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Mathematical Physics

Extremum conditions for functionals involving higher derivatives of several variable vector valued functions

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This paper addresses both necessary and relevant sufficient extremum conditions for a variational problem defined by a smooth Lagrangian, involving higher derivatives of several variable vector valued functions. A general formulation of first order necessary extremum conditions for variational problems with (or without) constraints is given. Global Legendre second order necessary extremum conditions are provided as well as new general explicit formula for second order sufficient extremum condition which does not require the notion of conjugate points as in the Jacobi sufficient condition.

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