Support Vector Machines

EECE 580B

Lecture 15
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Linear kernel - 1D

\[ \Phi^0(x) = \frac{x^2}{9} \]
Linear kernel - 1D

\[ \Phi^0(x) \]

\[ \Phi^1(x) \]
Linear kernel - 1D

\[ \Phi^{-1/2}(x) \quad \Phi^1(x) \quad \Phi^0(x) \]
Linear kernel - 2D

\[
\Phi^{[0 \ 0]}(x)
\]
Linear kernel - 2D

\[ \Phi^{[2 \ 0]}(x) \]

\[ \Phi^{[0 \ 0]}(x) \]
Linear kernel - 2D

\[ \Phi^{[-1, 2]}(x) \]

\[ \Phi^{[2, 0]}(x) \]

\[ \Phi^{[0, 0]}(x) \]
Quadratic (homogeneous) kernel - 1D

\[ \Phi^0(x) = \frac{x^4}{9} \]
Quadratic (homogeneous) kernel - 1D

\[ \Phi^0(x) \]

\[ \Phi^{1.2}(x) \]
Quadratic (homogeneous) kernel - 1D

\[ \Phi_0(x) \]

\[ \Phi_{-0.5}(x) \]

\[ \Phi^{1.2}(x) \]
Quadratic (homogeneous) kernel - 1D

\[ \Phi^-0.5(x) \]

\[ \Phi^+0.5(x) \]

\[ \Phi^0(x) \]
Quadratic (homogeneous) kernel - 2D

\[ \Phi^{[0 \ 0]}(x) \]
Quadratic (homogeneous) kernel - 2D

\[ \Phi[1.5, 0](x) \]

\( x[1] \) vs. \( x[2] \) with 3D graph showing the quadratic kernel function.
Quadratic (homogeneous) kernel - 2D

\[ \Phi[-1.3, .5](x) \]
Quadratic (homogeneous) kernel - 2D

\[ \Phi[-1.2, .7](x) \]
Gaussian kernel - 1D

\[ \Phi^0(x) \]
Gaussian kernel - 1D

\[ \Phi^0(x) \quad \Phi^4(x) \]
Gaussian kernel - 1D

$\Phi^{-6}(x)$  $\Phi^0(x)$  $\Phi^4(x)$
Gaussian kernel - 2D

\[ \Phi^{[0 \ 0]}(x) \]
Gaussian kernel - 2D

\[ \Phi^{[0,0]}(x) \quad \Phi^{[4,-2]}(x) \]
Gaussian kernel - 2D
Quadratic (homogeneous) kernel - 2D
Gaussian kernel - 2D