

# PANEL ON OPERATIONS, PERFORMANCE, AND PERSONNEL

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Collaborators

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VIRAL INFECTION PROPAGATION THROUGH AIR-TRAVEL

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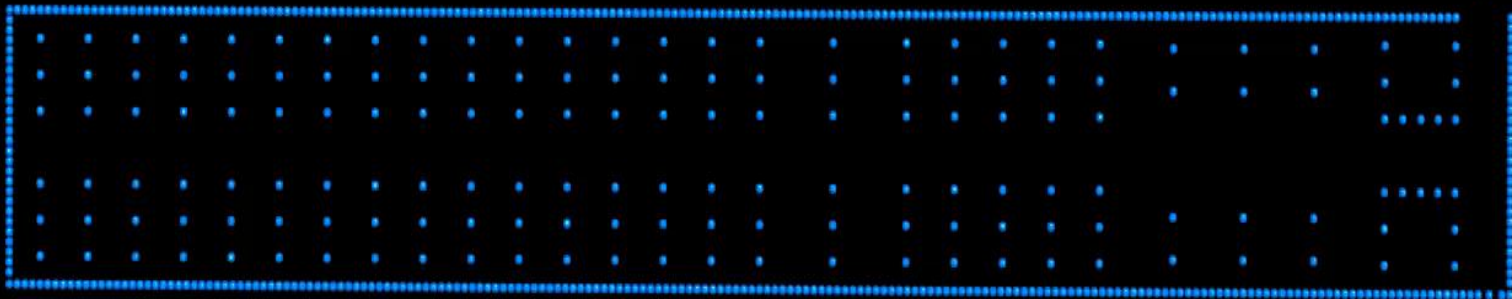
# OUTLINE

- Pedestrian dynamics
- Processes
- Design
- Air quality
- Airport preparation

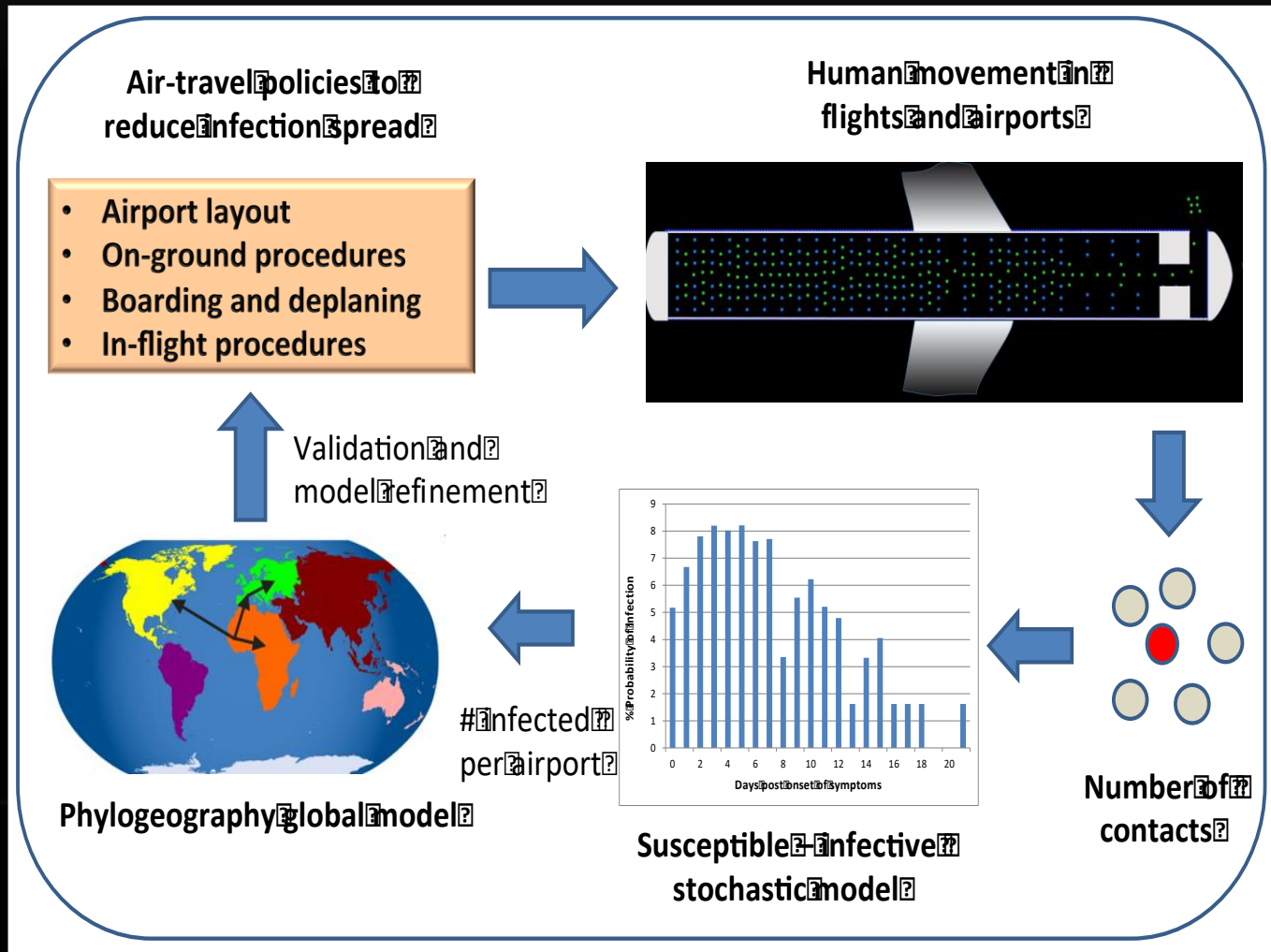
If passengers use N95 masks, they can be quite safe even if a lot of other factors go wrong

