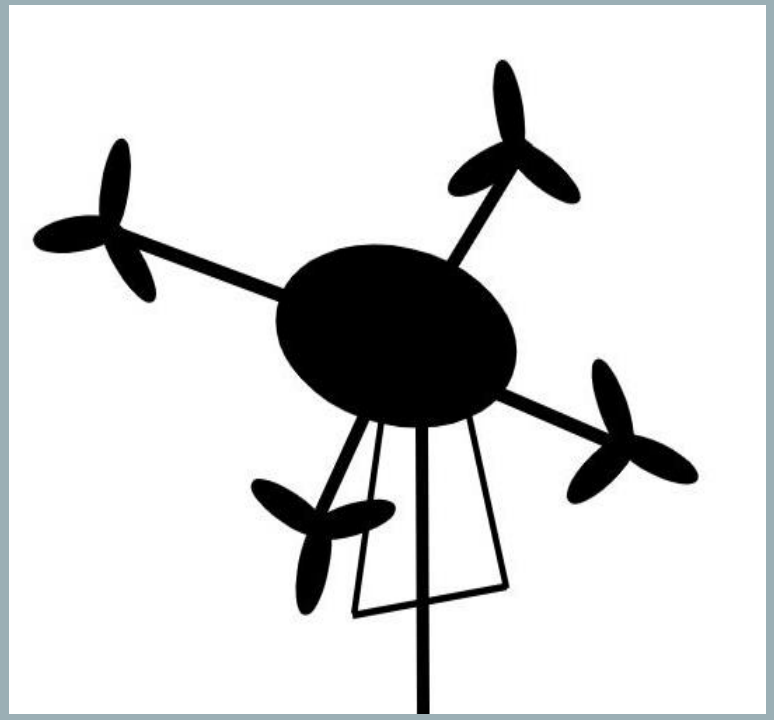
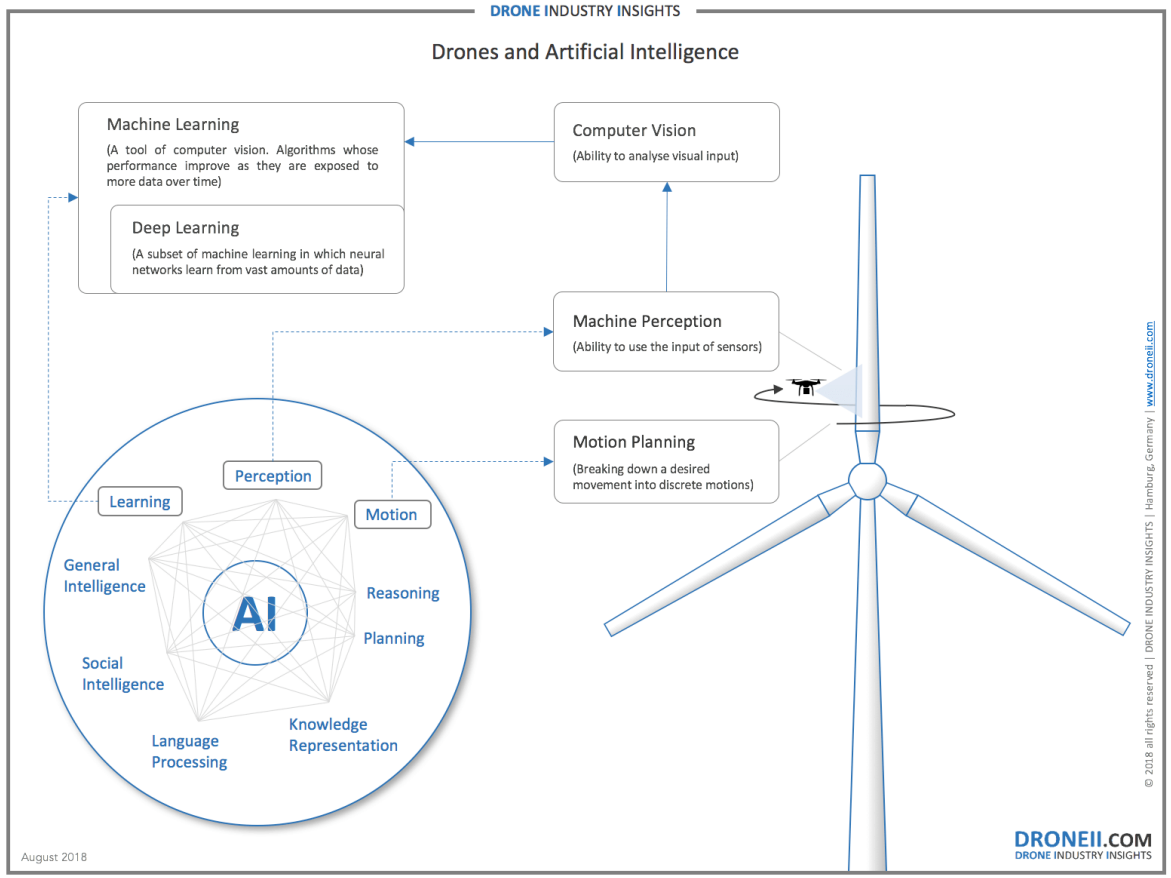
IMPORTANT POINTS



