New stochastic sketching methods for Big Data Ridge Regression

Cheikh Saliou Touré

Student at ENS Cachan

Tutor : Robert Gower

Inria Paris (Sierra department)

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Abstract

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1. *Hadamard Sketches*

1.1 Algorithm

1.2 Convergence rate

$Z = AS^T(SAS^T)^{-1}SA$

$D = diag()$
$\rho = 1 - \lambda_{min}(A^{-\frac{1}{2}}E[Z]A^{-\frac{1}{2}})$
$S_i = I_{C_i}H.$

Denote $I_C = [I_{C_1}, I_{C_2}, \ldots, I_{C_r}]$.
$\tilde{A} = HAH^T$.

$$A^{-\frac{1}{2}}E[Z]A^{-\frac{1}{2}} = E[A^{\frac{1}{2}}S^T(SAS^T)^{-1}SA^{\frac{1}{2}}] = \sum_i p_i A^{\frac{1}{2}}H^T I_{C_i}^T(I_{C_i}HAH^T I_{C_i}^T)^{-1}I_{C_i}HA^{\frac{1}{2}}$$
$$= A^{\frac{1}{2}}H^T E[I_C^T(I_C\tilde{A}I_C^T)^{-1}I_C]HA^{\frac{1}{2}} = H^T\tilde{A}^{\frac{1}{2}}E[I_C^T(I_C\tilde{A}I_C^T)^{-1}I_C]\tilde{A}^{\frac{1}{2}}H.$$

We recognize the convergence rate in the Randomized Newton Method and then

2. *Conclusion*

References

[1] Robert Gower and Peter Richtarik, Randomized iterative methods for linear systems, SIAM, (2015).