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Sparse Approximate Inverses and Target Matrices

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Sparse approximate inverses are a popular choice of preconditioner especially for use in a parallel environment, due to the high degree of parallelizability in both their construction and application. This is certainly true when the preconditioner, P, is calculated by minimizing $\|I - PA\|_F$ via the solution of independent linear least squares problems for the rows separately.

In this talk we will consider generalizations of such preconditioners, which maintain this attractive feature: firstly through use of an alternative norm, and secondly via the use of 'target matrices'. The former has been discussed previously though it appears not to have been exploited. The second and main focus here will be on readily inverted target matrices, T, which form part of a preconditioner when $\|T - PA\|$ is minimized. We will discuss two varieties of target matrices, and show results when a target matrix is used in the solution of advection-diffusion problems.