

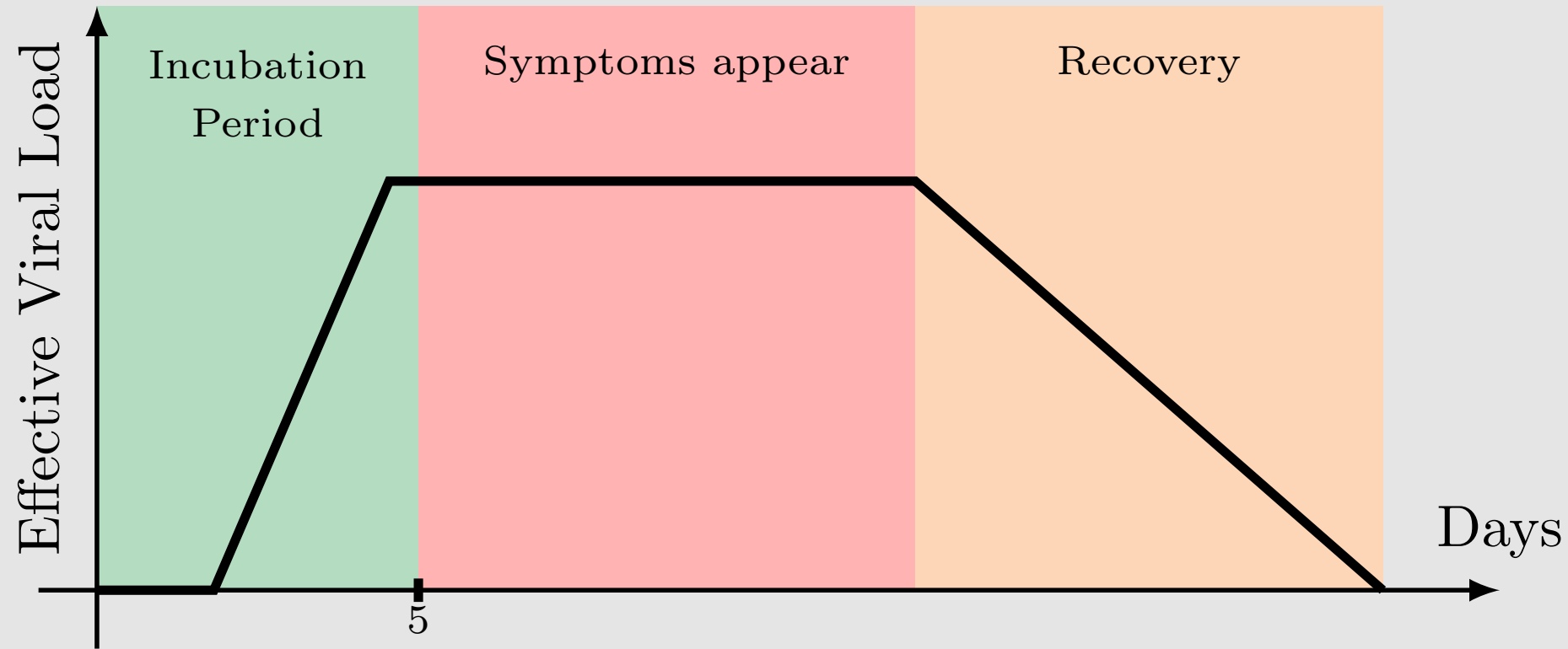
# Developing Effective Contact Tracing Frameworks using Digital Twins and AI

Prateek Gupta

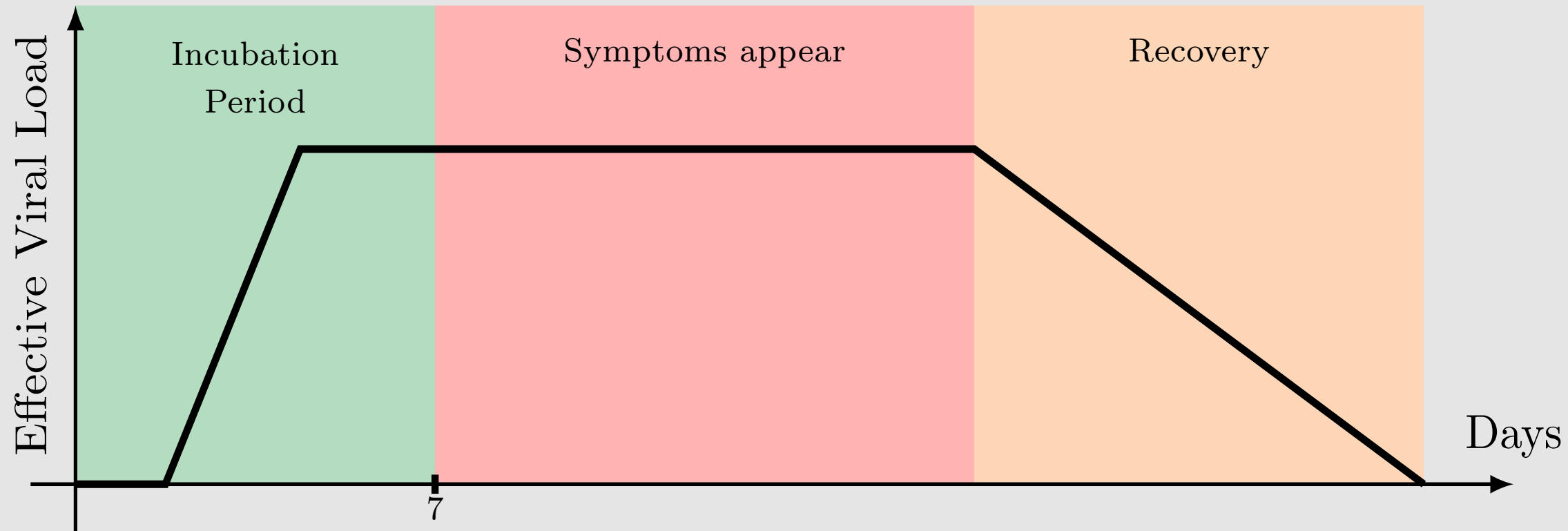
*University of Oxford, The Alan Turing Institute,  
Montréal Institute of Learning Algorithms (Mila)*



# SARS-CoV-2 Viral Load



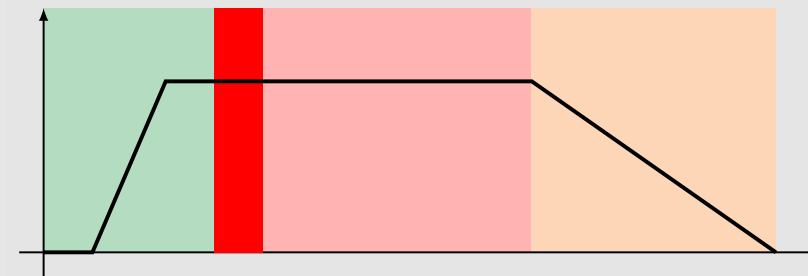
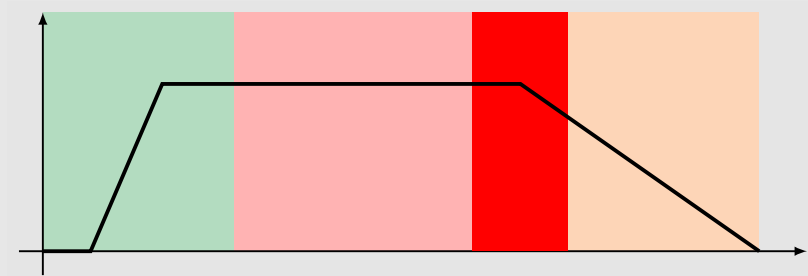
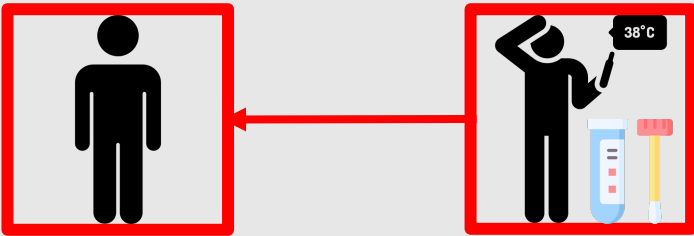
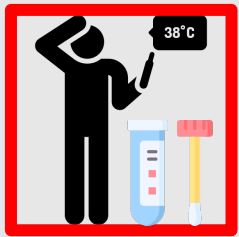
# Worst-case Viral Load



