Modern statistical inference in complex biological systems

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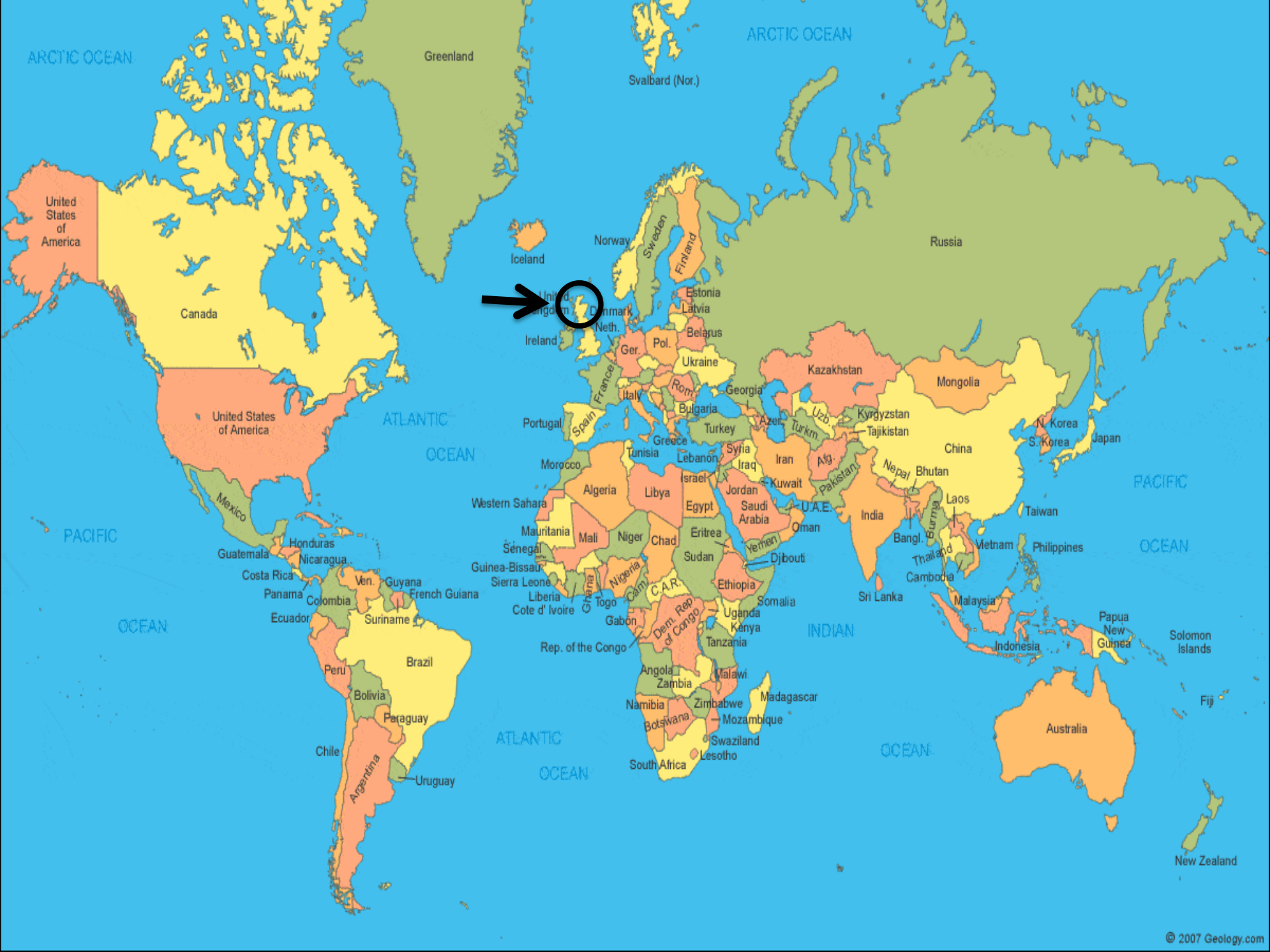


