

# PEIYU LIU

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## SUMMARY

- **Biostatistics Ph.D. Student** at University of Florida with **8+ years'** experience in statistical modelling.
- Proficient in multiple coding languages including **R/Rshiny, Matlab, SAS, SQL, Python, C++ etc.**
- Specialized in Mathematical modelling, Machine learning, Biostatistics computing, and Clinical trial analysis.

## EXPERIENCES

### Biostatistician

Gainesville, U.S.

*Emerging Pathogens Institute | University of Florida*

05/2025-present

- Designed and executed an **RSV severity analysis** using **CoxPh and logistic regression** to study age, gender, birth history, and comorbidities against length of stay, ICU admission, oxygen, ventilation, and inpatient status.
- Conducted analysis of Florida kindergarten measles **vaccine coverage**, quantifying **outbreak probabilities** and expected **outbreak sizes** under varying coverage scenarios.
- Developed the **open-source R package vaxineR**, standardizing outbreak risk modeling with functions for Re estimation, vaccination scenario simulations, and county-level **vaccination data visualization**.
- Provided outbreak risk plots and quantitative summaries **cited in a Science news article** on vaccination coverage decline, and produced RSV **analytic figures** for a **manuscript submission** to *Nature Communications*.
- Provide **pre-proposal study design** guidance: perform **power analyses**, calculate appropriate **sample size** for testing intervention effects such as vector control, vaccination etc.

### Research Assistant

Gainesville, U.S.

*Biostatistics Department | University of Florida*

08/2023-present

- Developed **3 R Shiny** apps: a dengue trial simulator (serological vs. clinical endpoints), a SIR model estimator (**LS, bootstrap, MCMC**), and a US weather app (**ggplot2 visualization, K-means, Machine learning forecasting**).
- **Taught Kaplan–Meier and Nelson–Aalen survival curve estimation** (4–8 hrs) as a guest lecturer.
- Innovated a unified **trial evaluation** framework by integrating a stochastic antibody kinetics model (ANPP) with temperature-driven SEIR-SIR model, comparing the **novel serological vs traditional clinical endpoints**.
- Formulated mosquito bite-driven **antibody dynamics** into closed-form moment equations, validated with large-scale **Monte Carlo** simulations, and derived standardized **sample size formulas** for trial design.
- Synthesized **quantitative evidence** demonstrating that serological endpoints can reduce trial sample sizes by several orders of magnitude, linking different interventions to **endpoint choices and follow-up timing**.
- Led statistical analyses in a pediatric clinical-genomic RSV study, integrating **CoxPh and regression models** with viral **genotype data** to examine **genotype–phenotype associations** and their impact on disease severity.

### Research Fellow and Lecturer

Changsha, China.

*Math Department | Hunan Institute of Science and Technology*

06/2021-08/2023

- Taught **Probability Theory and Mathematical Statistics** to 200+ students, 243 class hours each year.
- **Mentored** undergraduate team to a second prize in the National **Mathematical Modeling** Contest.
- Formulated a three-dimensional **pulsed differential equation** model capturing interactions among **tumor cells, effector cells, and helper T cells**, and proved the existence and **stability of tumor-free periodic solutions**.
- Performed bifurcation analysis on therapy intensity, effector-cell activation, and birth rates to evaluate how **radioimmunotherapy strategies** shift thresholds for tumor-free dynamics.
- Applied **spline interpolation** to complete multinational weather datasets (10 countries) and performed descriptive and spatial analyses, including **bivariate choropleth mapping**.
- Directed a 50,000 CNY municipal-funded project to build a **COVID-19 visualization platform** integrating statistical and mathematical models for epidemic monitoring.

### Researcher

Xian, China.

*School of Mathematics and Statistics | Shaanxi Normal University*

07/2018-06/2022

- Built SEIAR **compartmental models**, applying **Nonlinear Least Squares, Bootstrap, and MCMC** with sensitivity and threshold analyses to quantitatively evaluate and inform **vaccination** and NPI strategies.
- Supported a data-driven COVID-19 forecasting and **visualization platform** by designing and maintaining **compartmental modeling** components.
- Applied missing imputation (**EM**), variable selection (**Lasso regression**), **Generalized additive model** to quantify meteorological impacts on air pollution across Xi'an districts.

- Developed and analyzed a nonlinear predator–prey differential system with **saturation effects**, proving **equilibrium coexistence** and **stability** under **stochastic** noise through bifurcation and Poincaré map analyses.