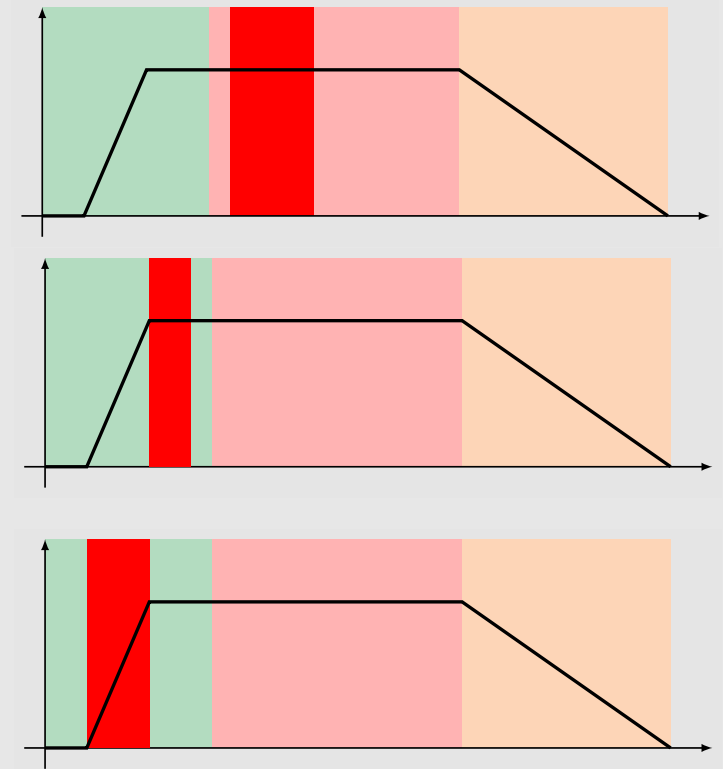
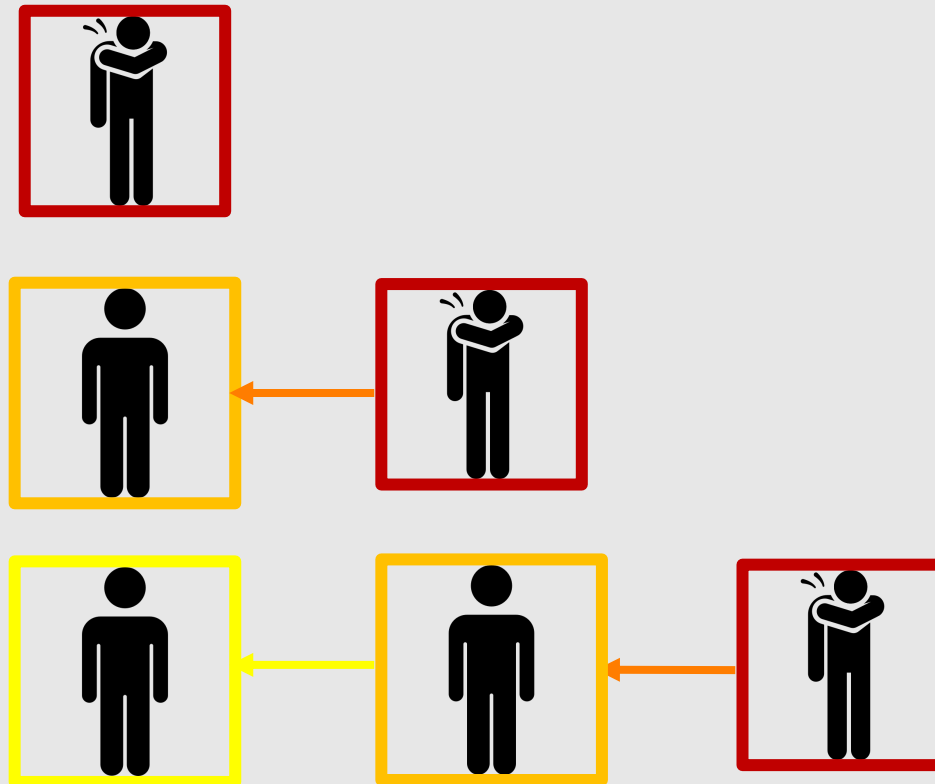
Poor memory recall

