The kernelized version of the logistic regression then becomes:

$$K(\mathbf{X}, \mathbf{X}') = \langle \Phi(\mathbf{X}), \Phi(\mathbf{X}') \rangle$$

Again, the kernel matrix K represents the dot products in the transformed space, and we compute the dual coefficients to obtain the model.

These mathematical representations encapsulate the kernel trick across linear, polynomial, and logistic regression methods. It allows for the computation of complex relationships without explicitly mapping the data to higher dimensions.