# PEDESTRIAN DYNAMICS

- Simulate movement of each individual
  - Use proximity to estimate infection risk

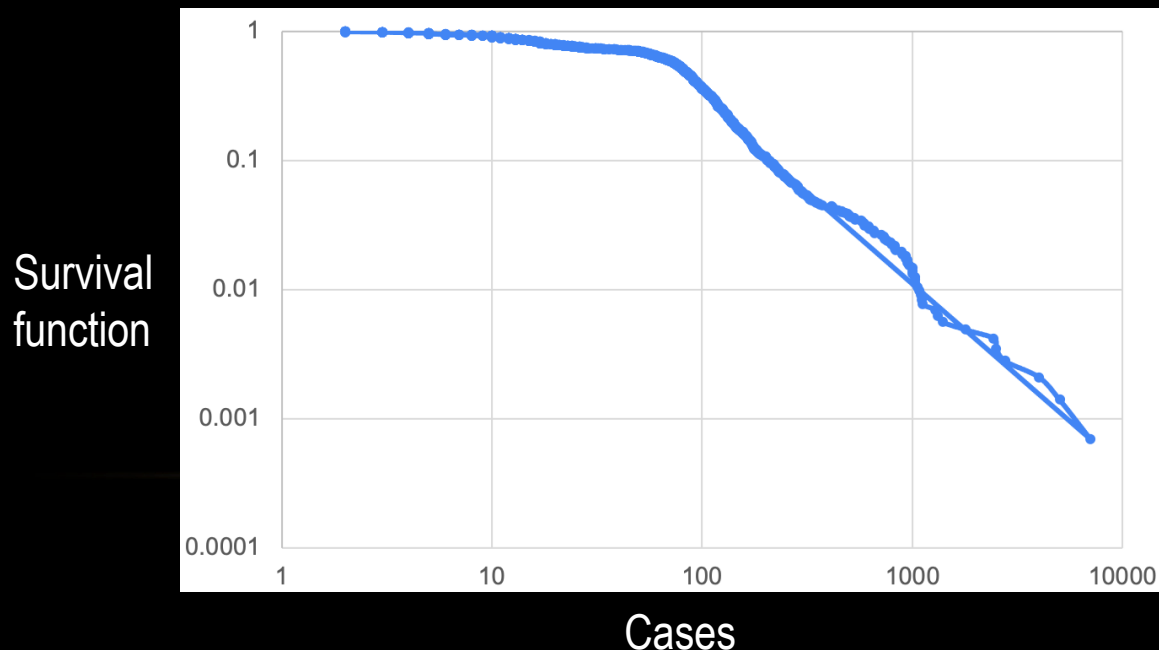


# WORKFLOW



# DIFFICULTY OF PREDICTION

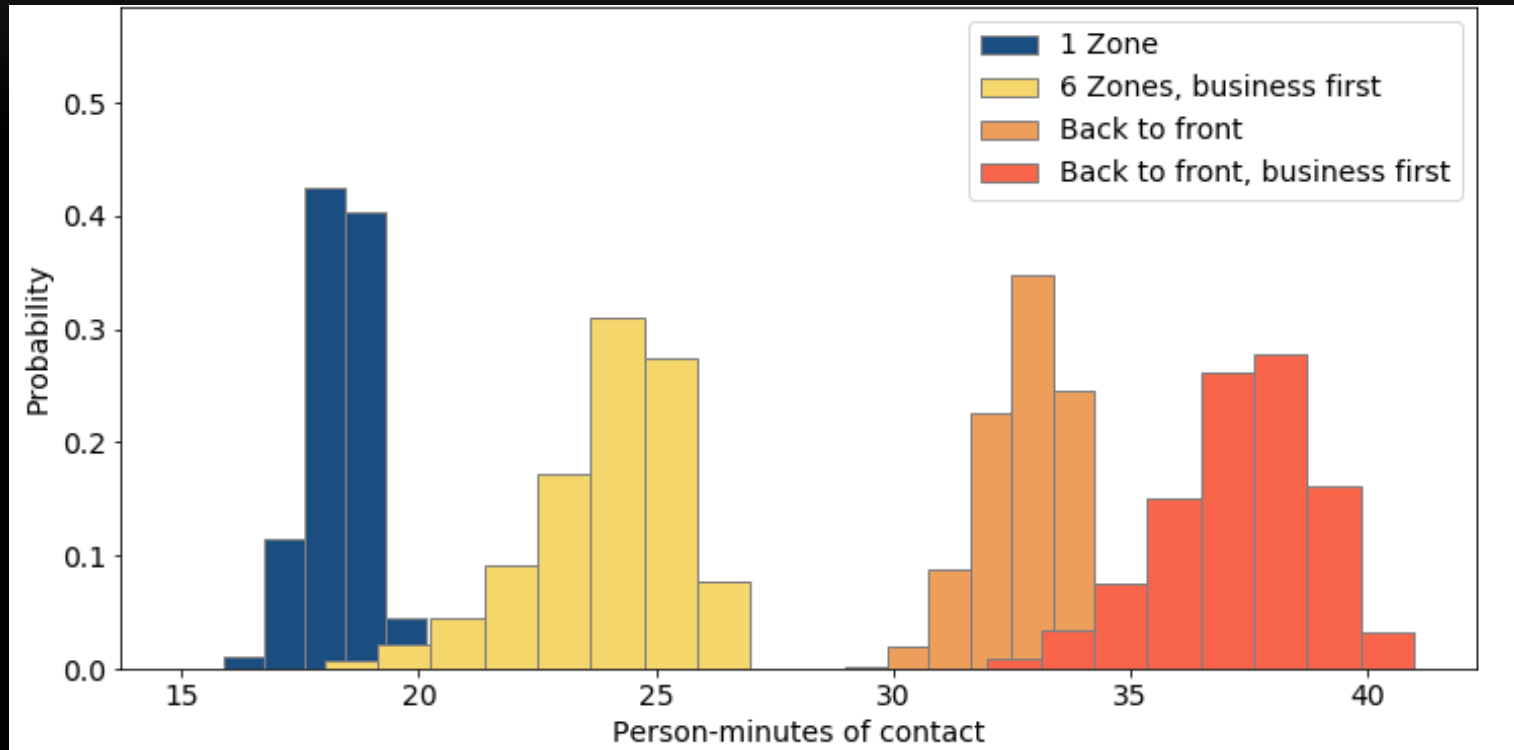
- Lack of data and inherent uncertainty in human behavior