Poor user adherence

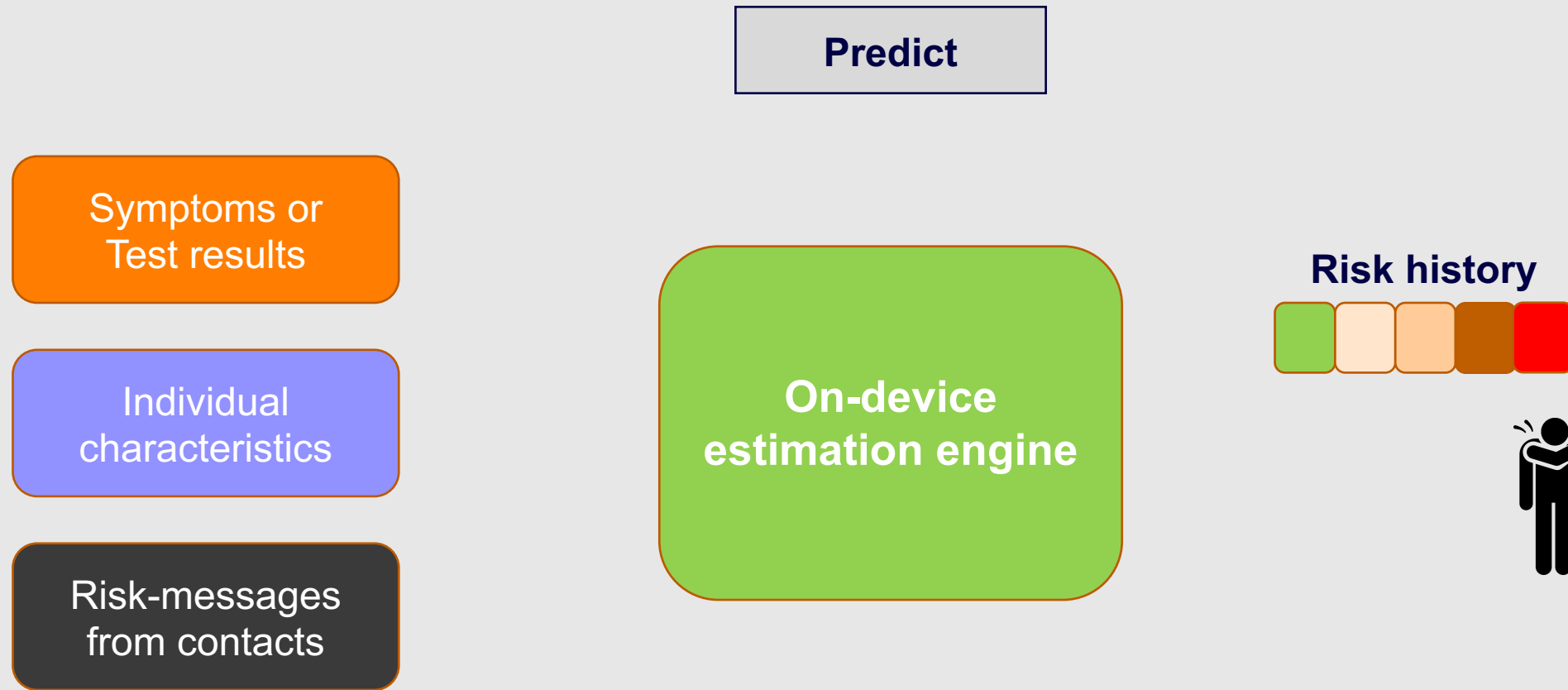
# Current contact tracing frameworks



# Faster signals of infection

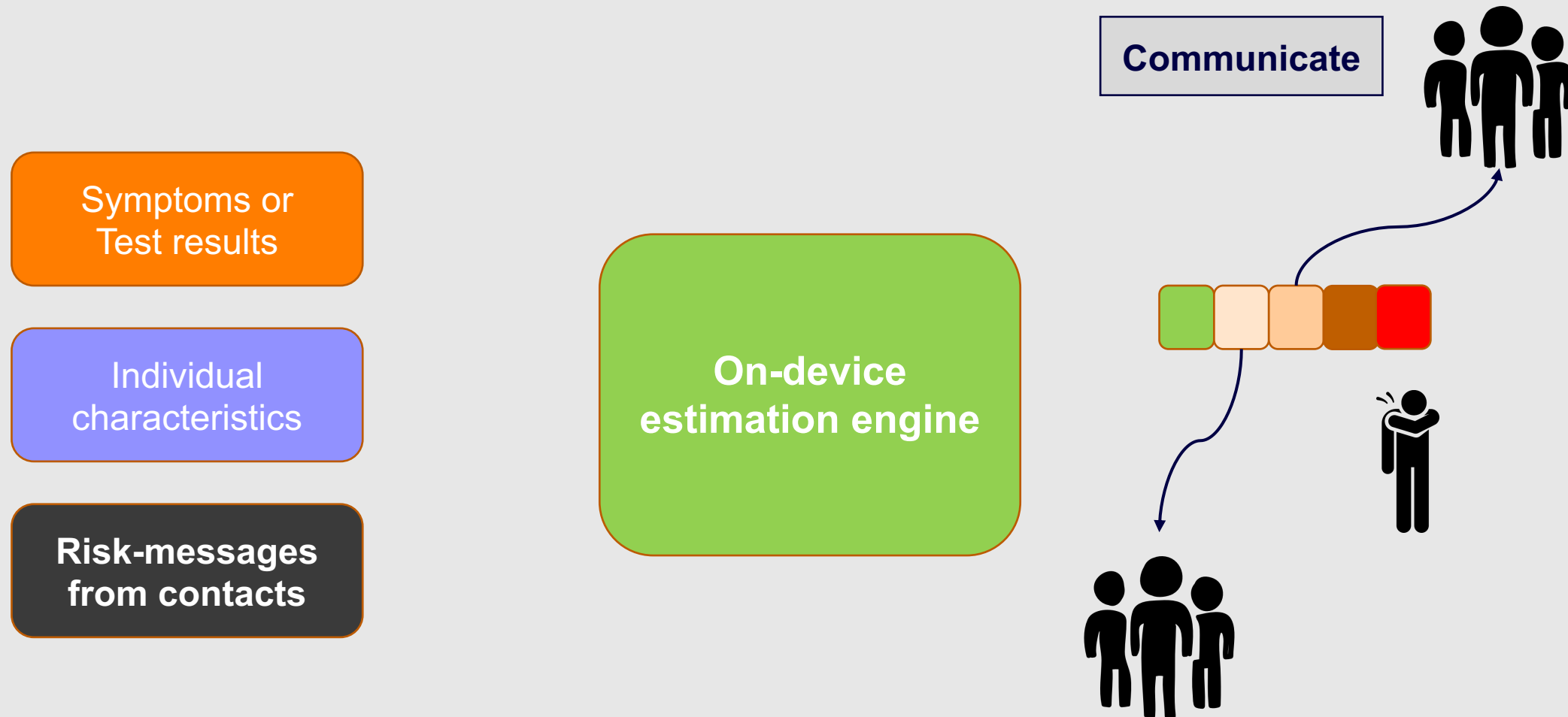


# Proactive Contact Tracing (PCT) Framework



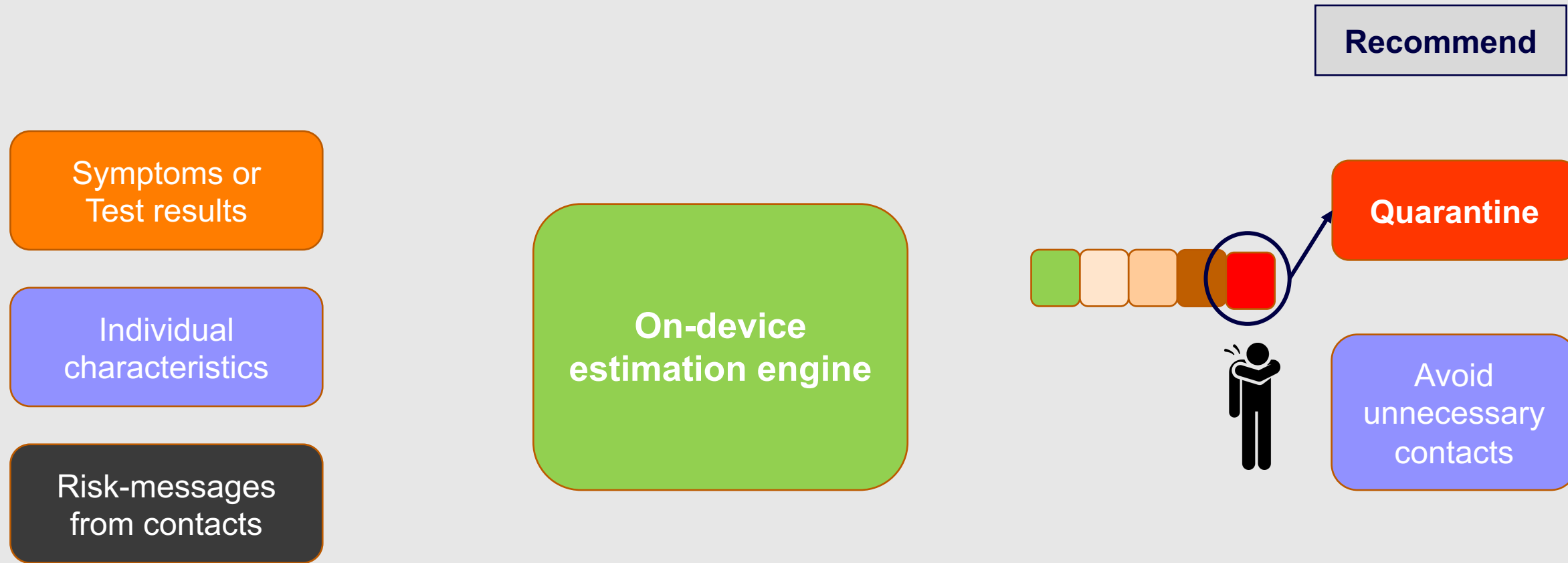
Gupta et al. (2023), Proactive Contact Tracing, PLOS Digital Health