## EDUCATION

- Ph.D.** (Biostatistics, GPA: 3.9/4) 08/2023 - present  
School of Public Health & Health Professions, University of Florida Gainesville, U.S.
- Coursework: *Biostatistics Methods and Computing, Statistical Machine Learning, Survival Analysis, Casual Inference, Data visualization, Longitudinal Analysis, Analytical methods for Infectious Diseases*
- M.S.** (Computational Mathematics, top 5%) 05/2021  
School of Mathematics and Statistics, Shaaxi Normal University Xian, China
- Coursework: *Advanced Biomathematics, Stochastic Process, Stability, Qualitative Theory of Differential Equations*
- B.S.** (Statistics, top 5%) 05/2017  
School of Mathematics and Statistics, Shaaxi Normal University Xian, China
- Coursework: *Probability Theory, Statistical Analysis and R, Mathematical Modeling, Practical Regression Analysis, Multivariate Statistical Analysis, Statistical Computing, Time Series Analysis*

## SELECTED PUBLICATIONS

- Liu, P.**, Hitchings, M., Rong, L., & Cummings, D. (2025). Serological markers as efficient endpoints for vector control trials: A mechanistic modeling framework for comparative evaluation with clinical and entomological endpoints. Manuscript under review.
- Santos, L. A., Castillo, A., Gustani-Buss, E., Hitchings, M. D. T., & **Liu, P.** (2025). Increased genomic diversification frequency of respiratory syncytial virus (RSV) types A and B in pediatric cohort in the United States after the onset of the COVID-19 pandemic. Under review at *Nature Communications*.
- Yan, Q., & **Liu, P.** (2023). Effects of climatic factors and control measures on the spread of COVID-19. *Journal of Zhejiang University (Science Edition)*, 50(2). (<https://doi.org/10.3785/j.issn.1008-9497.2023.02.003>)
- Wang G., Ding W., Zhang Z., **Liu, P.** (2022) Qualitative analysis of a tumor-immune model with impulsive control strategies at fixed time. *Journal of Hunan Institute of Science and Technology*, 35(3): 1-6. (doi: [10.16740/j.cnki.cn43-1421/n.2022.03.017](https://doi.org/10.16740/j.cnki.cn43-1421/n.2022.03.017))
- Liu, P.**, He S., Rong L., and Tang S.. (2020) The effect of control measures on COVID-19 transmission in Italy: Comparison with Guangdong province in China. *Infectious Diseases of Poverty*, 9(130):1-13. (<https://doi.org/10.1186/s40249-020-00730-2>)
- Xia F., Xiao Y., **Liu, P.**, Cheke R.. (2020) Differences in how interventions coupled with effective reproduction numbers account for marked variations in COVID-19 epidemic outcomes. *Mathematical Biosciences and Engineering*, 17:85-98. (<http://dx.doi.org/10.3934/mbe.2020274>)

## HONORS

- Invited speaker:** Stochastic Epidemic Models with Inference, Rollins School of Public Health, Emory University (SISMID) 2025.
- Coach & Judge:** ASA DataFest, University of Florida (American Statistical Association) 2025.
- Mentored** undergraduate students win **second prize** in China **Mathematical Contest in Modeling** 2022.
- National Scholarship by Ministry of Education** (Top 1% nationwide) in China 2021.
- Second Prize** in China **Mathematical Contest in Modeling** 2016.

## APPLICATIONS/PACKAGES

Developed R Package

- Peiyu Liu, Matt Hitchings, Ira Longini. Package “vaxineR” A Statistical Tools for Vaccine coverage analysis and outbreak risk assessment. <https://cran.r-project.org/web/packages/vaxineR/>

Developed Online Tools/Webpages (R-shiny):

- Dengue Clinical Trial (serological vs. clinical endpoints): <https://peiyuliu.shinyapps.io/anpp-trial-comparison/>
- SIR Model Estimation (Least Squares, Bootstrap, MCMC): <https://peiyuliu.shinyapps.io/sir-estimation-comparison/>
- US Weather Analyses (ggplot2 visualization, K-means clustering, Machine Learning forecasting): <https://peiyuliu.shinyapps.io/us-weather-analysis/>

## GOOGLE SCHOLAR

Available at: <https://scholar.google.com/citations?user=O6KFoOUAAAJ&hl=en&oi=ao>