Privacy-Protecting COVID-19 Exposure Notification Via Cluster Events Without Proximity Detection

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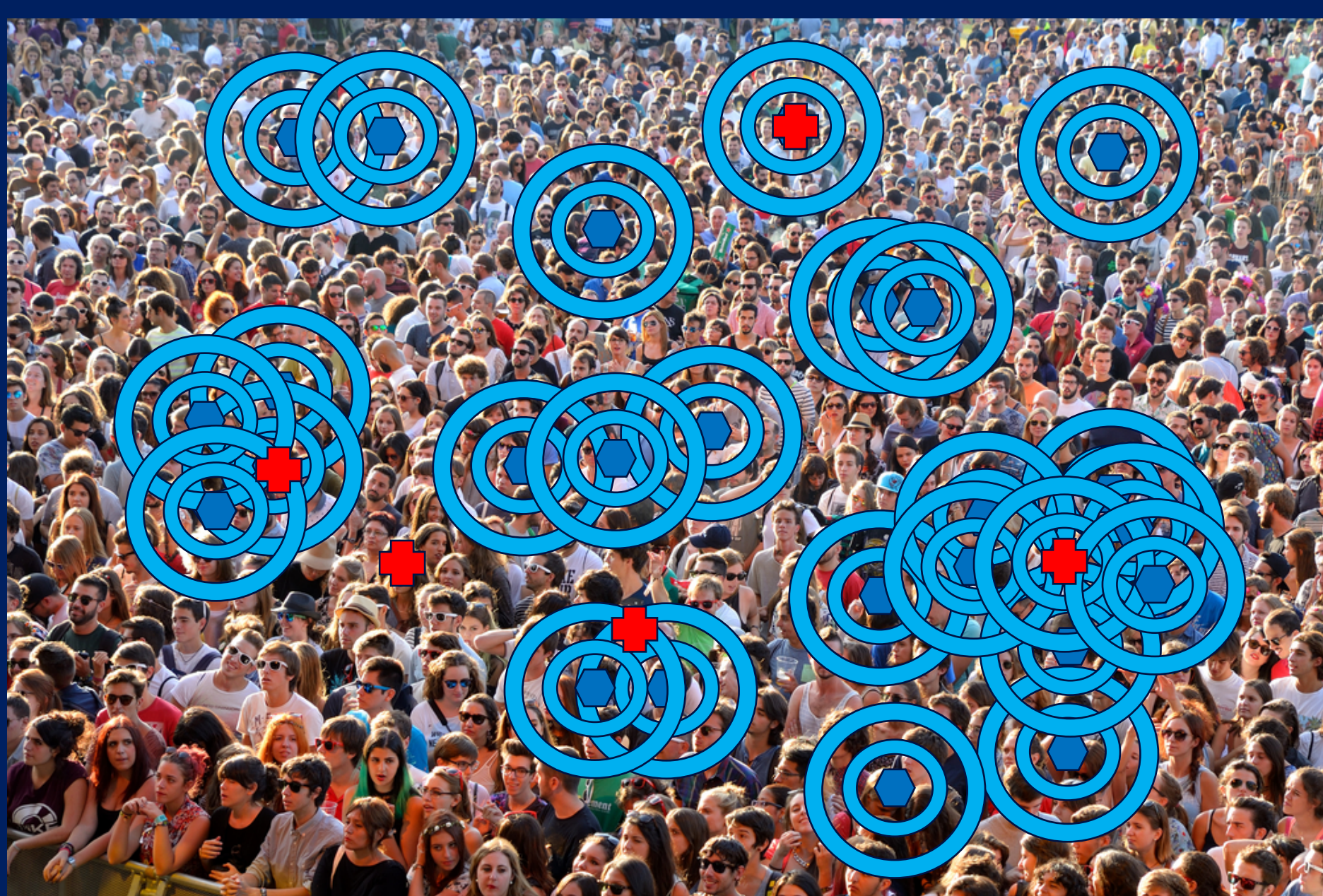U.S. NAVAL RESEARCH LABORATORY

- COVID Testing can be: Expensive And Slow
    - Many new infections before exposed knows to quarantine

