HW for 2019-05-30

(due: 2019-06-05)

1: HALS-RRI Implement the RRI iteration and apply it to the test problem in demo_nmf. Use svd_nmf_init for an initial starting point, and run for 100 iterations. Demonstrate the convergence by giving a semilog plot of $r_k - r_{\mathrm{final}}$ where $r = \|A - WH\|_F$.

2: AA-HALS-RRI Acceleration methods convert a slowly-converging sequences into more rapidly convergent sequences by learning patterns in the relations between steps. Anderson acceleration is an acceleration method that applies specifically to fixed point iterations of the form

$$x^{k+1} = G(x^k)$$

transforming to a new iteration

$$\tilde{x}^{k+1} = \sum_{j=0}^{m-1} \alpha_j G(\tilde{x}^{k-j})$$

where the coefficients α_j are learned from looking at the relation between $\tilde{x}^{k-j}$ and $G(\tilde{x}^{k-j})$ over several steps. A simple code to run a step of Anderson acceleration is included in the class repository. Use this code to accelerate the convergence of RRI in the previous problem, starting about 20 steps in. Again demonstrate the convergence by giving a semilog plot of the $r_k - r_{\mathrm{final}}$.

Note: In order to use Anderson acceleration, you will need to pack the matrices W and H into a single vector x at each step (and then unpack afterward). You can do this using MATLAB's reshape command.