- Solution
  - Generate a large number of possible scenarios
  - Compare different policies for the set of possible scenarios



## Sizes of superspreading events

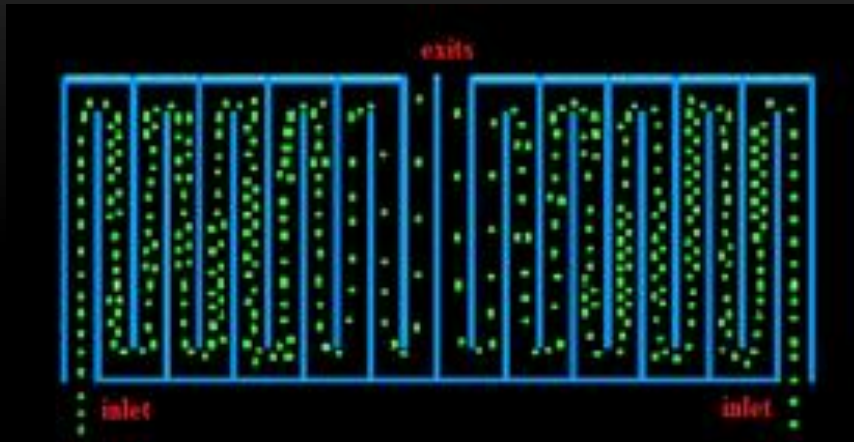
- Pareto exponent below 2 indicates infinite variance
  - Parameters estimation can be hard

