

# Analysis and Visualization Overview

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Measuring and Modeling Health Behavior  
with Smartphone Mediated Data Collection

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# Analytics Tools

- Making best use of smartphone/wearable collected data requires investing in proper analysis
- Analytics investments typically require a combination of
  - Traditional techniques (biostatistical methods, traditional epidemiological summaries)
  - Techniques drawn from Machine Learning & Computational Statistics
    - Classifiers
    - Inference methods
- Dynamic modeling will sometimes be used
- Monte Carlo methods in both forms
  - sequential (Particle filtering): sample from posterior distributions over latent state
  - batch (MCMC) : sample from posterior distributions of parameters
  - Partical MCMC: sample from posterior distributions of both parameters & latent state

# Example Layers of Analysis

- Filtering & data cleaning
- Aggregation
- Simple classification (e.g., contact patterns from Bluetooth)
- More complex classification (e.g., context, behaviour, posture, etc.)
- Statistical modeling
  - Inference (e.g., sources of infection)
  - Biostatistical modeling (e.g., recurrent events, competing risks & survival analysis, etc.)
- Dynamic modeling (linkage to counter-factuals: policy & intervention questions, multi-pathway effects)

# Key Distinctions

- On-phone analysis
  - Power-frugality and rapid processing key, limited to phone-specific analysis
- Server-side analysis with immediate feedback
  - Rapid processing; back-transport requirement; multi-phone analysis possible
- Offline server-side analysis
  - Rapid processing; back-transport requirement; multi-phone analysis possible