# Proactive Contact Tracing (PCT) Framework



Gupta et al. (2023), Proactive Contact Tracing, PLOS Digital Health

# Proactive Contact Tracing (PCT) Framework

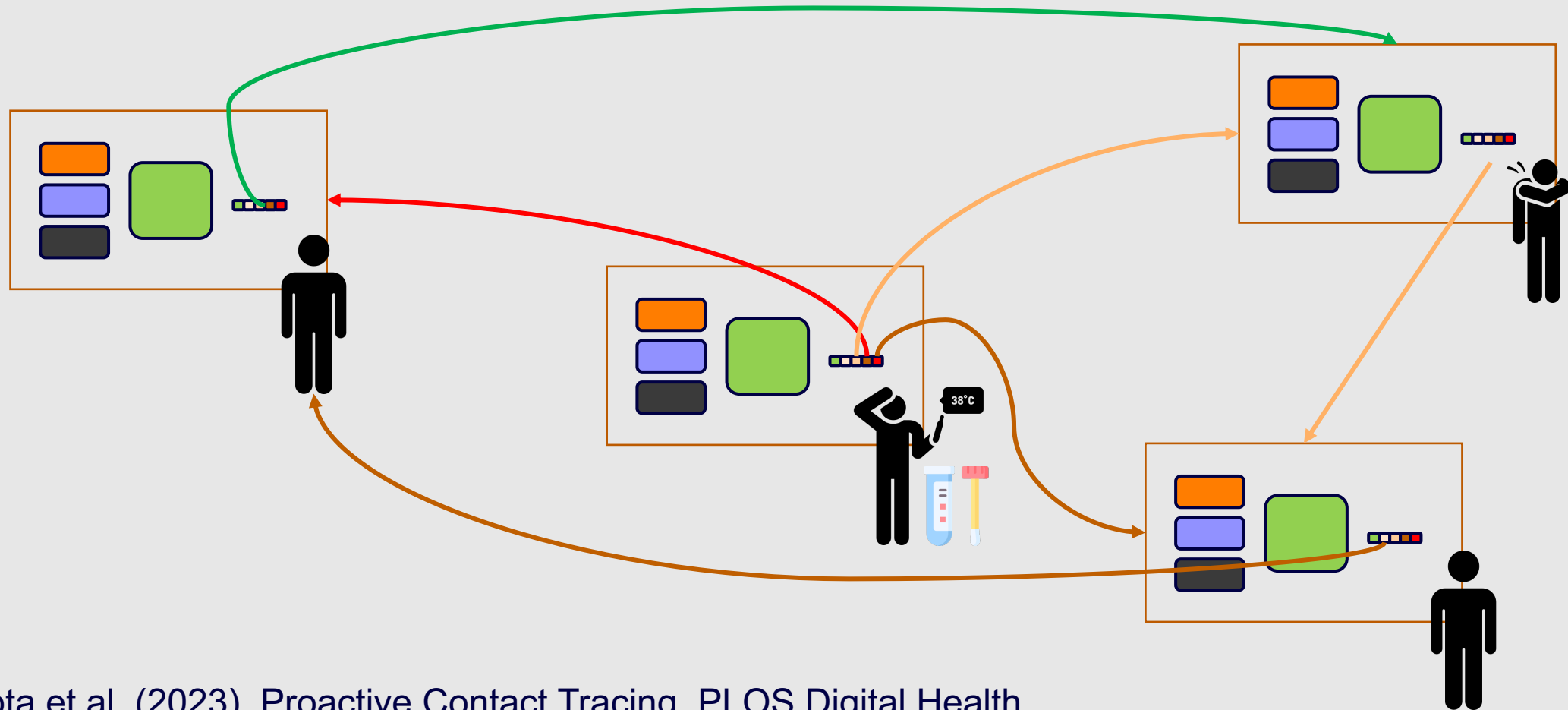


Gupta et al. (2023), Proactive Contact Tracing, PLOS Digital Health





# Proactive Contact Tracing (PCT) Framework

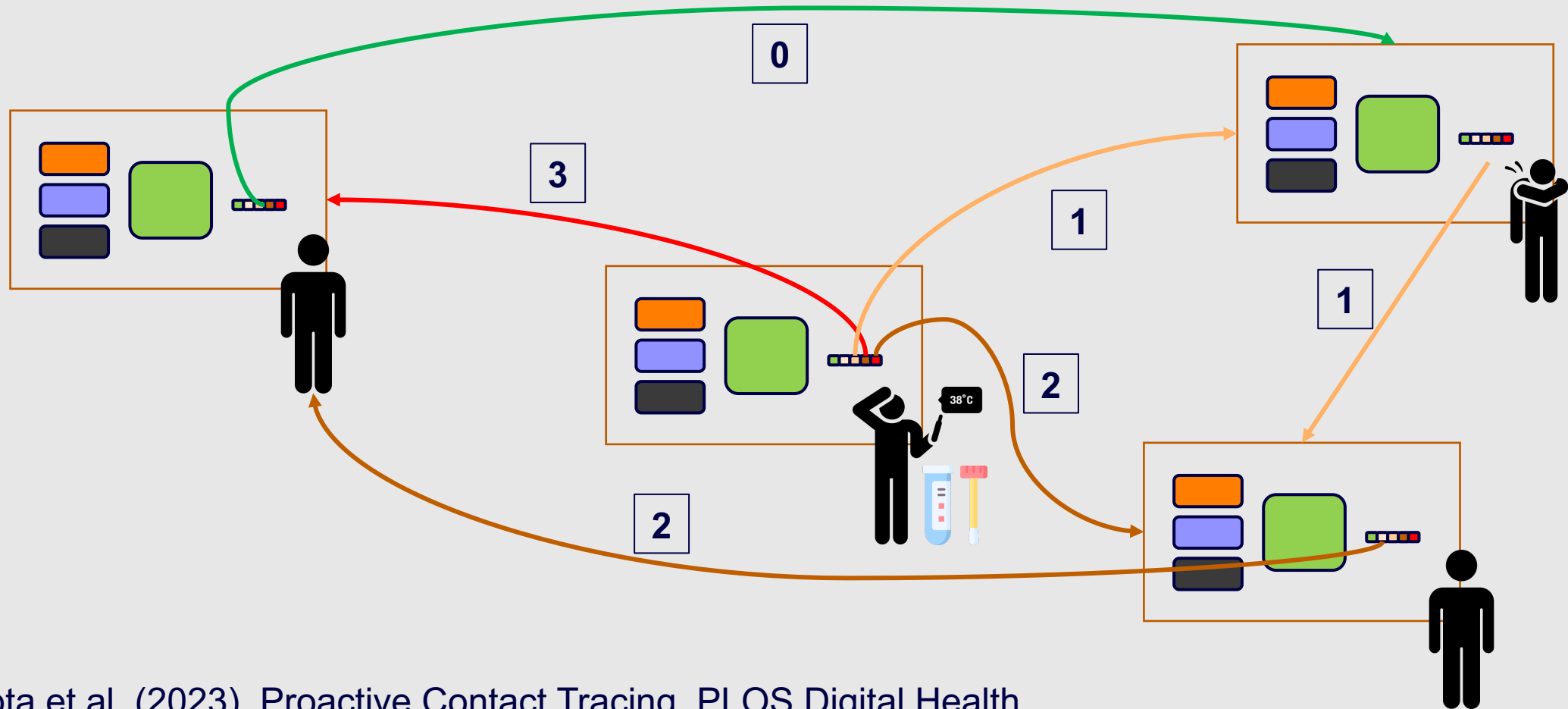


Gupta et al. (2023), Proactive Contact Tracing, PLOS Digital Health

# Privacy-preserving PCT

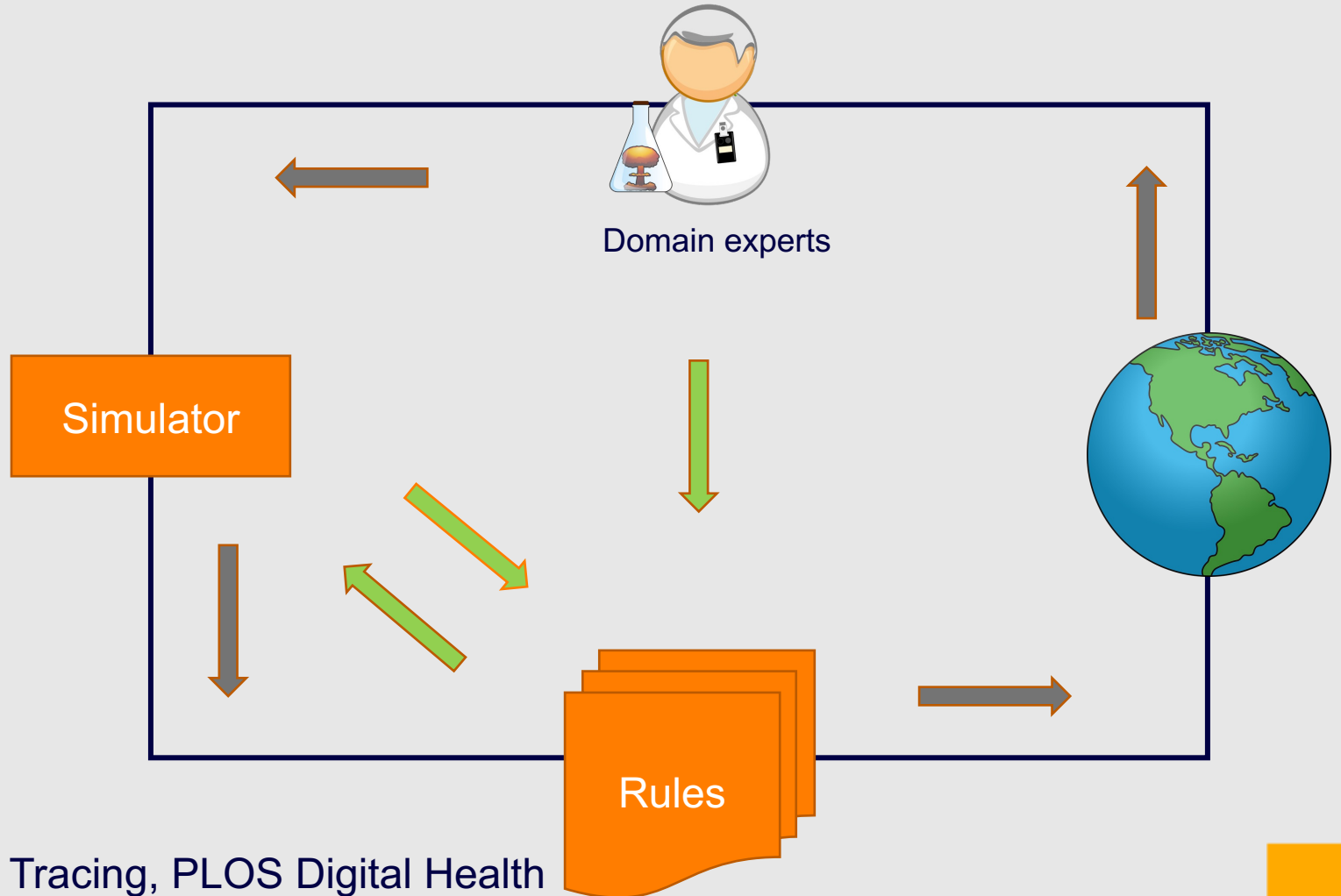
- User's information never leaves the phone
- Communication of risk messages is done using minimum number of bits

