Preuve

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Abstract

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$$[\nabla_x \frac{1}{2}||Ax-b||_2^2]_j = [\nabla_x \frac{1}{2}(Ax-b).(Ax-b)]_j$$

$$[\nabla_x \frac{1}{2}||Ax-b||_2^2]_j = [\nabla_x \frac{1}{2}(\sum_{i=1}^{n}(\sum_{k=1}^{p} A_{i,k}x_k)^2 - 2b_i(\sum_{k=1}^{p} A_{i,k}x_k) + b_i^2)]_j$$

$$[\nabla_x \frac{1}{2}||Ax-b||_2^2]_j = \frac{\partial \frac{1}{2}(\sum_{i=1}^{n}(\sum_{k=1}^{p} A_{i,k}x_k)^2 - 2b_i(\sum_{k=1}^{p} A_{i,k}x_k) + b_i^2)}{\partial x_j}$$

$$[\nabla_x \frac{1}{2}||Ax-b||_2^2]_j = \frac{1}{2}(\sum_{i=1}^{n} 2(\sum_{k=1}^{p} A_{i,k}x_k)A_{i,j} - 2b_iA_{i,j})$$

$$[\nabla_x \frac{1}{2}||Ax-b||_2^2]_j = (\sum_{i=1}^{n}(\sum_{k=1}^{p} A_{i,k}x_k)A_{i,j} - b_iA_{i,j})$$

$$[\nabla_x \frac{1}{2}||Ax-b||_2^2]_j = (\sum_{i=1}^{n} A_{i,j}(\sum_{k=1}^{p} A_{i,k}x_k) - b_i)$$

$$[\nabla_x \frac{1}{2}||Ax-b||_2^2]_j = \sum_{i=1}^{n} A^T_{j,i}[Ax-b]_i$$

$$[\nabla_x \frac{1}{2}||Ax-b||_2^2]_j = [A^T(Ax-b)]_j$$

$$[\nabla_x \frac{1}{2}||Ax-b||_2^2]_j = [\nabla_x \frac{1}{2}(Ax-b).(Ax-b)]_j$$

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$$[\nabla_x \frac{1}{2}||Ax-b||_2^2]_j = [A^T(Ax-b)]_j$$