Accelerating Any EM Algorithm Without Sacrificing Simplicity and Stability

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New Classes of Methods for EM Acceleration

• Developed two new classes of iterative schemes.
• Consider EM as a fixed-point iteration: $\theta = F(\theta)$
• STEM: extension of Steffensen’s method for scalar fixed-point problem
• SQUAREM: novel idea of “squaring” combined with STEM
• SQUAREM more efficient than STEM (3 to 30 fold acceleration in our examples).

Simple, Stable and General

• Easy to implement - require only EM updating function (vectorized parameter).
• No evaluation of $L_{obs}, Q, \text{grads, hess}$.
• Accelerate any linearly convergent scheme (e.g., ECM, ECME, gradient EM)
• Generally non-monotone, but are easily globalized (stabilization and steplength pruning)
• General and automatic (no problem-specific considerations).
• Ideal “off-the-shelf” method for EM acceleration in large and complex statistical problems.
• A simple R function is available