# PCT Framework in 2 bits



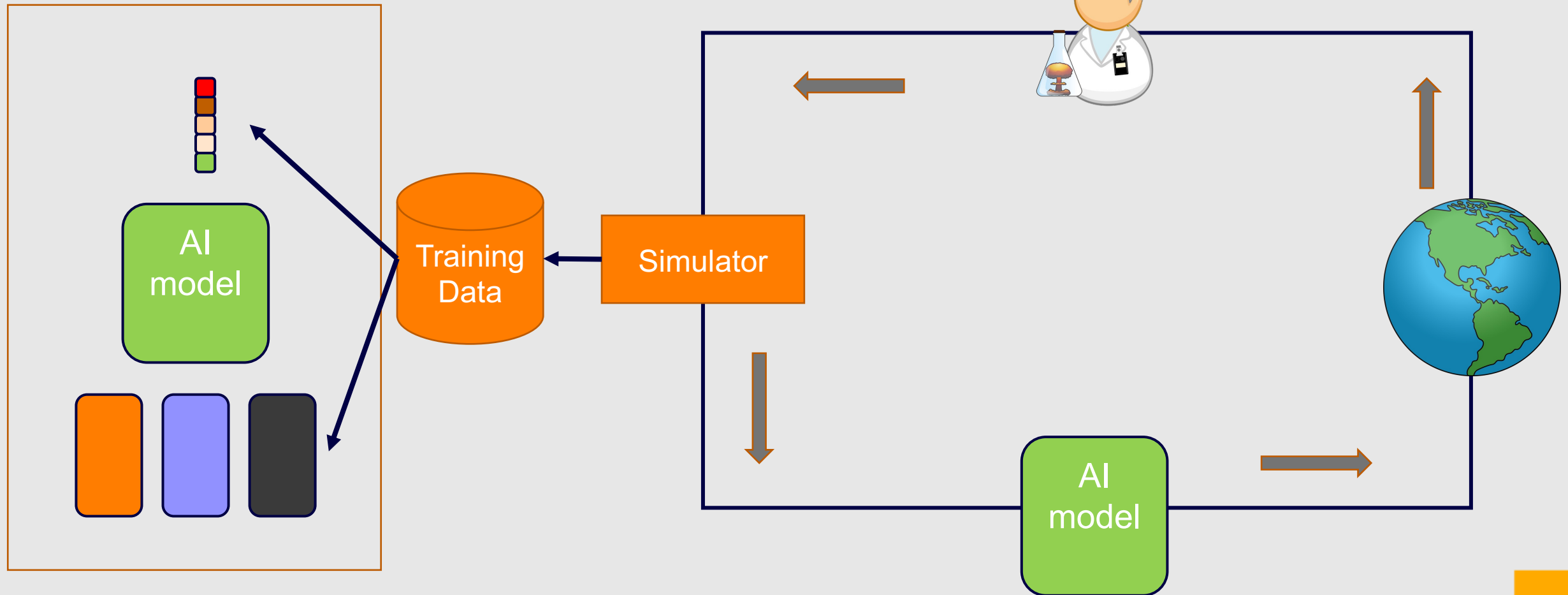
Gupta et al. (2023), Proactive Contact Tracing, PLOS Digital Health

# Rule-based PCT

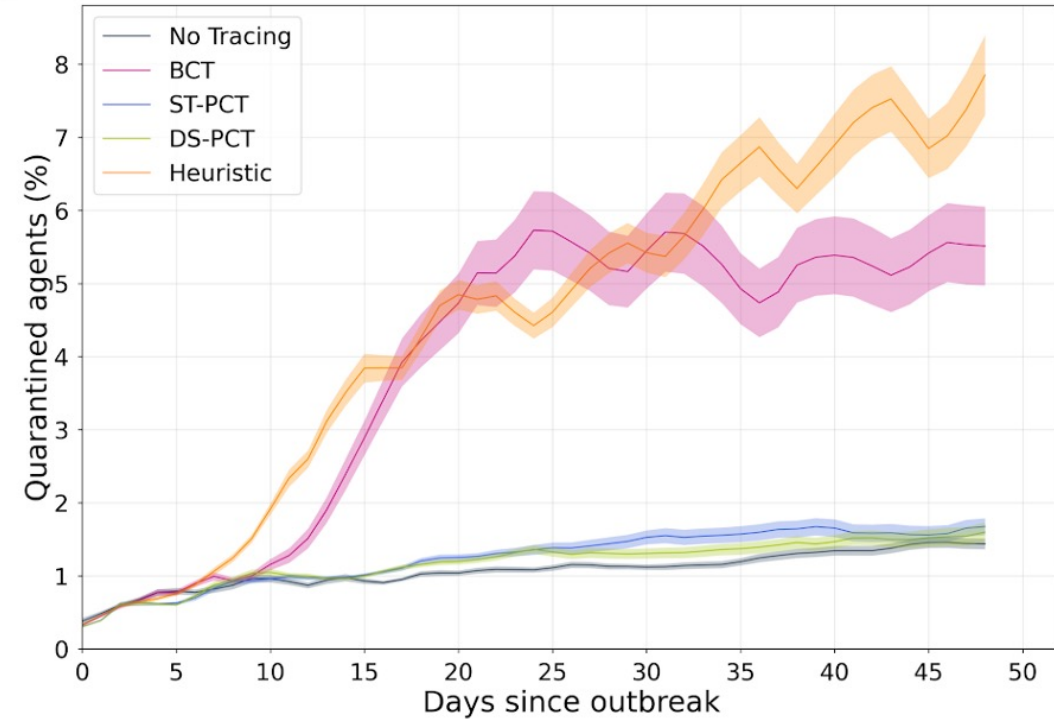
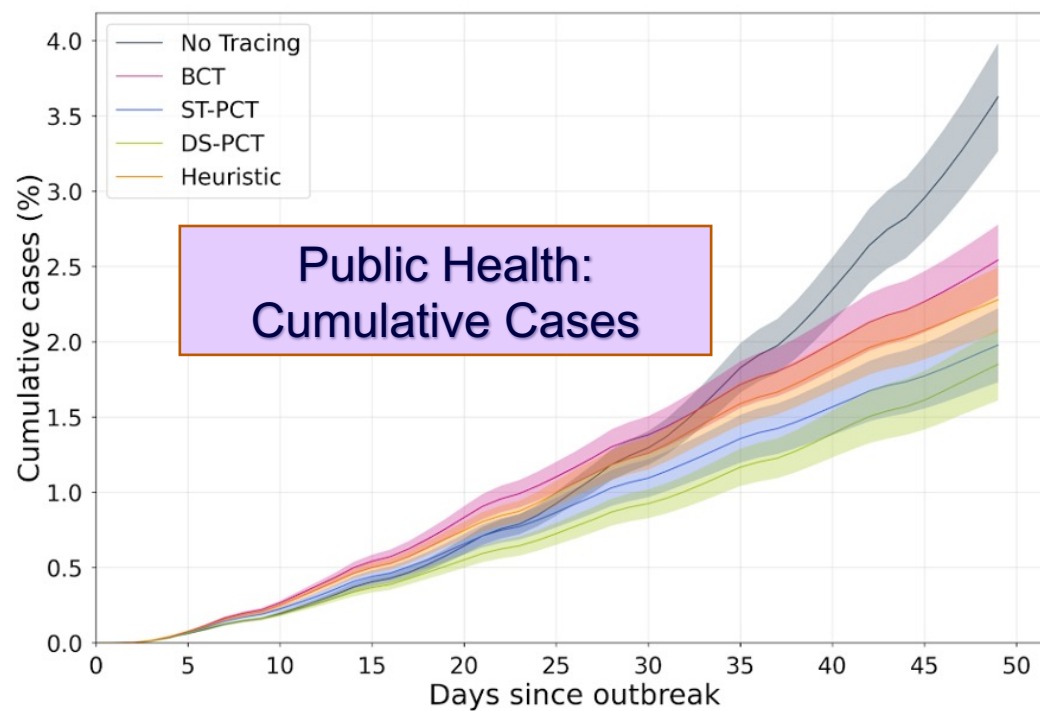


