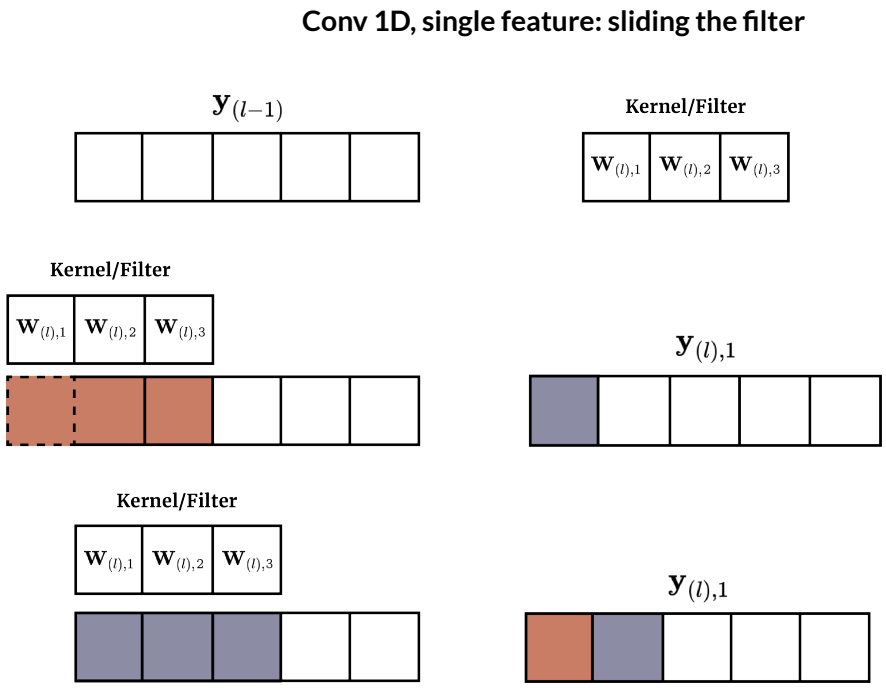
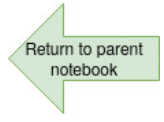
Conv 1D: One spatial dimension

Conv 1D: single feature

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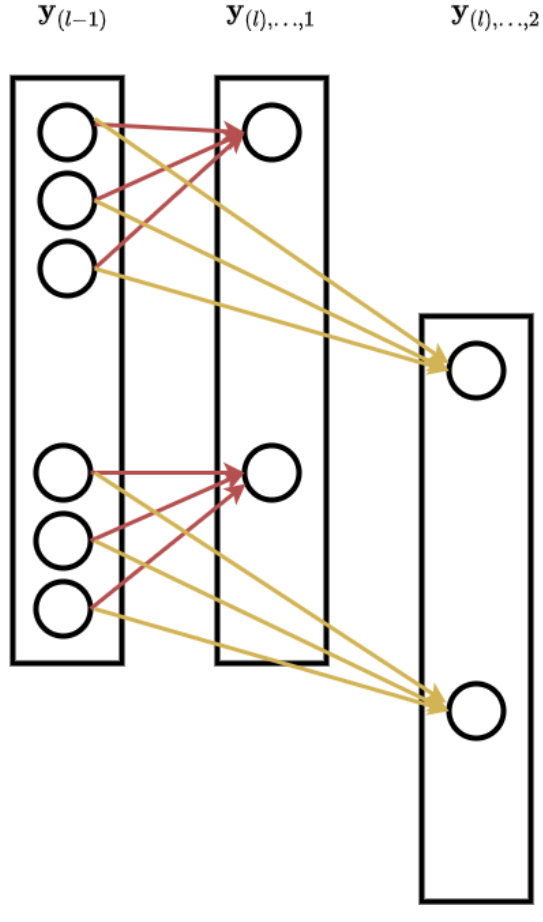
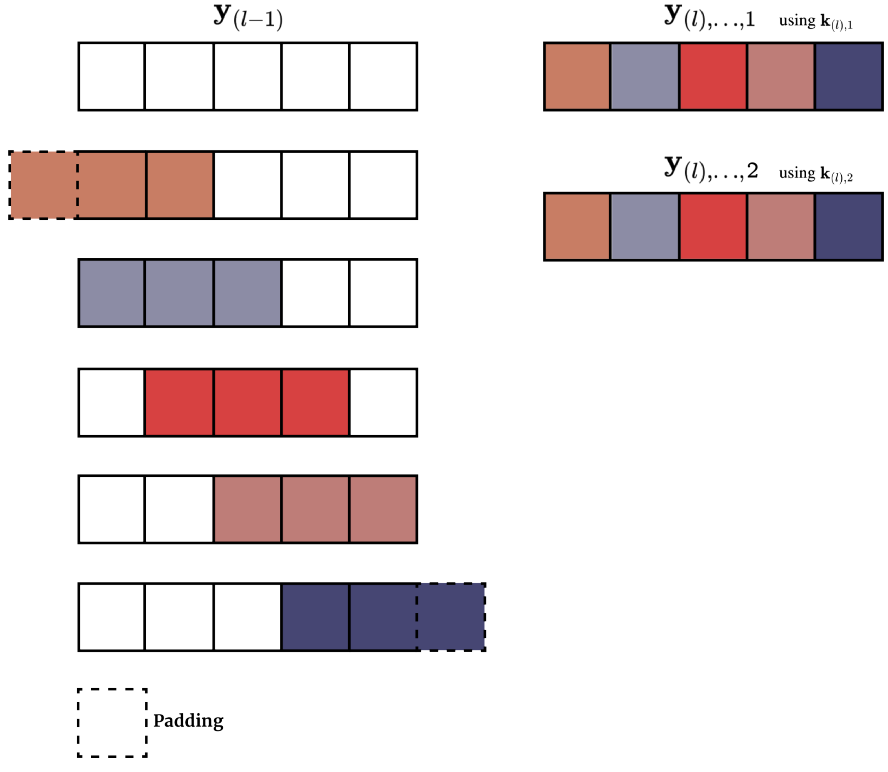
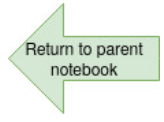
Conv 1D: single feature to multiple features

