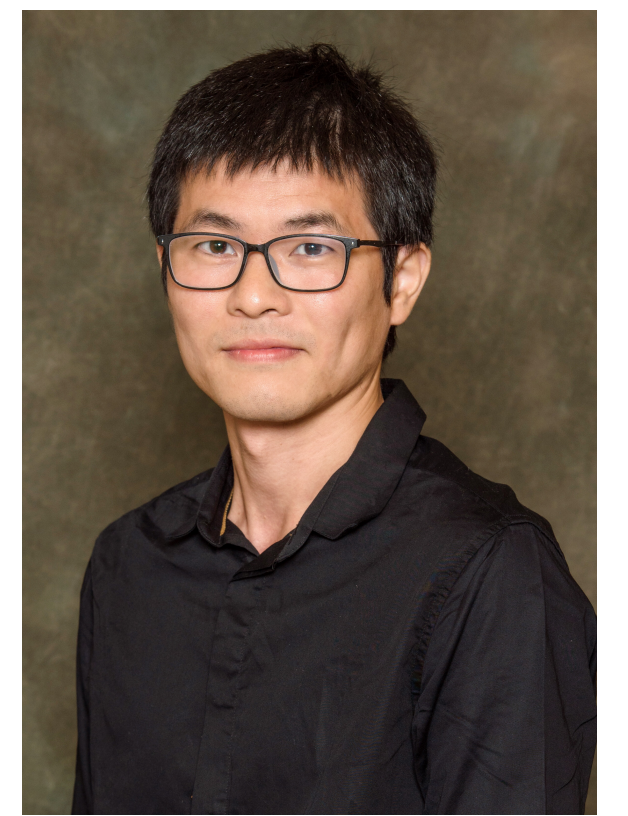


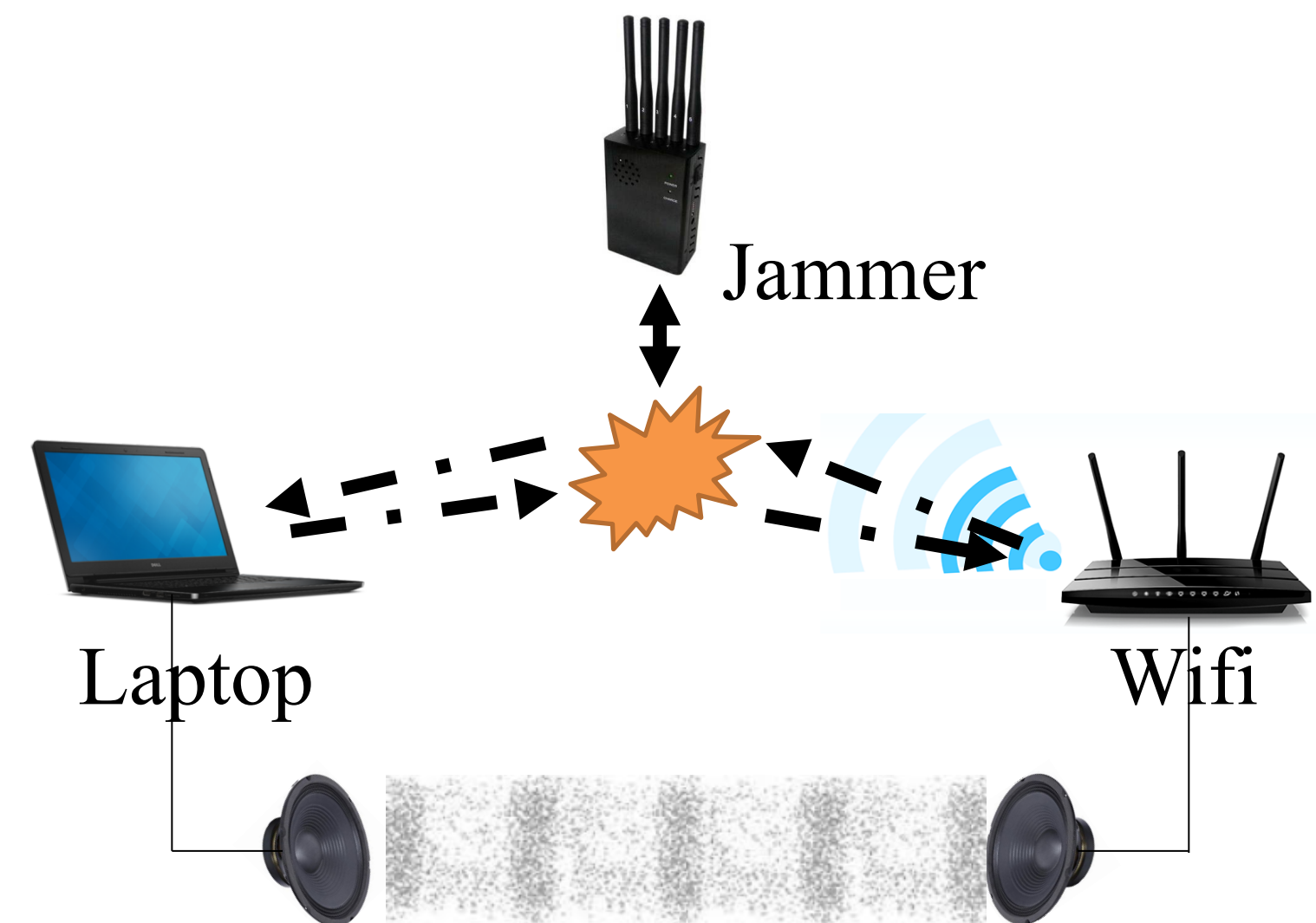
URadio: Towards Secure Smart Home IoT Communication Using Hybrid Ultrasonic-RF Radio



