Leonard Korp 302582
Nikita Malyschkin 319500
Valentin Engelke 358096

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Foundations of Data Science
Exercise sheet 2

Exercise 1

$$w_1 = \begin{pmatrix} -0.4216370213557839 \\ -0.21081851067789195 \\ -0.10540925533894598 \\ -0.10540925533894598 \end{pmatrix} w_2 = \begin{pmatrix} 0.4216370213557839 \\ -0.4216370213557839 \\ -0.4216370213557839 \\ 0 \end{pmatrix} w = \begin{pmatrix} 0.31622776601683794 \\ -0.31622776601683794 \\ -0.5270462766947299 \\ -0.10540925533894598 \end{pmatrix}$$

Exercise 2

The order of the set of examples matters, as the number of steps can change. With the given set S the algorithm needs to update w 3 times. With S' as

$$S' = [[-1, 2, -4], 1], [[8, -2, -3], 1], [[2, -2, 5], -1], [[-6, 2, 7], -1], [[1, -1, 1], -1], [[4, 2, 1], -1]]$$

only 1 update step is needed.

Exercise 4

a)

$C_{11} = \{A\}, P_{11} = (2, 12)$
$C_{12} = \{B\}, P_{12} = (3, 11)$
$C_{13} = \{C, D, E, F, G, H\}, P_{13} = (7.5, 6)$

$C_{21} = \{A\}, P_{21} = (2, 12)$
$C_{22} = \{B, C\}, P_{22} = (3, 9.5)$
$C_{23} = \{D, E, F, G, H\}, P_{23} = (8.4, 5.6)$

$C_{31} = \{A, B\}, P_{31} = (2.5, 11.5)$
$C_{32} = \{C\}, P_{32} = (3, 8)$
$C_{33} = \{D, E, F, G, H\}, P_{33} = (8.4, 5.6)$

c)

$C_1 = \{\}, P_1 = (100, 100)$
$C_2 = \{\}, P_2 = (200, 200)$
$C_3 = \{A, B, C, D, E, F, G, H\}, P_3 = (6.25, 7.375)$