My name is Maria Teresa Chiri and I am an Assistant Professor in the Department of Mathematics and Statistics at Queen's University.

My research focuses on methods coming from partial differential equations, calculus of variations and control theory to study problems in applied sciences. In particular these are some of the problems I would like to solve.

Problem 1 It is possible to control a stable traveling wave for a system of Parabolic Partial Differential Equation? Specifically, can we reverse the movement of the wave? The answer to this question would help to determine strategies for the eradication of invasive species! The study of this problem requires knowledge of PDEs and optimal control theory.

Problem 2 Imagine having a contaminated region that expands with constant speed in the normal direction. Suppose we can only use pesticides along the boundary of this region. In which parts of the perimeter is it most convenient to distribute the pesticide in order to eradicate the contamination and minimize the quantity of pesticide used? This problem requires knowledge in calculus of variations, geometric measure theory, and control theory

Problem 3 Suppose we want to model the traffic of a large city. One possibility is to consider a network in which each edge is a road and the density of vehicles evolves according to a scalar conservation law. If we consider one equation for each road, the model becomes too complicated, so we use conservation laws for large-capacity streets, and diffusion in $\mathbb{R}^2$ for neighborhoods with small streets. What is an efficient way to write this multiscale model? To study this problem it is necessary to know PDEs and in particular conservation laws.

If you find any of these problems interesting or would like to hear more about my research, do not hesitate to contact me at maria.chiri@queensu.ca