Gupta et al. (2023), Proactive Contact Tracing, PLOS Digital Health

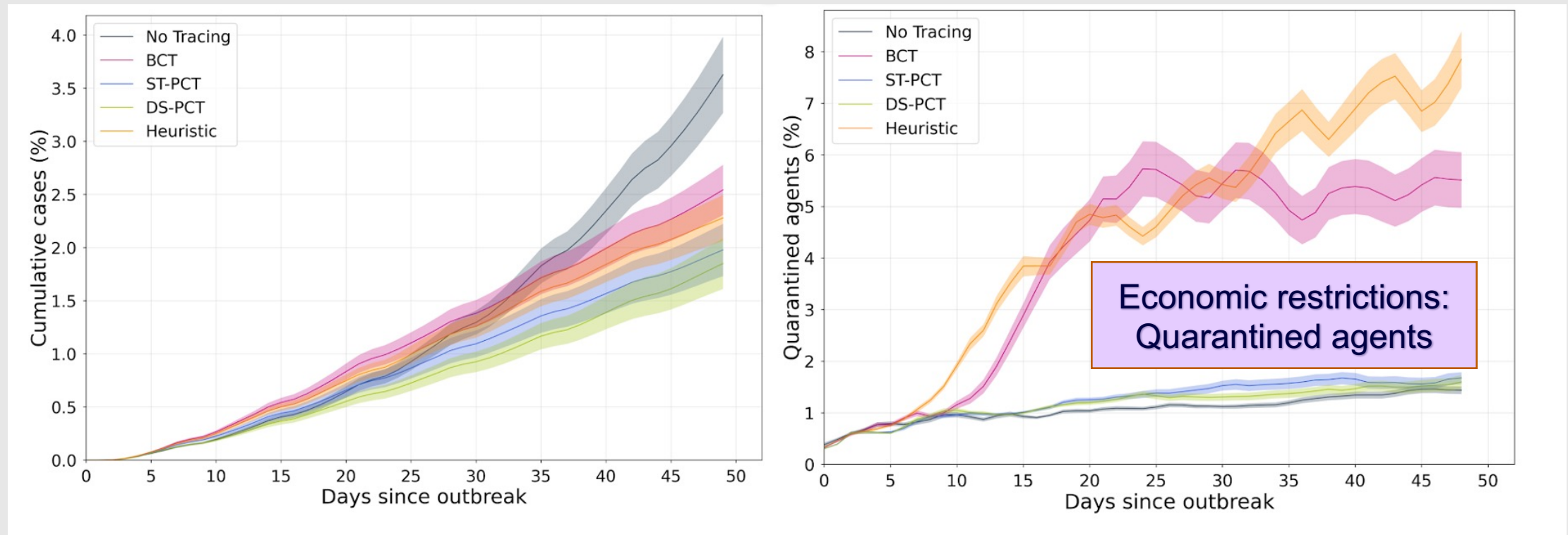
# AI-based PCT



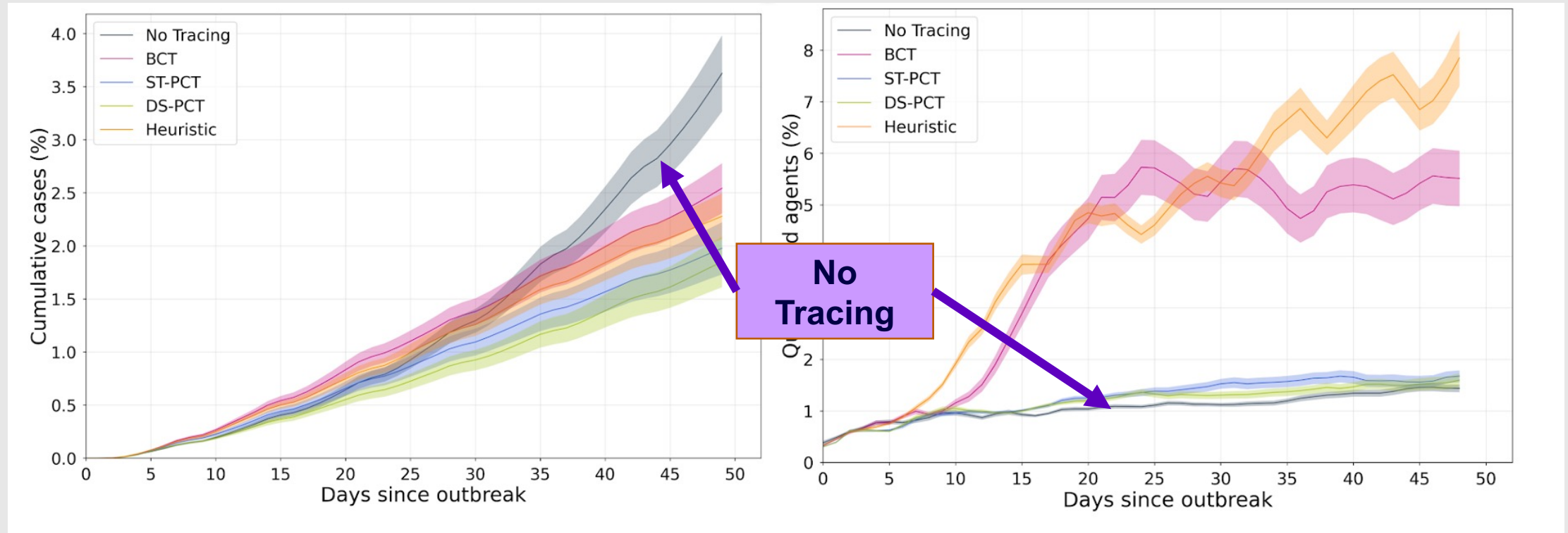
# Results



# Results

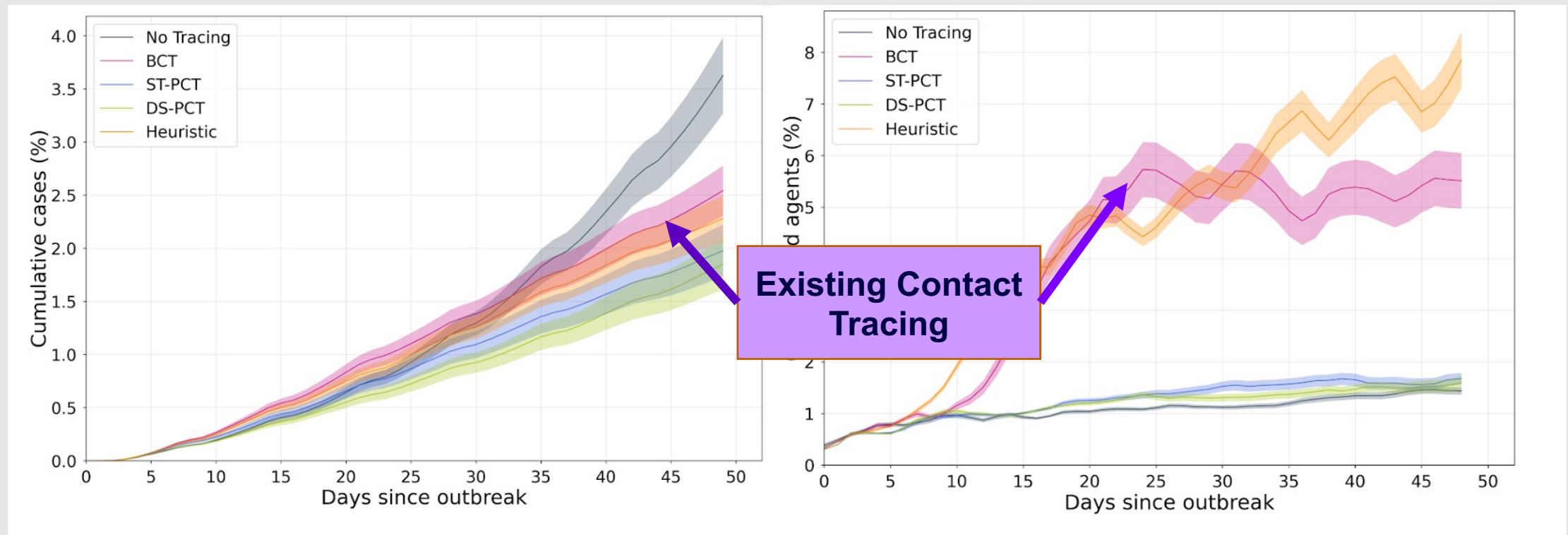


