This talk describes a new framework for solving control and estimation problems in systems modeled by scalar conservation laws with convex flux, with applications to highway traffic flow estimation and control. Using an equivalent Hamilton-Jacobi formulation, we show that the solution to the original PDE can be written semi-analytically. Using the properties of the solutions to HJ PDEs, we prove that when the data of the problem is prescribed in piecewise affine form, the constraints of the model are mixed integer linear. This property enables us to identify a class of transportation engineering problems (control, estimation, fault detection, user privacy analysis) that can be solved exactly using MILPs.

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