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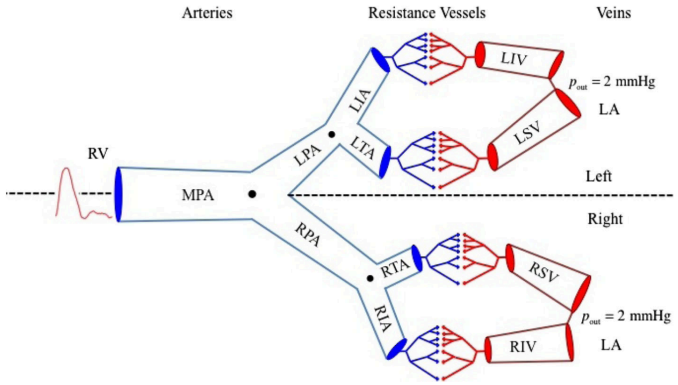
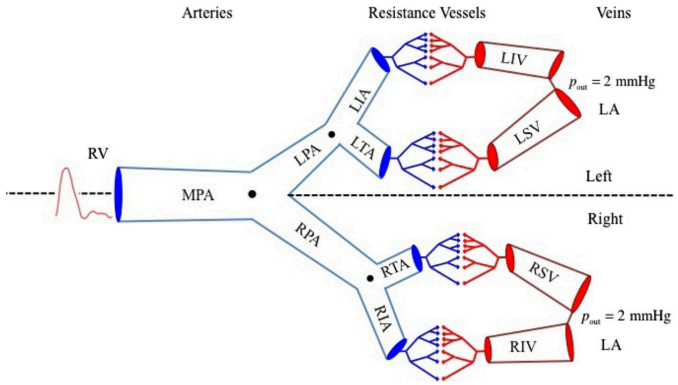
Dynamical System



$$\frac{\partial q}{\partial t} + \frac{\partial}{\partial x}\left(\frac{q^2}{A}\right) + \frac{A}{\rho}\frac{\partial p}{\partial x} = -\frac{2\pi\nu r}{\delta}\frac{q}{A}$$

Dynamical System



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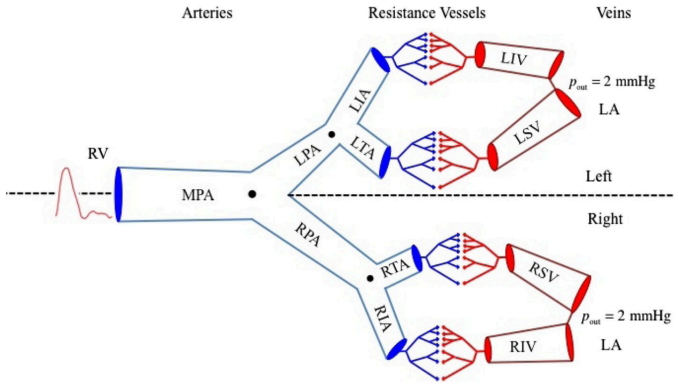
Experimental data