# PROCESSES – AIRPLANE BOARDING

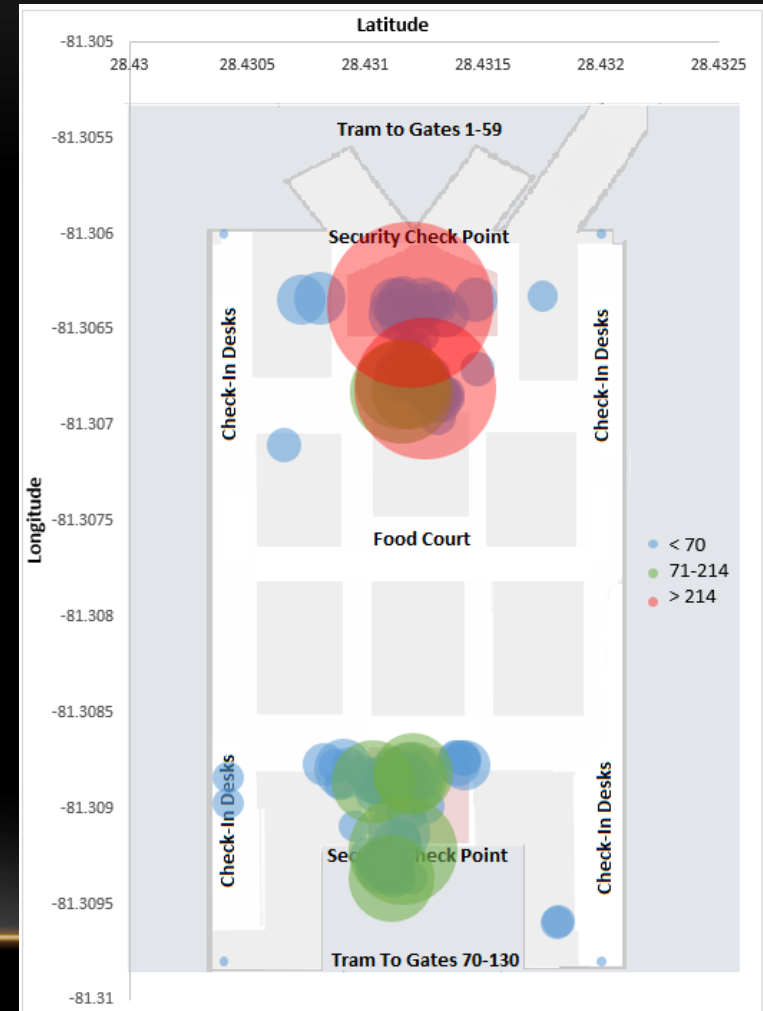


- Results show that the new boarding procedures made things worse
  - Random boarding would reduce infection risk
  - Less hand luggage would help a lot

