

CCSU
DEPARTMENT OF MATHEMATICAL SCIENCES

COLLOQUIUM

Friday, September 8

3:15 – 4:15 PM

Maria Sanford, Room 101

**ESTIMATING PARAMETERS:
REGRESSION VERSUS ORDINARY
DIFFERENTIAL EQUATIONS**

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Abstract: It is easy to plot a line given a specific equation such as $y = 2t - 1$. And given a dataset (assumed to have noise), estimating the best fitting b_0 and b_1 in $y = b_1t + b_0$ is done with linear regression, which requires knowledge of linear algebra and optimization, but is otherwise straightforward. In contrast, plotting a specific nonlinear equation can be a challenge, and fitting one to data often requires numerical methods. But working with ODEs is even more challenging. Plotting a solution requires using numerical techniques, and estimating the ODE parameters from noisy data may have no evident solution, even in approximation.

This talk starts with the statistical theory of estimating parameters, which is applied to both linear and nonlinear regression. Then examples of ODEs are considered. First, the trajectories of fourteen different types of balls used in sports are compared, which requires looking at both drag and lift as well as the Reynolds number (a dimensionless quantity derived in fluid mechanics). Finally, different orbits of rockets going from the Earth to the Moon are contrasted. Specifically, we consider the successful Chandrayaan-3 mission, the unsuccessful Luna-25, and one of the more recently discovered low-energy transfer trajectories.

To join us online use the following link: <https://ccsu.webex.com/meet/gotchev>

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<http://mathcolloquium.sites.ccsu.edu/>