

Machine Learning for Infectious Disease Risk Prediction

Multi-level Taxonomy

Pandemic and Epidemic Phases

Intrinsic and Complex Transmission Patterns of Disease

Spatiotemporal Dependency Mining

Gap between Epidemiological Interpretation and Computational Modeling

Epidemiological
Parameterization

Epidemiology-
embedded Learning

Lack of Epidemiological Information and Disease-related Data

Enhancement of Data
and Information
Completeness

Knowledge Transfer
between Similar
Disease Patterns

Endemic and Elimination Phases

Localized Disease Transmission Patterns

Temporal Autocorrelation Modeling

Correlated Signals of Disease Dynamics

Specific Challenges in Disease Elimination

Imported Risk Modeling

Limited Resource Management for Surveillance

Technical Challenges

Data

Multiple Modalities

Multi-source Time-series Data
Time-series Data with Textual Data
Time-series Data with Biomedical Data



Multiple Resolutions

Same, Fine, and Coarse
Scales with Predicted
Variables

Task

Distribution Shift

Data Distribution Shift
Parameter Distribution Shift

Uncertainty Quantification

Probabilistic Modeling
Uncertainty-aware Deep Learning

Model and Prediction Robustness

Stacking Technique
Result Ensemble
Bootstrapping Sampling



Model Interpretability

Model Structure
Temporal Similarity

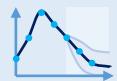
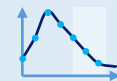


Evaluation


Measurements of
Disease Severity

Disease Incidence
Case Numbers
Death Counts

Patient Visit Counts
Disease Activity Levels



Evaluations of Model
Performance
Point Estimation
Interval Estimation