Qiben Yan, Michigan State University

<https://seitlab.github.io/satc2018/>

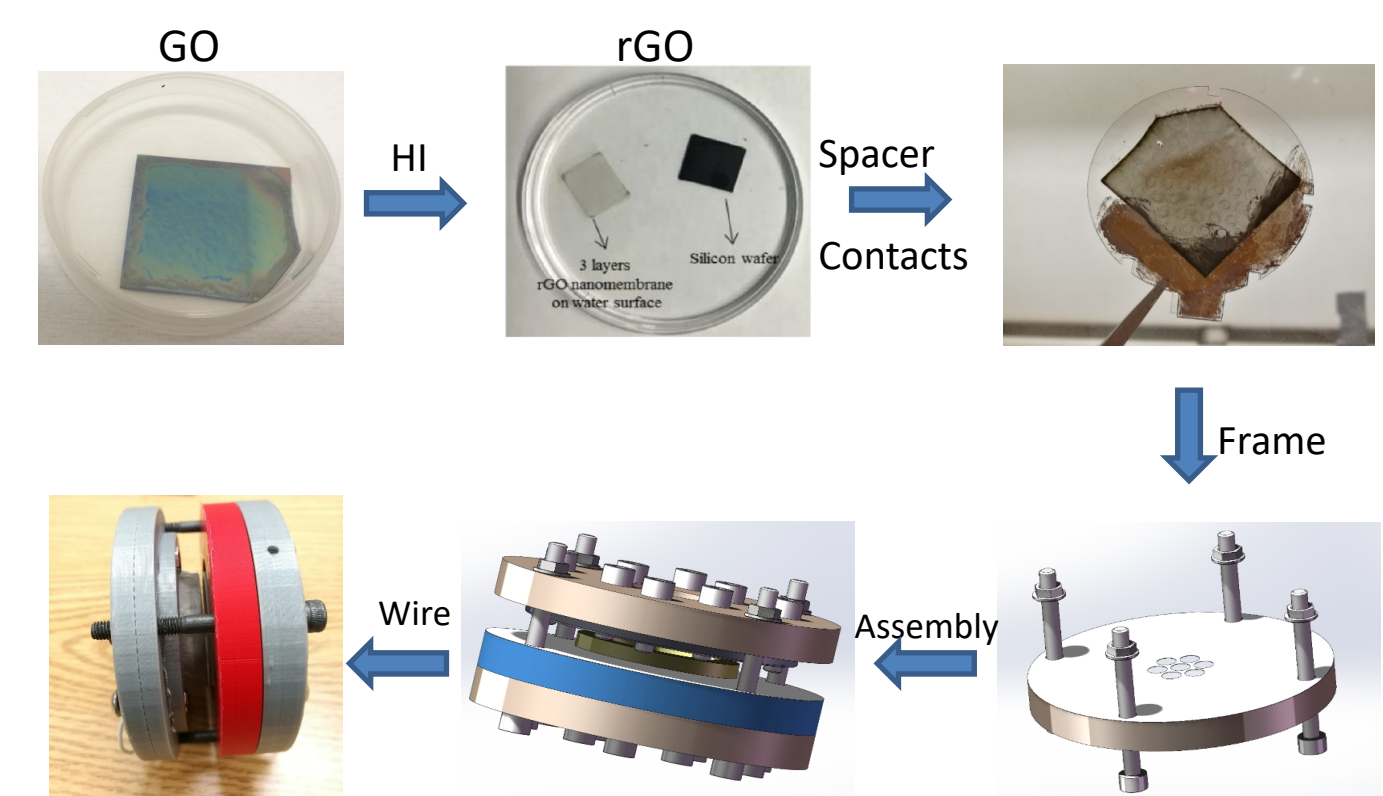
- With the rapid growth of IoT devices, ensuring secure communications in IoT networks becomes a critical yet challenging task.
- Ultrasonic communication system has been widely used in medical equipment, underwater environment, and airborne environment. In future, the ultrasonic communication system can be used in smart homes.



