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Estimation of turbulent channel flow based on wall measurements

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The unsteady flow estimation problem has been studied for decades. A typical application is feedback control of turbulence based on sensor information such as wall shear stress and pressure. This problem is also relevant to reproduce the entire flow state from limited and noisy flow measurements data.

In this presentation, we will first introduce some previous studies for estimating fully developed turbulent channel flows from wall information by applying several model-based techniques, such as an adjoint method and a kalman filter. Then, we will show our recent attempt using data-driven methods, starting from linear stochastic estimation(LSE) to non-linear machine learning-based estimation.