Model prediction

Objective function

Dynamical System



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Closed-form solution

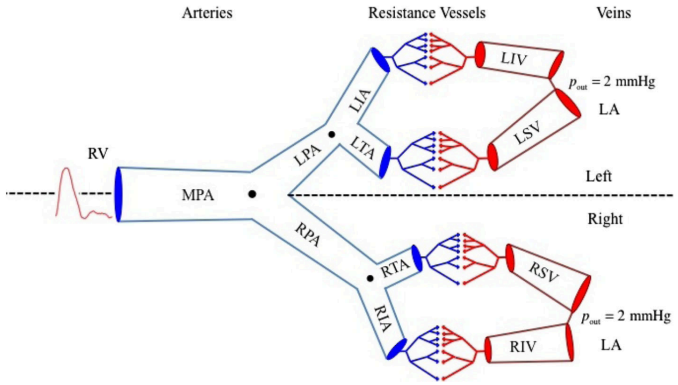
Experimental data

Model prediction

Objective function

Closed-form solution

Dynamical System



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Closed-form solution

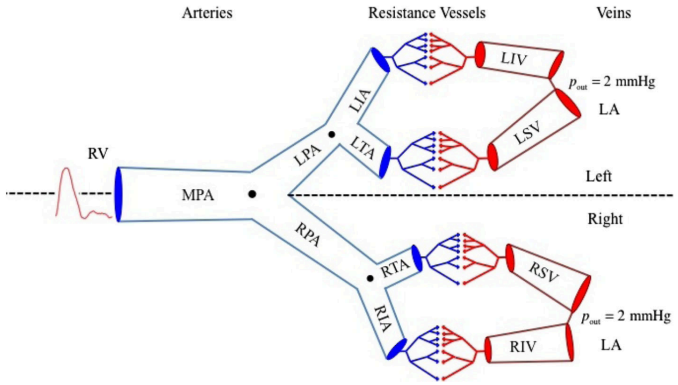
Experimental data

Model prediction

Objective function

Analytically intractable

Dynamical System



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Analytically intractable

Experimental data

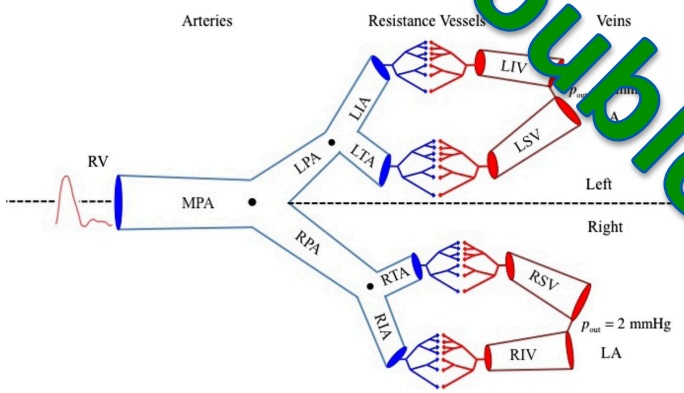
Model prediction

Objective function

Analytically intractable

Dynamical System

Experimental data



Double intractable

Model prediction

$$\frac{\partial q}{\partial t} + \frac{\partial}{\partial x}\left(\frac{q^2}{A}\right) + \frac{A}{\rho}\frac{\partial p}{\partial x} = -\frac{2\pi\nu r}{\delta}\frac{q}{A}$$

Objective function

Analytically intractable

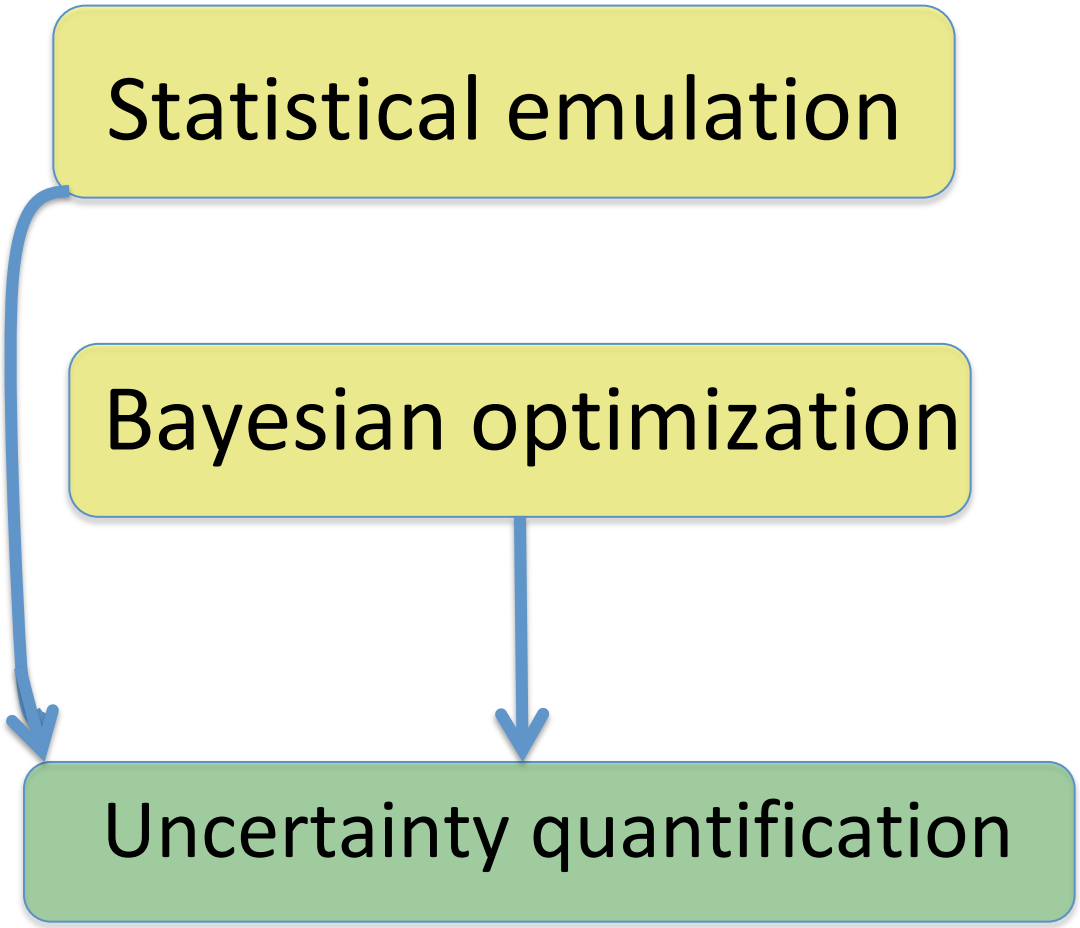
Analytically intractable

Overview

Statistical emulation

Bayesian optimization

Overview


Statistical emulation
Bayesian optimization
Uncertainty quantification

Overview

Statistical emulation

Bayesian optimization

Uncertainty quantification

Gaussian processes