Conv 1D: single feature to multiple features



Conv 1D, single feature to multiple features

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Conv 1D: Multiple features to multiple features

When the input $\mathbf{y}_{(l-1)}$ has more than one feature ($n_{(l-1)} > 1$)

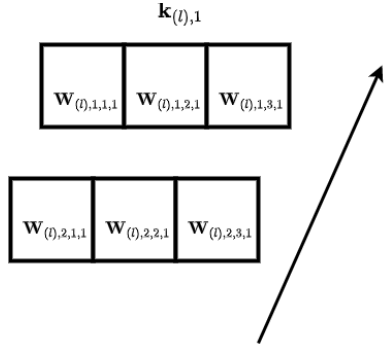
- the kernel for each output feature must have feature dimension of length $n_{(l-1)}$

Here is the kernel for the first output feature, assuming $n_{(l-1)} = 2$

- it's feature dimension is length 2.

There would be a similar kernel for each of the output features.

Conv 1D: 2 input features: kernel 1

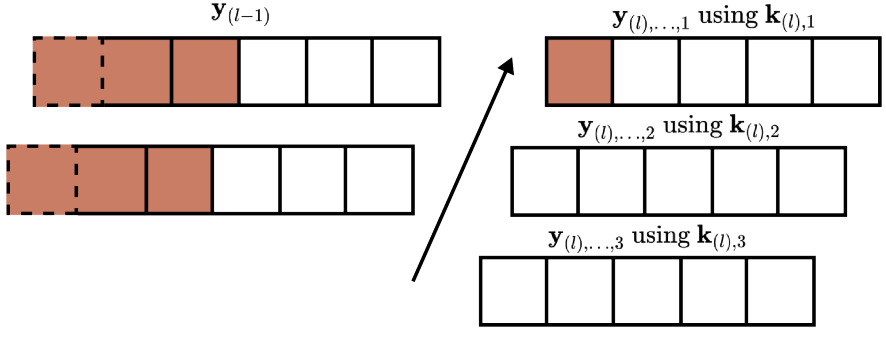


- $\mathbf{W}_{(l),j',\ldots,j}$
  - layer l
  - output feature j
  - spatial location: $\ldots \in \{1, 2, 3\}$
  - input feature j'

Let's illustrate how this works.