# Results

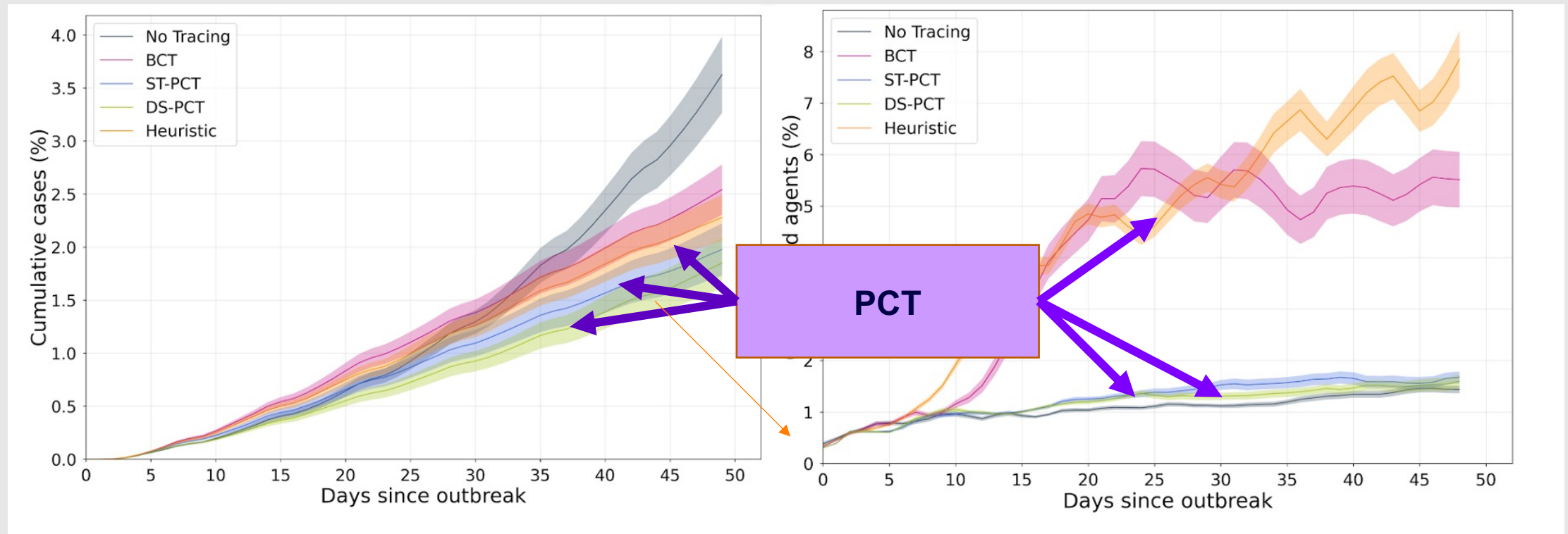




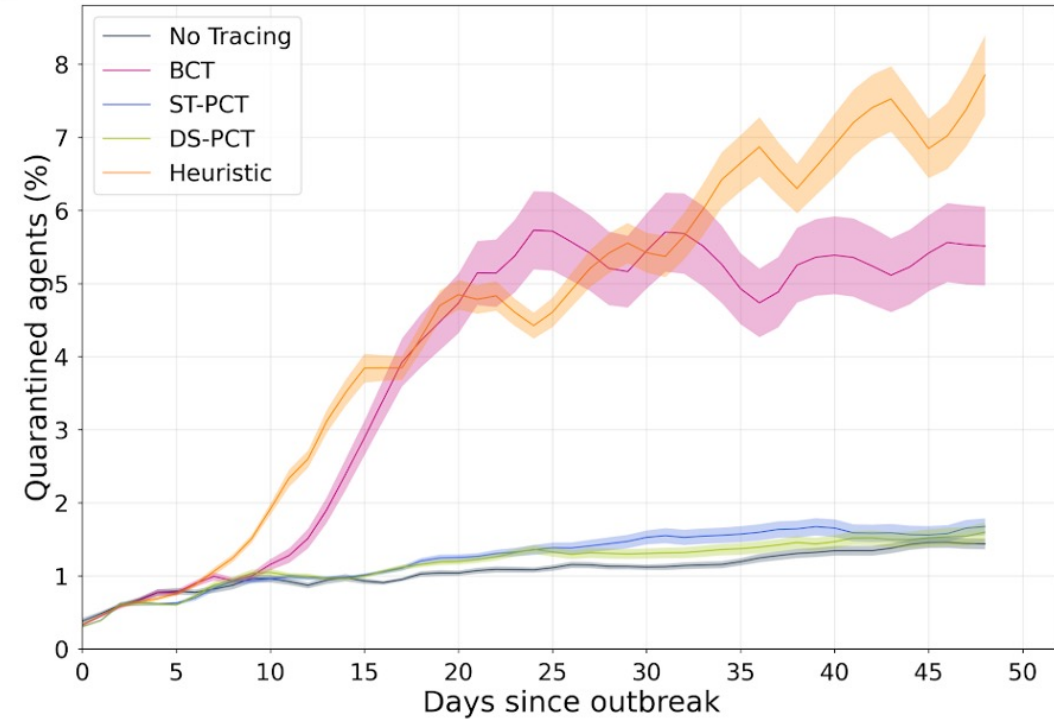
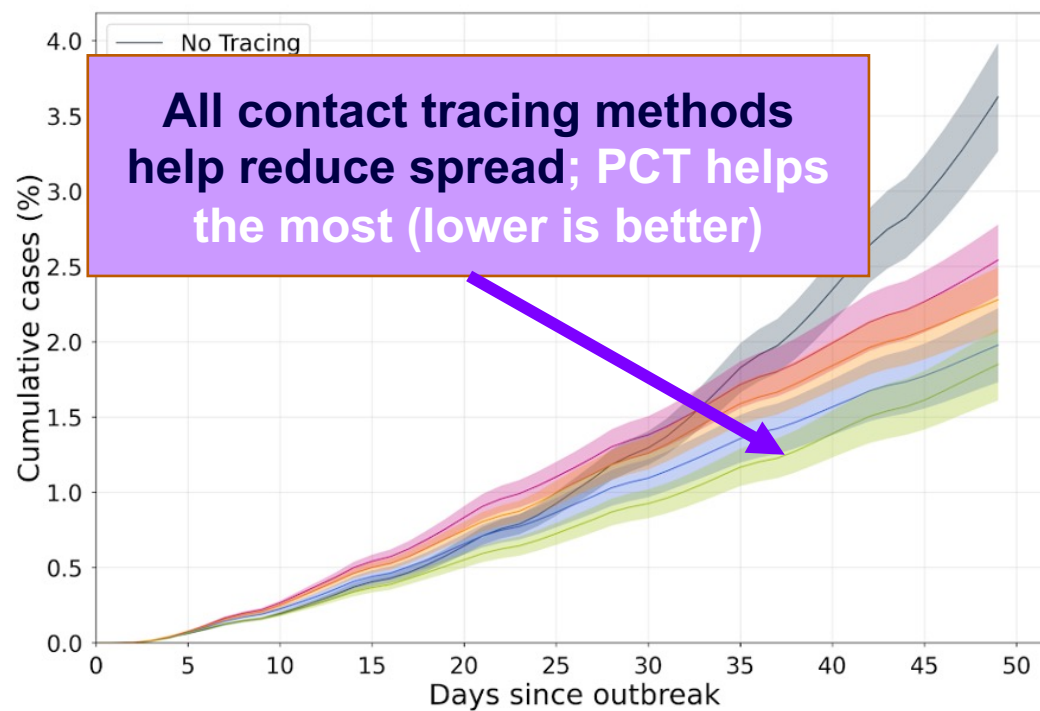
# Results



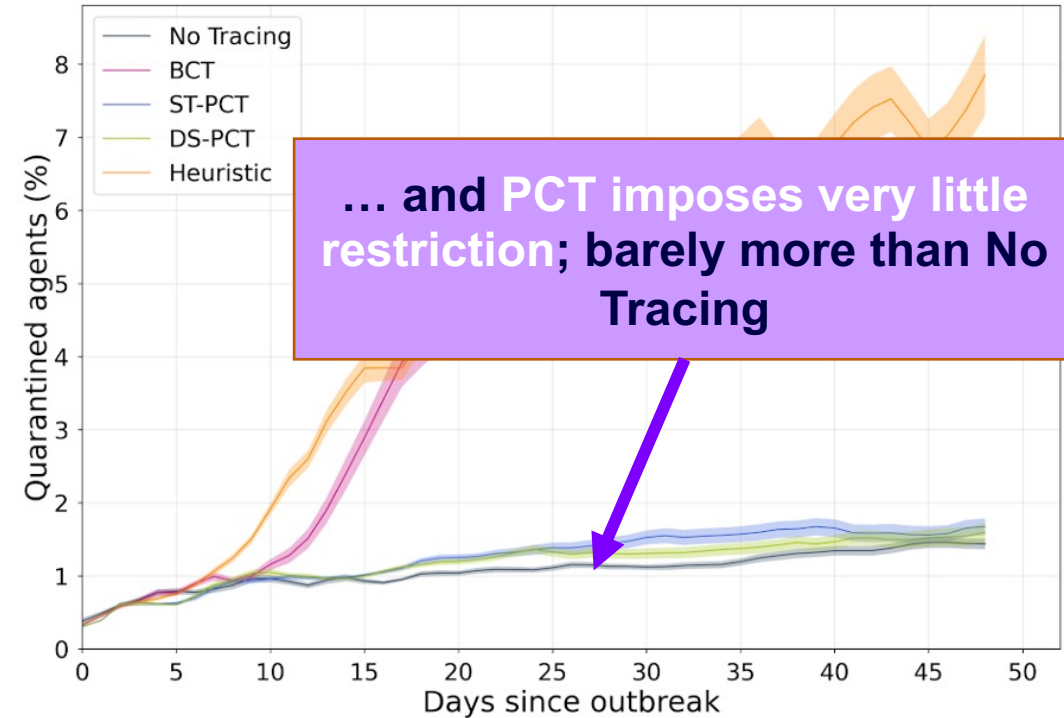
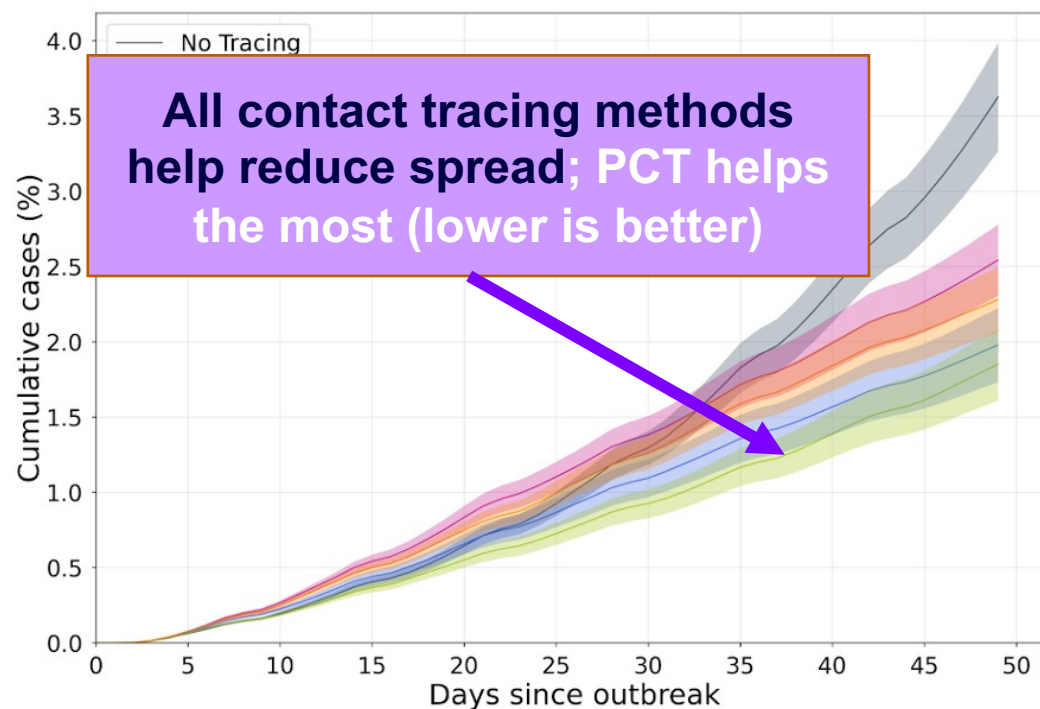
# Results



