IoT Applications with Common Distributed Architecture for Data Acquisition

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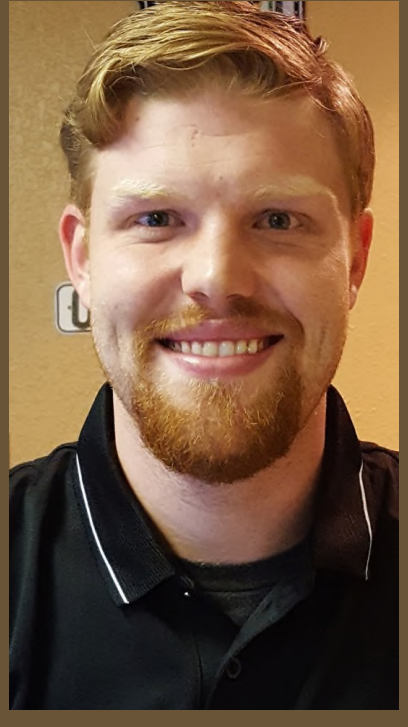
Kevin Seets



Kevin Seets is currently an undergraduate student at Texas State University. He is in his junior year as an electrical engineering major with a focus on networks and communications. Prior to attending university, he was an industrial boiler control technician who worked on projects throughout the United States.

Purpose

Review applications of Coordinated IoT For Data Acquisition (CIDAQ) architecture through:

- Usefulness in active shooter training and other first-responder related applications
- Examples of projects currently implementing CIDAQ architecture
- Machine Learning and Artificial Intelligence (ML/AI) algorithms being used in conjunction with CIDAQ Architecture
- Market Data
- Smart Grid Technologies

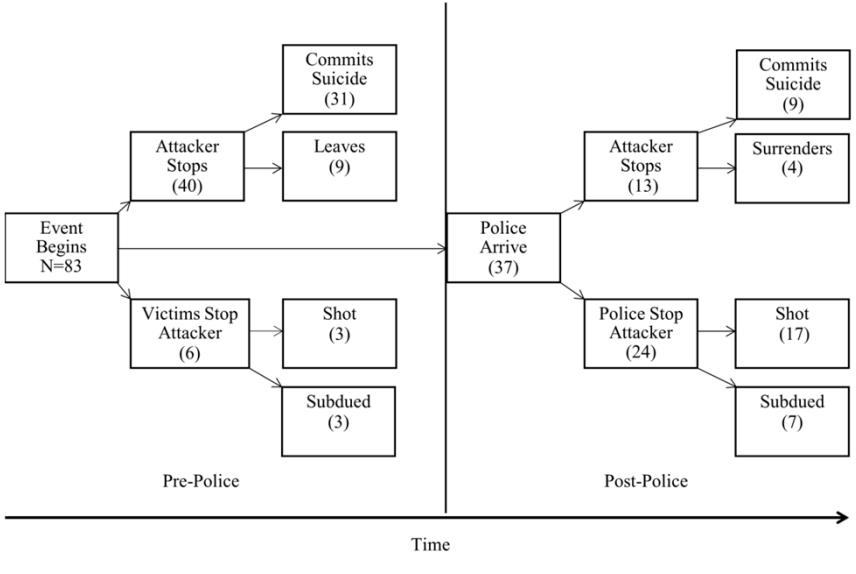
Active Shooter Training

Problem:

- Police intervention shows to increase number of victims shot [1]
- Current training is time consuming and expensive

