

Improving Exposure Notification: Technology Challenges

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PACT is a collaboration led by the MIT Computer Science and Artificial Intelligence Laboratory (CSAIL), MIT Internet Policy Research Initiative, Massachusetts General Hospital Center for Global Health and MIT Lincoln Laboratory. It includes close collaborators from Boston University, Brown University, Carnegie Mellon University, the MIT Media Lab, the Weizmann Institute and a number of public and private research and development centers. The PACT team is a partnership among cryptographers, physicians, privacy experts, scientists and engineers. PACT's mission is to enhance contact tracing in pandemic response by designing exposure detection functions in personal digital communication devices that have maximal public health utility while preserving privacy.

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IBM Research

Private Automated Exposure Notification “Stack”



Layer 3

**Public Health
Interface**

**User
Interface**

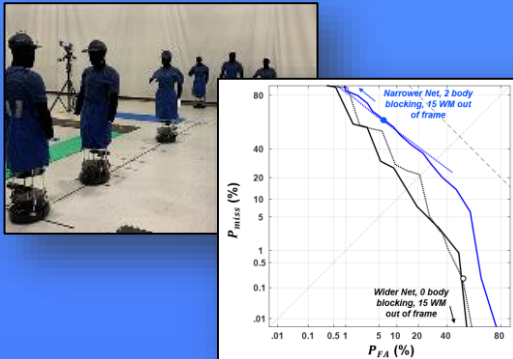
Layer 2

Private Cryptographic Protocol

Layer 1

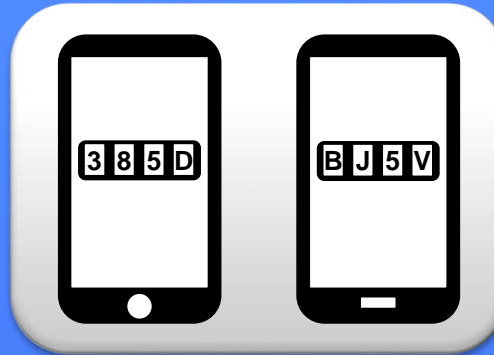
Exposure Estimation

Exposure Estimation (Layer 1)



- Range estimation improvement
 - Bluetooth, Ultra-Wideband, Ultrasound
 - Metadata processing and communication
- Risk estimation improvements
- Data collections
 - Proxemics
 - Mobility

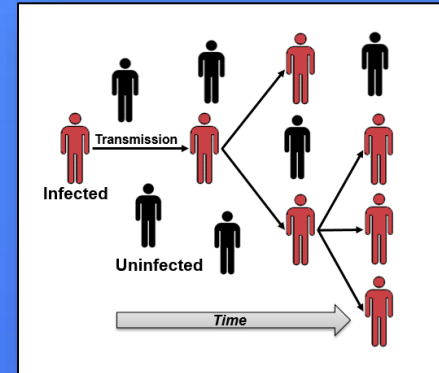
Private Cryptographic Protocol (Layer 2)



- Privacy improvements
 - Better protection against potentially malicious actors
- Advances in private analytics
 - Support for backward contact tracing
 - Improved public health insights on super-spreader events

*Graphic adopted from Robin Marsden (RGM Productions), <https://youtu.be/dsf6nwvxaVo>

Public Health and User Interfaces (Layer 3)



- Reduction of barriers to adoption
 - Focus groups, feedback
 - Inexpensive, compatible wearables
- Modeling, simulation
 - Validation of models against real-world data to help public health specify optimal risk parameters

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- Our colleagues at NIST
- Our colleagues in the academic and public health communities of Arizona, Pennsylvania and Massachusetts



* A partial list of the PACT team members working at MIT and MGH on automatic exposure notification. Many other such teams have been working on AEN worldwide since the beginning of the pandemic.