ML Assignment - 2

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Q3) A function $f(x)$ is said to be convex over $[a,b]$ if for some $x_1, x_2 \in [a,b]$ and $\lambda \in (0,1)$

$$f(\lambda x_1 + (1-\lambda) x_2) \leq \lambda f(x_1) + (1-\lambda) f(x_2)$$

Let $g(x)$ be another convex function

$h(x) = f(x) + g(x)$ be the sum of two convex function $f(x)$, $g(x)$.

① → $f(\lambda x_1 + (1-\lambda) x_2) \leq \lambda f(x_1) + (1-\lambda) f(x_2)$

② → $g(\lambda x_1 + (1-\lambda) x_2) \leq \lambda g(x_1) + (1-\lambda) g(x_2)$

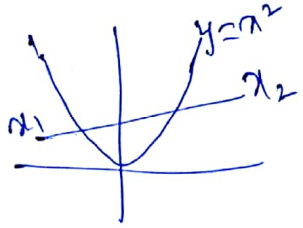
①+② ⇒ $\lambda(f(x_1) + g(x_1)) + (1-\lambda)(f(x_2) + g(x_2))$

⇒ $\lambda\, h(x_1) + (1-\lambda)(h(x_2))$

which is $\geq h(\lambda x_1 + (1-\lambda) x_2)$

∴ $h(x) = f(x) + g(x)$ is also a convex function.

→ Lasso with MSE is of the form $y = x^2$ which is also convex in nature



⇒ which denoted the convexity of LASSO with MSE error, since the Graph lies below the line passing through $x_1, x_2 \in [a,b]$ where $[a,b] \in f(x)$.

Q2) The kernel used in RBF kernel implementation is an exponential function whose expansion spreads in multiple directions, which often leads to Overfitting of the model.

This is avoided in general to prevent overfitting of the model.