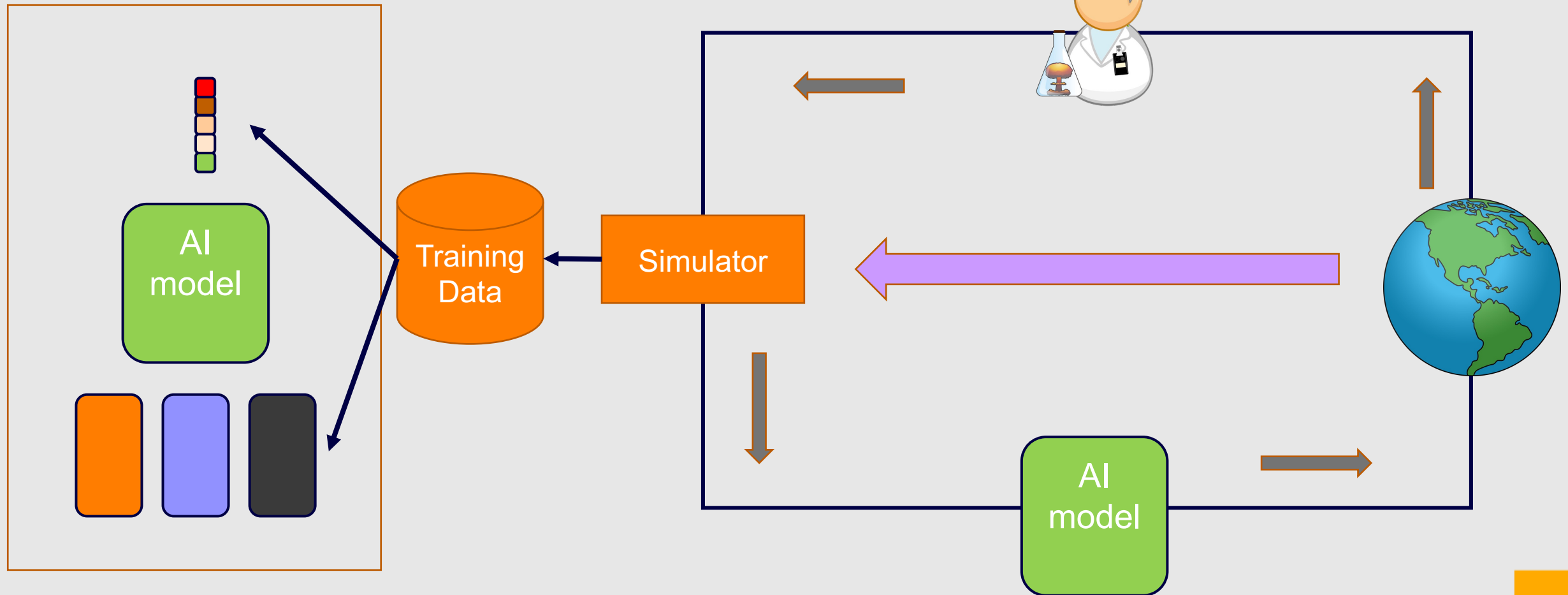
# Results



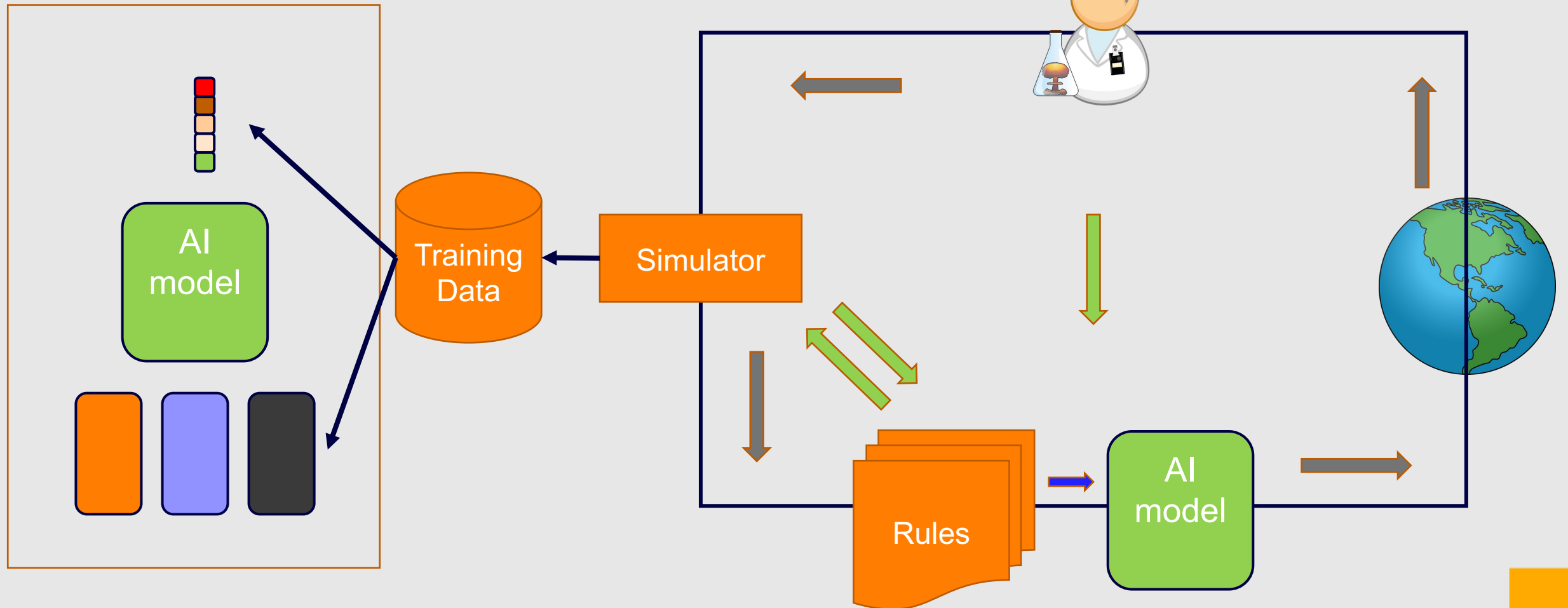
# Results



# Real-world deployment



# Safe deployment



# Slides & Resources

- Slides: [www.pgupta.info/talks](http://www.pgupta.info/talks)
- PCT Framework: Gupta et al. (2023), Proactive Contact Tracing, PLOS Digital Health
- AI-based PCT: Bengio et al. (2021), Predicting Infectiousness for Proactive Contact Tracing, ICLR
- Mobile application code: <https://github.com/mila-iqua/COVI-Mobile>
- Blog: [www.pgupta.info/blog](http://www.pgupta.info/blog)



Slides

# AI for Global Climate Cooperation



AI FOR  
**GLOBAL CLIMATE  
COOPERATION**

[www.ai4climatecoop.org](http://www.ai4climatecoop.org)



Slides

**Use of digital twins to design AI-guided negotiation protocols to promote international cooperation on climate change objectives**

**Netexplo Observatory's 10 most innovative ideas of 2022**



**The  
Alan Turing  
Institute**



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