Systems of differential equations, both ordinary and partial, are the main tools in mathematical modelling. They are needed for a description of many phenomena ranging from the movement of deep or shallow water waves, through the evolution of predator – prey systems, to the evolution of the Universe. It is quite frequent however that a system of differential equations describing a given phenomenon is so complicated that there is no apparent way to find even its most simple solution. One of the reasons for this may be the wrong choice of coordinates in which the system of equations is written up; it may happen that after a suitable change of indepedent and/or dependent variables the equations of the system take a form in which finding its general solution is immediate. This made the reason for studies of differential equations independently of coordinates. One performs such studies by considering all equations that can be transformed to a given one by a specific class of transformations of variables as the same. A choice of a 'specific class of transformations' depends on the context or convenience. One of the most natural choices is to consider a class of point transformations, which arbitrarily mix independent and dependent variables, but which do not mix these variables with the derivatives of the dependent variables.

The objectives of the project concern a certain class of systems of partial differential equations for a real function of two real variables considered modulo point transformations. We will show that each system from this class is equivalent to a certain 5-dimensional geometry, called para-CR geometry with Levi form degenerate in one direction. We will find all local differential invariants of such equations, which will enable us to fully classify these systems of differential equations. Using this classification we will find examples of such systems which are highly symmetric. These examples of systems of differential equations, despite of their rather strong nonlinearity, will be realtively easy to solve due to the symmetry.