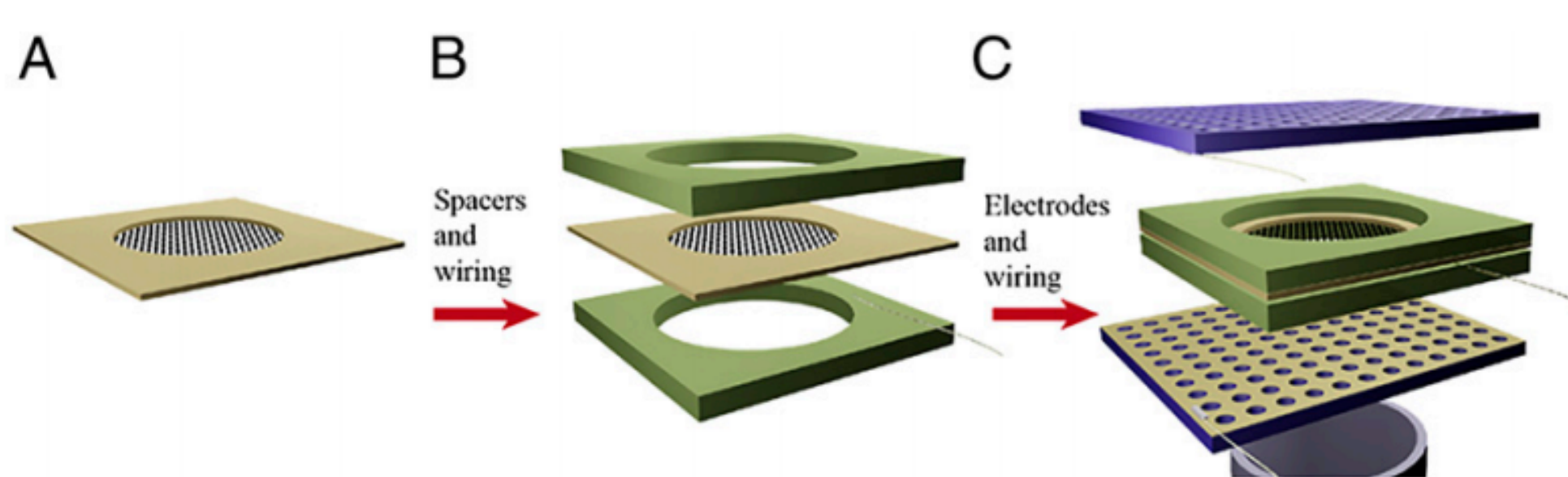
To address these security and privacy challenges in smart home IoT communication:

- We develop a hybrid ultrasonic-RF radio (URadio) using a graphene-based wideband ultrasonic transducer to enable secure IoT communication, and evaluate the solution's performance in different smart home environments;
- We develop intelligent jamming-defense mechanisms and device authentication schemes to ensure communications are conducted in a reliable and trustworthy manner.

