

SF3580

Anna Broms & Fredrik Frukland

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1 Task 2

1.1 (a)

Insert figure

1.2 (b)

Insert figure

1.3 (c)

Insert figure

The Rayleigh quotient only uses the symmetric part of A in

$$r(\mathbf{x}) = \mathbf{x}^H A \mathbf{x}$$

assuming \mathbf{x} is normalized. The matrix A is no longer symmetric, i.e. $A \neq A^H$, but any square matrix can be decomposed into a symmetric part A_s and a nonsymmetric part A_{ns} by

$$A = \underbrace{\frac{1}{2} (A + A^H)}_{=A_s} + \underbrace{\frac{1}{2} (A - A^H)}_{=A_{ns}}.$$

Thus

$$r(\mathbf{x}) = \mathbf{x}^H A_s \mathbf{x} + \mathbf{x}^H A_{ns} \mathbf{x} = \mathbf{x}^H A_s \mathbf{x}$$

since

$$\mathbf{x}^H A_{ns} \mathbf{x} = \mathbf{x}^H A \mathbf{x} - \mathbf{x}^H A^H \mathbf{x} = 0.$$

For a nonsymmetric matrix all available information is not used.

2 Task 3

test

3 Task 4

test

4 Task 6

test

5 Task 8

test