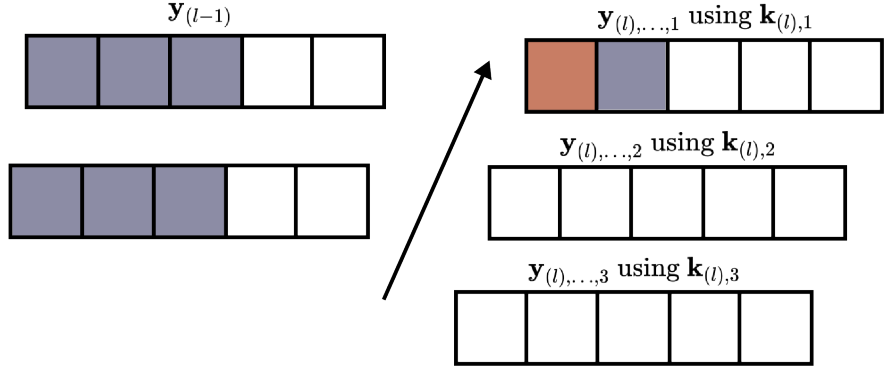
- Output feature 1
- Spatial location 1

Conv 1D: 2 features to 3 features: kernel 1



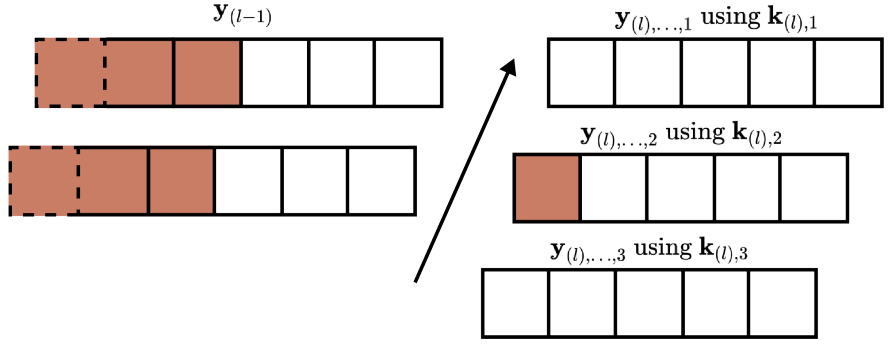
- Output feature 1
- Spatial location 2

Conv 1D: 2 features to 3 features: kernel 1



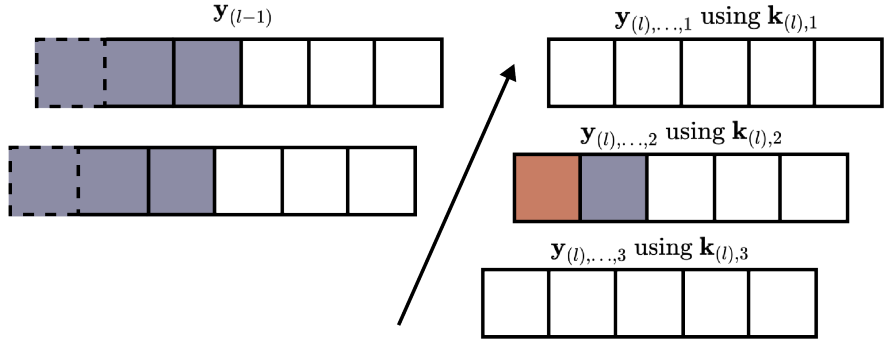
- Output feature 2
- Spatial location 1

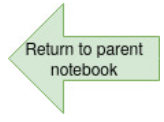
Conv 1D: 2 features to 3 features: kernel 2



- Output feature 2
- Spatial location 2

Conv 1D: 2 features to 3 features: kernel 2

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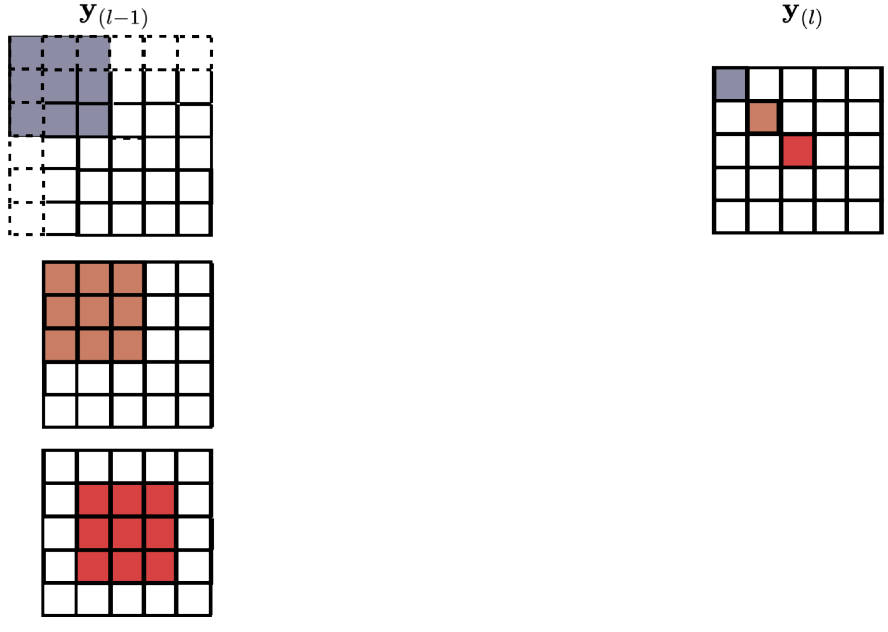
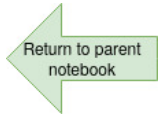
Conv 2D: Two spatial dimensions