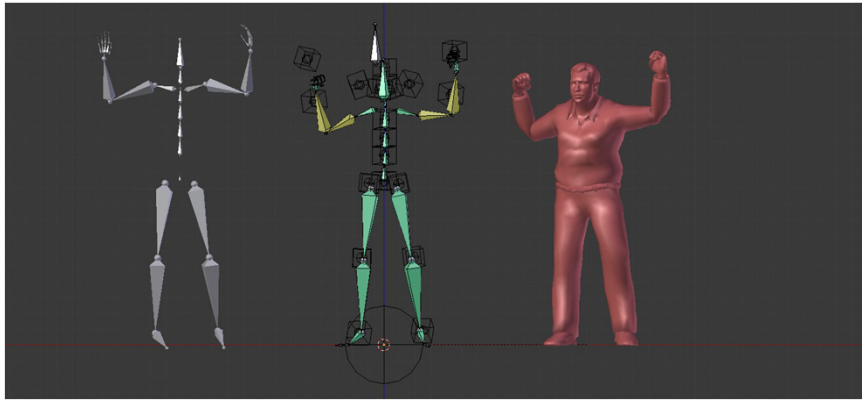
Potential Solution:

- Inertial Measurement Unit (IMU) IoT devices for movement tracking
- Virtual training would be less expensive and more available



[1] M. H. Martaindale, W. L. Sandel, and J. P. Blair, “Active-shooter events in the workplace: Findings and policy implications,” J. Bus. Contin. Emer. Plan., vol. 11, no. 1, p. 6–20, 2017.

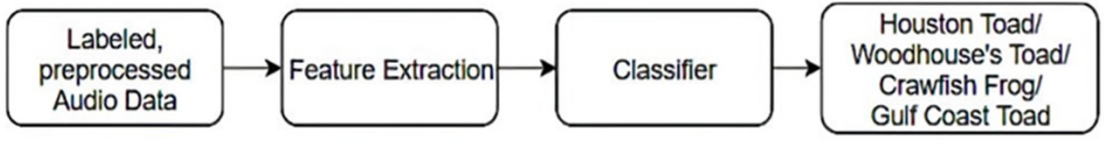
First Responders



- Need for comprehensive disaster training
- Simulated and virtual training expansion
- Ops-Plus, HYDRA, ADMS

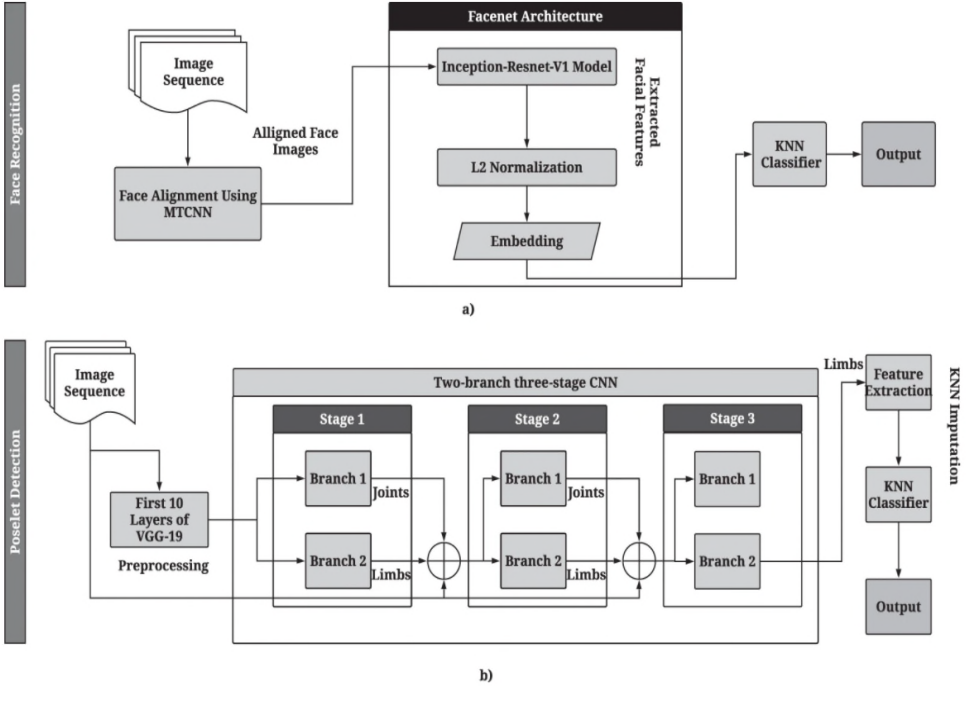
More Applications

- Remote monitoring of heat trace cables used in industrial applications
- Patient monitoring in hospitals
- Detection and monitoring of the endangered Houston Toad and Craw Frog



