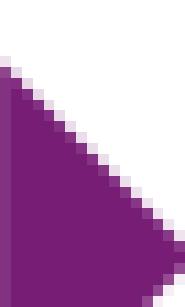# KERNELS AS BUILDING BLOCKS

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▶ **Product:** Given kernels K_1 and K_2 define the product kernel

$$K_1 K_2(x, dx') = \int_{\mathbb{X}} K_1(x, dy) K_2(y, dx')$$

▸ In discrete case corresponds to matrix multiplication

$$(K_1 K_2)(x, x') = \sum_y K_1(x, y) K_2(y, x')$$

▶ Given K we denote $K^t = K \cdots K$ as the t-times composition of K

▸ Algorithmically corresponds to composition of algorithms

$$1. \text{ Input } X$$
$$2. \ Y \sim K_1(X, \mathrm{d}y)$$
$$3. \text{ Return } X' = K_2(Y, \mathrm{d}x')$$

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```
1. Input  X
2. Y ~ K₁(X, dy)
3. Return  X' = K₂(Y, dx')
```

KERNELS AS BUILDING BLOCKS