# PROCESSES – QUEUES



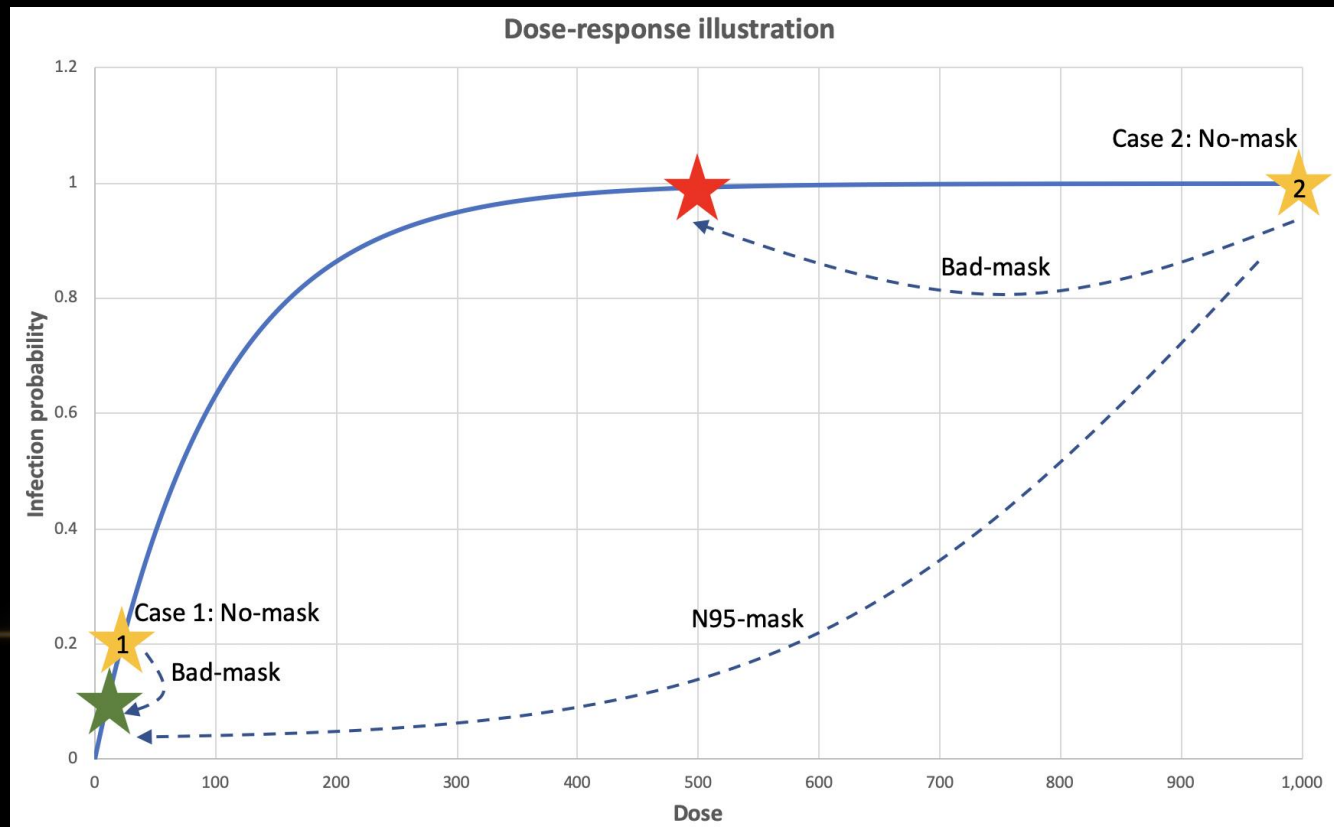
- Suitable security queue design can reduce contacts by 75%
  - Solid barriers
    - Not always effective [4]
  - Single file
  - Queue layout details



LBS analysis of passengers in Orlando

# AIR QUALITY

- HVAC exchange rate [4]
- Air quality in shuttles/trains and crowded locations [4]
- N95 masks can eliminate almost all risk in contrast to regular masks





# AIRPORT PREPARATION

- Tallahassee International Airport
  - Had prepared for Ebola, hurricanes, and biological attacks
  - Had N95 and other PPEs on hand
  - Abundant hand sanitizers
  - Indoor air quality studies and HVAC configured for maximum fresh air
  - Eye-catching messaging
  - Personal plan for employees

# SCIENCE OF DISASTER MITIGATION

- There is substantial risk for new disasters
  - Modern society is geared for optimization rather than robustness [N. Taleb]
  - Short-term benefits are incentivized over long-term sustainability
    - Example: Mitigation steps at an early stage of a pandemic can be more effective than at a later stage
      - Most of the time, an early outbreak will not lead to a pandemic
      - Will the public accept the cost of mitigation perceived as unnecessary?
- Solutions that take human response into account are required

# POTENTIAL FOR UNIVERSITY - AIRPORT COLLABORATIONS

- Techniques
  - Pedestrian dynamics to ensure social distancing without disruption to human activities
  - CFD simulations for air circulation patterns/air quality
- VIPRA results
  - Pointed out the usefulness of masks in Feb 2020
  - Pointed out the risk of local COVID outbreaks in Feb 2020
  - Identified the role of aerosol based spread in March 2020
    - 6 feet distancing is inadequate
  - Pointed out the ineffectiveness of back to front boarding on airplanes

# REFERENCES

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This material is based upon work supported by the National Science OAC under grants #2027514 and #1931511. This research used resources of the National Energy Research Scientific Computing Center (NERSC), a U.S. Department of Energy Office of Science User Facility operated under Contract No. DE-AC02-05CH11231. ALCF and TACC too provided supercomputing facilities. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation or other funding sources.