CIDAQ with ML/AI

- Properly trained ML/AI leads to stronger, more attainable data sets
- Most IoT applications that leverage ML/AI implement a CIDAQ architecture
- Deep learning algorithms due to large data sets



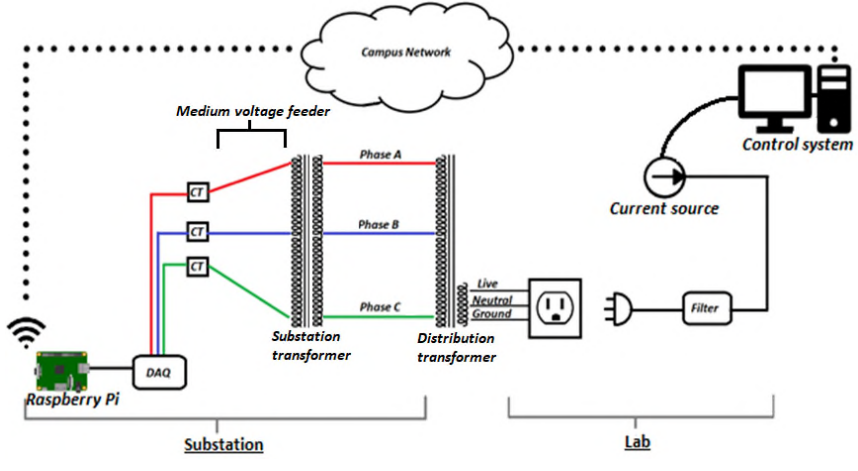
Market Data

- Hundreds of IoT start-ups as well as several Global 500 companies offering myriad applications [2]
- Individual applications
- ‘Full-Package’ solutions
- IoT data-as-a-service
- Fleet management

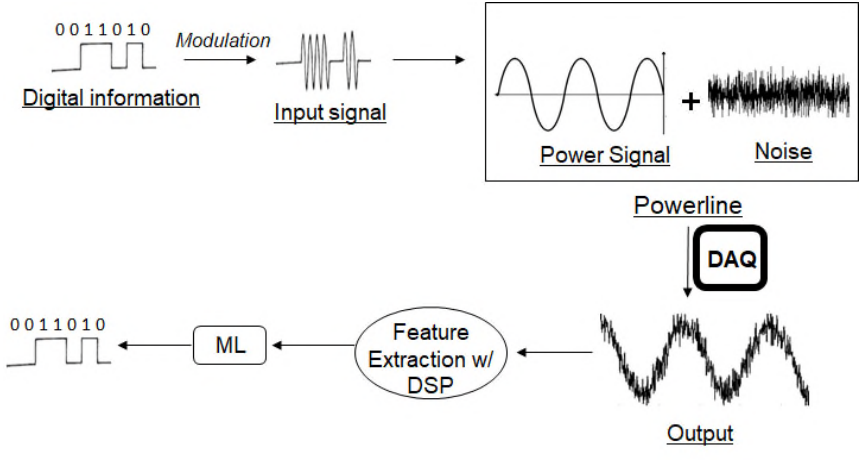
[2] 5 top wireless sensor solutions impacting the telecom sector. 30-March-2021. [Online]. Available: https://www.startus-insights.com/innovatorsguide/ 5-top-wireless-sensor-solutions-impac ting-the-telecom-sector/

Electrical Distribution Grid

- Grid is not designed for the burden of two-way power flow
- Need for “smart grid”
- Treat the grid as communication medium
- Low frequency band, 150 Hz-1350 Hz



Communicating on the Grid



- Noisy grid requires ML implementation
- Could also assess state of the grid

In Conclusion

- CIDAQ Architecture has myriad applications
- Implements ML/AI
- Gaining in popularity on the market
- Could become an integral part of the electrical grid

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Thank you for your time!

Questions?

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https://youtu.be/SSrxdYV1jOo