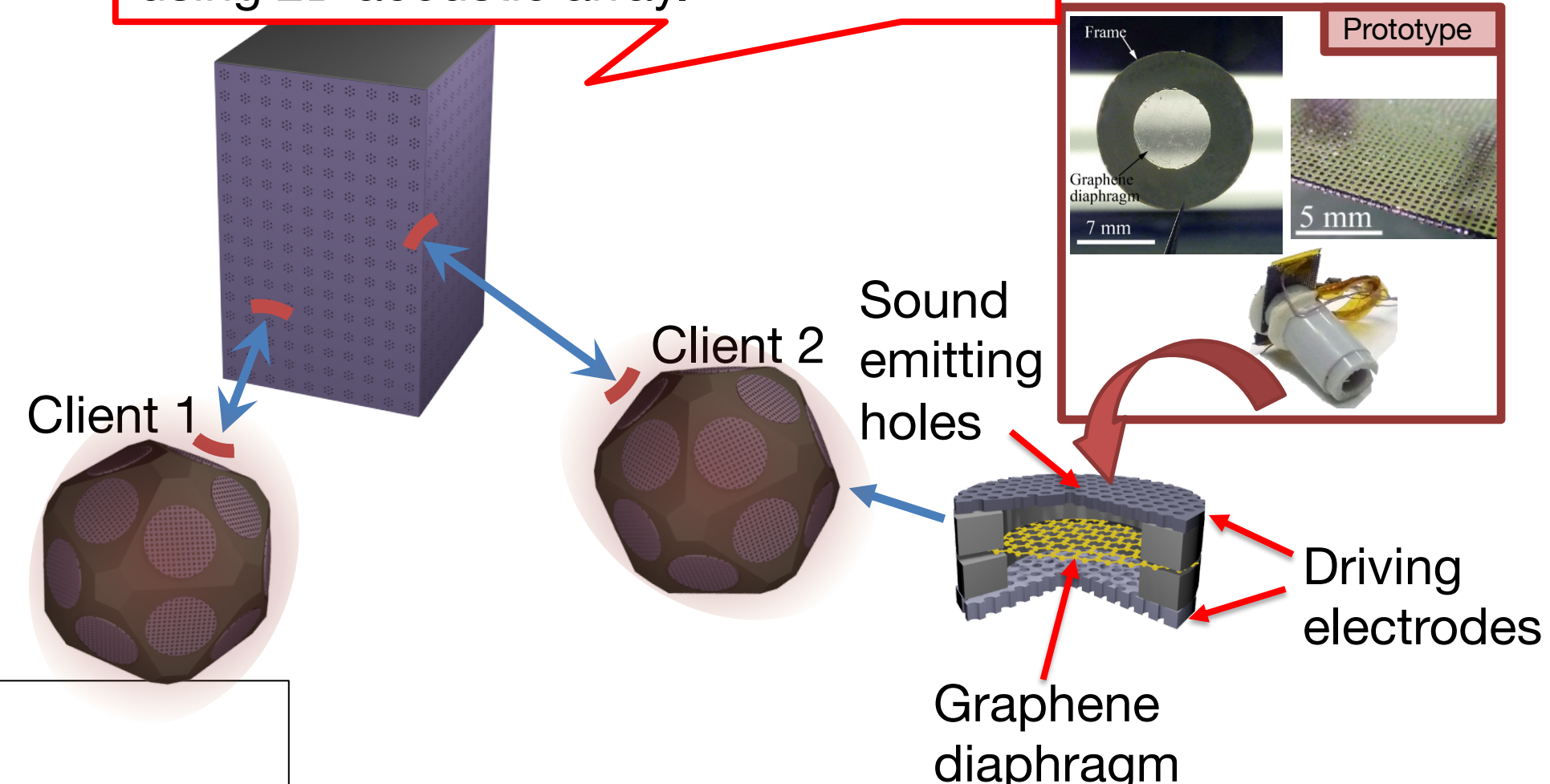
- We develop an ultrasonic secure communication system using a novel graphene-based radio.
- We build an OFDM modulated ultrasonic communication system operating with the ultrasonic transducers.



Ultrasonic Sensor with Graphene-based Membrane



Precise energy delivery to client enabled by *near-field beamforming* using 2D acoustic array.



Potential Applications:

- Earphone, headphone
- Voice authentication
- Wearable devices
- Hearing aid
- Ultrasound scanning
- Medical images
- Health monitoring
- Virtual reality speaker

Education Impacts:

- Mobile and Wireless Security (covers acoustic communication security, and ultrasound signal attacks);
- Wireless Communication Networks (covers acoustic communication networks).

Enhanced smart home security:

- [Safe house: ultrasound tech making smart homes more secure](#)
- [Research tackles smart home security.](#)

