

## CapStone Project

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### **Paper 1: Altalk: a tutorial to implement AI as IoT devices (IET Networks Research Article)**

- The novel idea of Altalk is to treat the machine learning mechanism as a cyber IoT device.
- Traditional AI-based IoT applications tightly integrate the AI mechanism within the network applications and this needs a significant coding effort.
- The advantage of this approach is that we can decompose a complex AI application into simplified distributed modules connected by using the IoT technology, and therefore the AI solution can be built more effectively.
- Also, in our approach, data can be easily processed in real time for an AI application. (Solves our problem to have real-time data as we had discussed in our first meet)
- Altalk that a developer to easily add the AI mechanism to the existing IoT applications through a graphical user interface (GUI).
- Altalk addresses several issues including how to connect the sensors, how to control the actuators, how to use the machine learning algorithm, how to train the models, how to validate accuracy, precision and recall of the model, and how to adjust the setting.
- Building a machine learning based IoT Application: Our approach integrates an IoT device management platform called IoTtalk with the Python opensource tool called scikit-learn.
- IoTalk is inherited from Altalk.
- Result: The study showed prediction accuracy of 94.68%. (using zero pattern adjustment model)
- Supervised machine learning naturally fits the IoT applications, where the sensors provide the features to the AI algorithms, and the remote controllers serve as the labels
- To support real-time computation of an AI application, the authors show that the overhead of the IoT communication in Altalk is <30 ms.

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### **Paper 2: IOT AND AI IN HEALTHCARE: A SYSTEMATIC LITERATURE REVIEW**

[https://doi.org/10.48009/3\\_iis\\_2018\\_33-41](https://doi.org/10.48009/3_iis_2018_33-41) (Issues in Information Systems)

- IoT plays a significant role in collecting and monitoring data, whereas AI is responsible for analysing the growing amounts of data and taking action based on what it learns from the data.
- Research Methodology: uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review.

- Wearables and Connectivity: The capabilities include tracking and monitoring of patients through wearable devices, remote service through telemedicine and remote diagnosis.
  - There is the need for medication administration to become more direct and active through mobile connectivity.
  - Limitation is inherent risks associated with wearables, including hacking of devices and data, lack of clear and concise user agreement and privacy policies, lack of user data protection legislation, which could deter widespread adoption of these devices.
  - Consumer's concerns: include wearables health effects, accuracy and reliability, data collection and storage, and privacy.
  - Detection and Treatment: Today, physicians can diagnose and treat much more diseases than in the past. However, even after years of practice, they can still struggle to make the correct diagnosis efficiently.
  - AI systems can provide additional help to doctors by providing clearer images, highlighting suspicious regions, providing better analysis tools and individualized risk assessments for each patient, which in turn reduce the need for invasive procedures.
  - Develop and test a cost-effective system that combines a digital medical device with a knowledge-based system and can give a general practitioner an expert opinion regarding the potential for heart disease in his patients.
  - Sensor Network: The sensors enable better design and testing phases, which reduce the need to make major changes once the device is launched and results in significant cost savings.
  - Sensor networks can support the development of platforms for patients and caregivers.
  - Patient Care: Future smart hospitals will rely on new integrated technology, an ecosystem of platforms, and staff that is able to use the new technology to re-invent the care process and better serve patient needs.
  - Results: point out that technologies such as IoT and AI can improve healthcare in a variety ways, but that further developments are needed for system accuracy, security, data collection and management, and privacy protection.
  - Future research should focus on large-scale testing of the proposed systems and frameworks in real settings.
  - Future studies should also focus on improving the security and privacy of IoT devices that monitor and store patient data, since the fear of leaked data has been found to be the biggest hurdle for consumer acceptance.
  - Lastly, future studies should investigate technology ecosystems (such as those required for smart hospitals) in different technical, economic, social, and cultural environments.
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