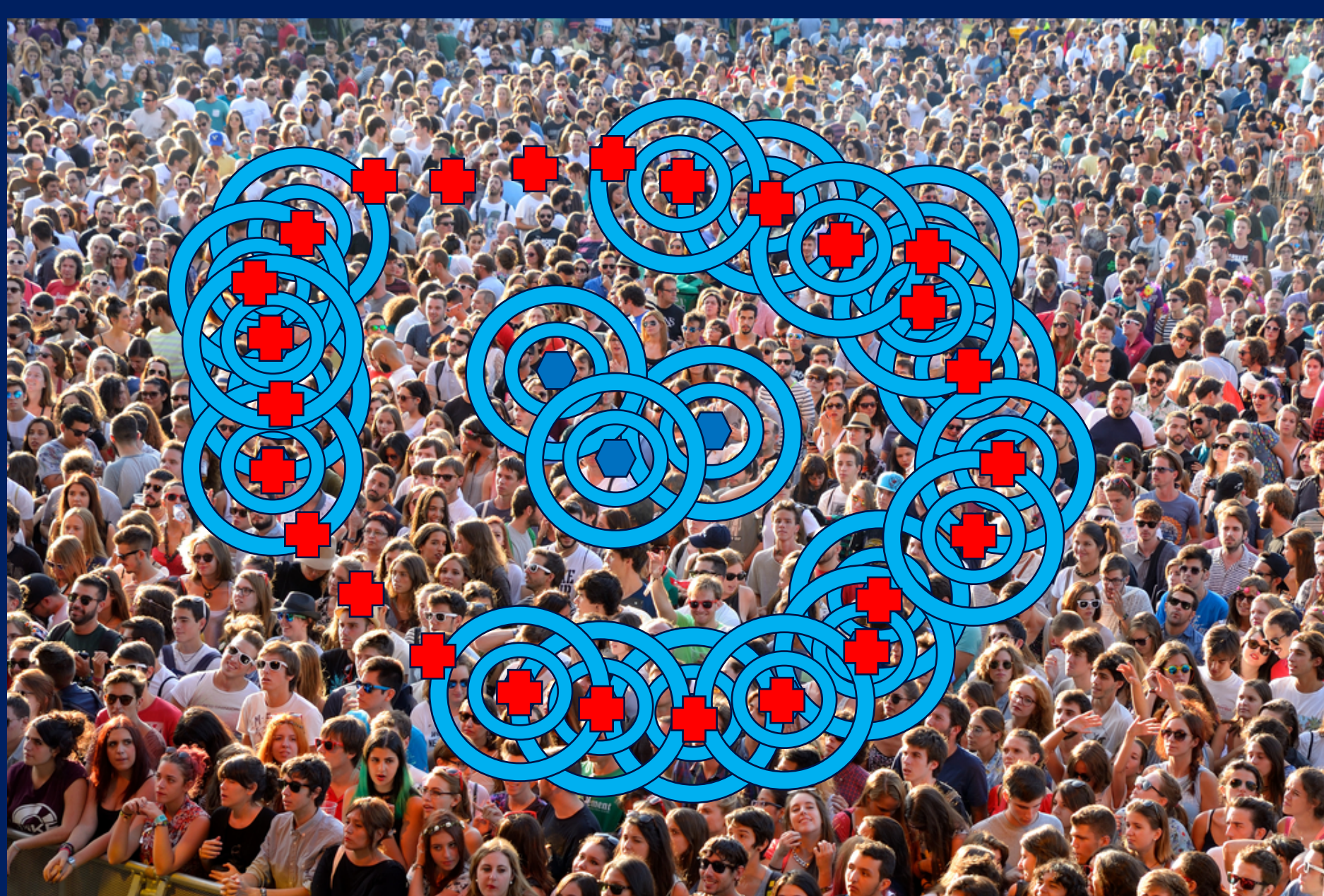✚ Positive: Tested yesterday. Results not in.

Some Problems Motivating This Design

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    - Many new infections before exposed knows to quarantine

- Exposure Notification depends on participation in proximity detection (bluetooth)

    1. Any nonparticipant is never detected/notified/notify-others
    2. Any not-detected participant is never det/notif/notif-others

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✚ Tested Positive

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- False reporting individual can create havoc

  - Johnny has a chem test tomorrow. Reporting a positive result (anonymously) he can close school.

Some Things Leveraged By This Design

- Point-of-care tests dist. through HHS/DoD and WHO
  - Cost about $5, Results in about 15 min
  - 99.7 Million tests allocated in U.S. as of a week ago
  - Sensitivity 97.1%, Specificity 98.5%

- COVID-19 propagates in clusters
  - Vast majority of infected never infect anyone else
  - Most distribution happens when multiple tested-positive individual are copresent with others
  - "In an overdispersed regime, identifying *transmission events* (someone infected someone else) is more important than identifying *infected individuals*." -Tufekci

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4. App pairs these w/ (random $ID_{(i,t)}$, location(random $ID_{(i,t)}$, t))

High level design summary

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6. System clusters pairs from all reporting phones into events with multiple tested-pos individuals are present
   - Indiv. false reports: must actually be at event and cross reporting threshold
   - Clustering may use ancillary info

- Example: Reportable Cluster ancillary criteria
  - Busy city street corner: 4
  - Crowded poorly-ventilated barbershop: 2

  - Unknown location: 3

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7. System pushes events to participant phones/publishes on webpage

8. Participants (and nonpart) locally compare pushed events to local individual history

Questions?

- Work is described in a paper under journal review
- Full disclosure: just a high-level design and discussion
    - No design detail
    - Not implemented
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