A hierarchical nonlinear mixed effects models for HIV infection

Jeehyun Lee(ezhyun@yonsei.ac.kr)[1], Yunjeong Lee[2], Yoon-gu Hwang[2]
Jun Yong Choi[3], Heedae Kwon[4]
[1]Department of Mathematics & Department of CSE, Yonsei University, Korea, [2]Department of Computational Science and Engineering, Yonsei University, Korea, [3]Department of Internal Medicine, Severance Hospital, Yonsei University College of Medicine, Korea, [4]Department of Mathematics, Inha University, Korea

Abstract

The objective of this research is to develop a model to account for variations at both the individual and population levels, which is clear in the clinical data. To achieve this goal, we propose an approach employing hierarchical nonlinear mixed effects models. It is based on an in-host HIV infection dynamics model and distribution of parameters across the population is taken into consideration. Mathematically, the established model is a system of random ordinary differential equations in which parameters are formulated as random variables. We analyze this model and provide numerical experiments supporting the analytical results.

Keywords: *HIV dynamics, mixed effects model, random ODE*

References

[1] H. T. Banks, S. Grove, S. Hu, and Y. Ma. A hierarchical bayesian approach for parameter estimation in HIV models. Inverse Problems, 21(6):1803, 2005.

[2] M. A. Sta ord, L. Corey, Y. Cao, E. S. Daar, D. D. Ho, and A. S. Perelson. Modeling plasma virus concentration during primary HIV infection. J. Theoret. Biol., 203(3):285 { 301, 2000.

Biography

*Education & Work Experience
2018-present Associate Dean of the College of Science
2004-present Professor in Mathematics and CSE at Yonsei University
2001-2004 Post-doctoral Associate in Mathematics at Carnegie Mellon University
1995-2001 Ph.D. in Applied Mathematics at Iowa State University (Dissertation Advisor: Max Gunzburger)

*Research Interests
Numerical Analysis / Scientific Computing
Mathematical Biology and Epidemiology
Control and Optimization