- AI and unmanned aerial vehicles (UAV)
- Thermal Imaging
- Power line infrasctructure inspection
- Corona discharge
- General Use of UAVs
- UAV inspection on hurricane Fiona in Puerto Rico.
- UAVs link to Reasearch and Education



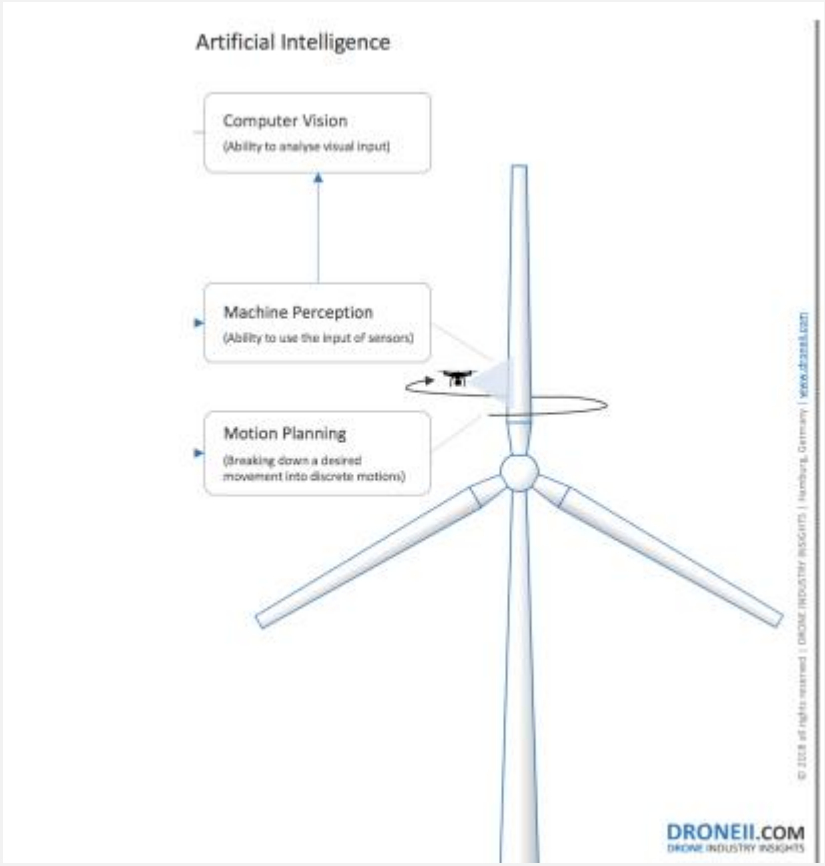
UAV AND AI

- PATTERN RECOGNITION
- COMPUTER VISSION
- MACHINE LEARNING
- IDENTIFY SPOTS
- EVALUATE SYSTEMS
- SENSING AND PERCEPTION

AI

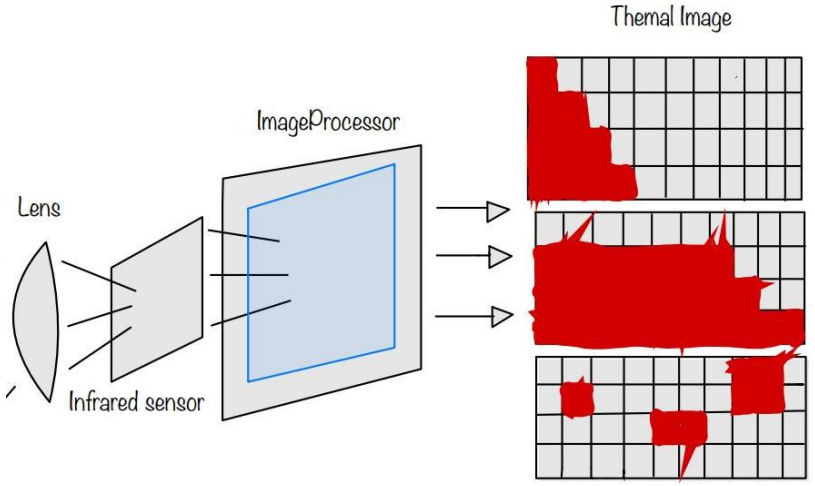
- Artificial Intelligence (AI) uses computer and technology systems to perform, and process tasks like humans do. Inspection is a very visual task that professionals do.

- AI tools such as tools used in AI to interpret the visual world and learn from it. UAVs can do various tasks independently with the help of computer vision to diagnose any visible abnormality in the electrical power systems. Electrical power systems can have broken components, incorrect placements of parts, and fires. These things can be caught by computer vision programs that recognize when something abnormal occurs in electrical systems.



