We have a reasonable corpus of theory and numerical experience in Model Inversion and Data Assimilation, but the abundance of Data that is available today is changing the paradigms and inciting us to study new approaches to these problems. In this talk we will begin by briefly reviewing ?classical? inverse problem and data assimilation theories. Then we will examine the potential of data-driven assimilation and inversion, and detail some of the most promising approaches. This will lead us to the challenging question: how can one couple model- and data-driven approaches to solve complex, industrial decision-making problems in the presence of uncertainty?