

# Performant Global Sensitivity Analysis using GlobalSensitivity.jl

Vaibhav Dixit<sup>1</sup>, Vijay Ivaturi<sup>2,3</sup>, Chris Rackauckas<sup>1,2,4</sup>

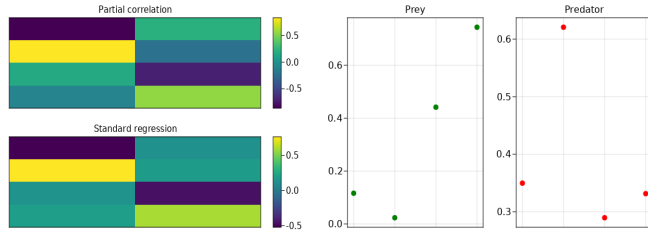
<sup>1</sup>Julia Computing Inc., <sup>2</sup>PumasAI,

<sup>3</sup>University of Maryland, Baltimore, <sup>4</sup>MIT

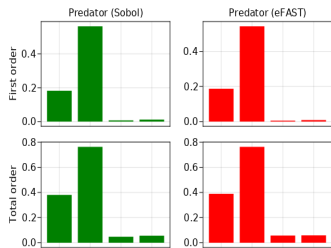
GlobalSensitivity.jl is a generalized GSA package written in the julia [1] programming language which implies it is capable of handling varied problems by design and additionally due to compatibility of julia. The built-in support for parallelism allows analysis of large models with significant simulation overhead with ease for domain scientists looking to use GSA. Currently GlobalSensitivity.jl supports the Sobol, Morris, eFAST, Regression based, DGSM, Delta Moment, EASI, Fractional Factorial and RBD-FAST GSA methods

In this poster we showcase results of using different GSA methods and analysing their results using visualizations. We consider the Lotka-Volterra differential equation model using SciML's [2] DifferentialEquations.jl package, code for this analysis and obtaining plots is available as a tutorial in the documentation website [3]. Further, application of GSA is demonstrated by analysing the anti-pcsk9 QsP model [4]. Additional tutorials for using GSA in pharmacometrics using Pumas on PK/PD and PBPK models are available here [5].

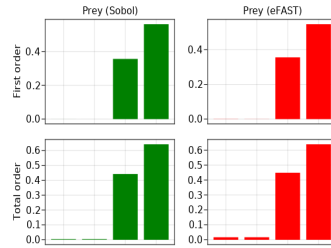
## Lotka Volterra GSA results for mean over time of prey population and maximum predator population.



## Partial correlation and Standard regression results



## Morris Method

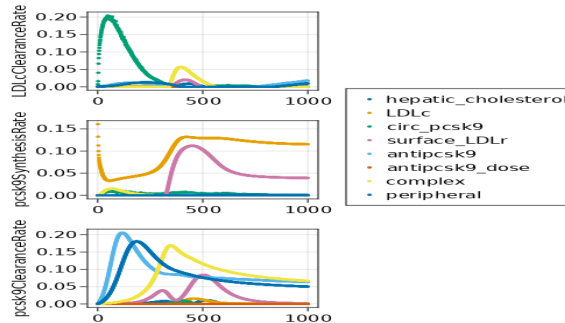


## Sobol and eFAST

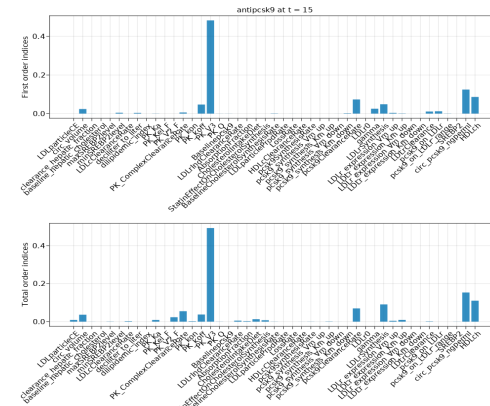
## Sobol Sensitivity analysis of time series (solution of ODE system)



## Total order Sobol Indices



## Sobol on Antipcsk9 at t= 15.0



## References

- <https://julialang.org>
- <https://sciml.ai>
- <https://gsa.sciml.ai/>
- <https://doi.org/10.1038/psp.2014.47>
- <https://tutorials.pumas.ai>