THERMAL IMAGING

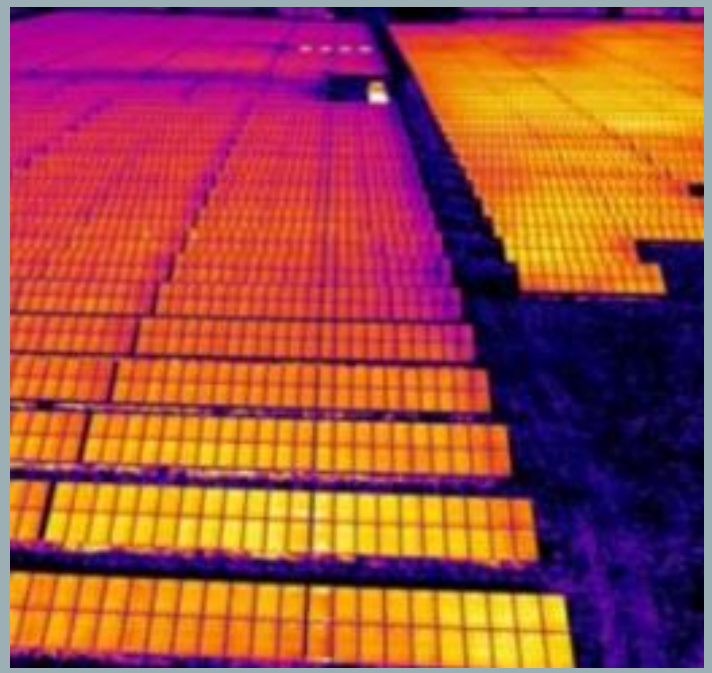
- SENSORS TO DETECT HEAT ENERGY
- SENSORS ARE CALLED INFRARED
- IMAGE IS PROCCES BY A COMPUTER
- IMAGE IS THEN CONSTRUCTED
- LASTLY INTERPRETED BY THE USER



HOT SPOTS

- Electrical “hot spots” are these hot temperature surpluss that ocurr when there is a presence of imbalance.
- Hot spots can be overheated transformers discharges in transmision lines, and others.
- Drones can fly over large areas in power systems to identify these “hot spots”.
- UAVs can autonomously drive and detect this hotspot.

THERMAL ANALYSIS



- The detection of temperature by a UAV can show the state of an electrical line, implementing machine learning programs to the drone can be use to autonomously detect heating problems in electrical systems.
- This job can also help with the operation and the maintenance personnel to correct defects on time. Thermal imaging is also useful to inspect solar panels. The same monitoring can be done by the use of a drone to go around solar panels and see if they are working properly

ELECTRICAN IMBALANCES DETECTION

- Electrical inbalances radiate heat.
- This heat can then be procces into an image for detection via UAVs.
- All sorts of components in electrical power systems can dissipate energy, and when components have inbalances this heat turn into fire.
- Transformers carry liquid oil to prevent this to fail or worst explode it is good practice to inspect them, and one excellent way to do it is by UAV.

POWER LINE AND INFRASTRUCTURE INSPECTION

- Power lines go around the whole union, referring to the United States of America. On average, U.S. utilities spend between 6 billion to 8 billion dollars annually to inspect and maintain their power lines with helicopters and ground crews.
- This high cost is due to its long distance, the remote location of their power lines and power plants, and the problematic/dangerous task of inspecting high voltage transmission lines. Adding UAVs to the electrical generation industry is a game changer, from their cost to lowering its difficulty, risk, and frequency of inspections.

CORONA DISCHARGE

- Corona discharges are an everyday activity in power lines. Corona discharge is a luminous partial discharge from conductors and insulators due to ionization of the air, where the electrical field exceeds a critical value.
- Due to its invisibility in daylight with the naked eye, it can be detected with a corona camera in the suspected areas. Corona discharges emit very little heat; therefore, they cannot be seen with Infra-Red cameras. One of the corona cameras is the DayCor(R) micROM HD Camera.
- Image processing with computer vision tools and with artificial intelligence can be helpful to implement this for visualizing corona discharge.

UAV ON DOCUMENTING THE EFFECTS OF HURRICANE FIONA

- On September 18, 2022, in the early morning, Hurricane Fiona struck the island of Puerto Rico with winds of around 70 miles per hour and bursts of about 95 miles per hour. It was not the winds that caused the impact but the significant amount of rain the island experienced
- The electrical power system was critically affected. The use of UAVs could be an effective way to inspect electrical lines. Damages to the electrical power system were inspected via UAVs

THE USE OF UAVS AS A LINK BETWEEN RESEARCH AND EDUCATION

- The University of Puerto Rico at Mayaguez has a unique ¨ research activity thanks to the Consortium of Hybrid Electric Systems (CHRES) on the use of unmanned vehicles for energy applications, including the inspection of critical infrastructure like electric power systems.
- The area of research is excellent for any innovation and noble solutions. Research in the area of power systems could be done much faster when doing evaluations and observations. An easy-to-view is much better than going by land to see the power system from the ground. Without a UAV, observations will have to be done in the area on foot. A UAV could take data via computer vision to do all sorts of research in power systems

IEEE PES POSTER PRESENTATION

- On July 17, I had the opportunity to present the poster of the research paper in order to be published in the IEEE. Next steps for this investigation is to make a prototype and further investigation on this subjects.


QUESTIONS?