Conv 2D: single feature to single feature

Conv 2D, single feature to single feature: padding at border

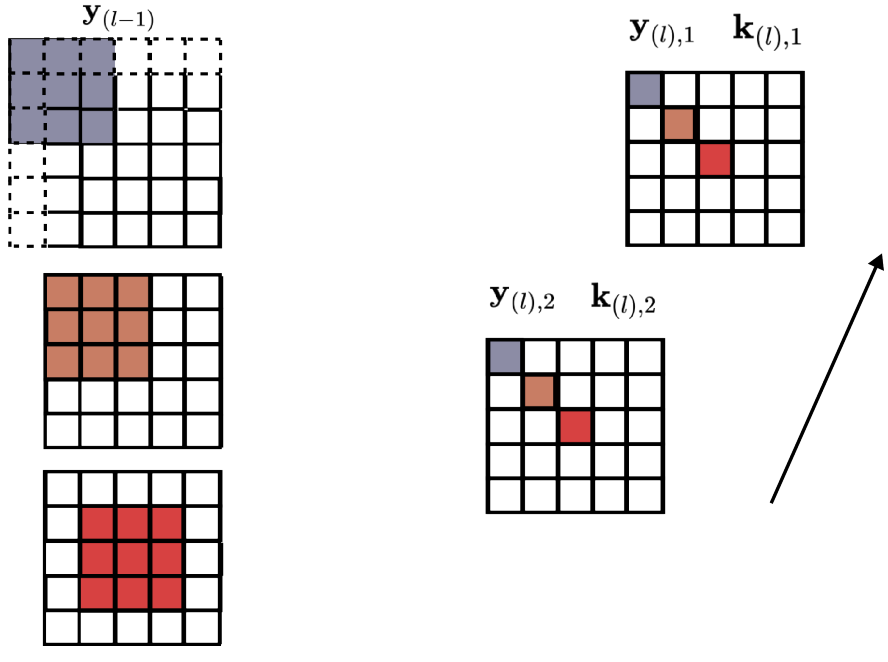


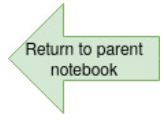
1



Conv 2D: single feature to multiple features

Conv 2D, single feature to multiple features: padding at border

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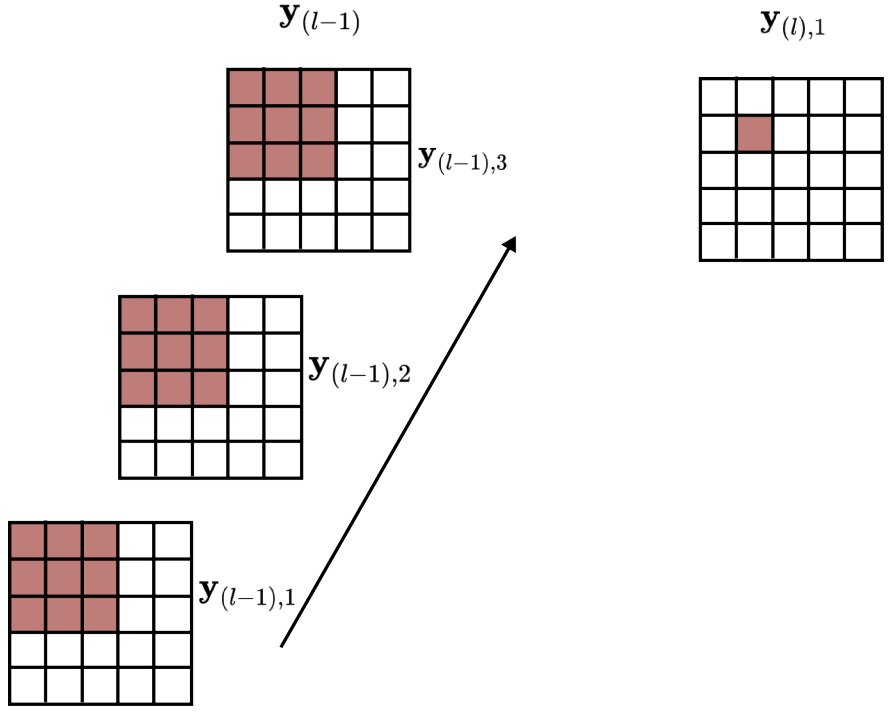
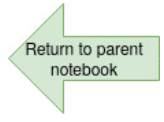
Conv 2D: multiple features to single feature

Conv 2D, multiple input, single output feature: padding at border

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Conv 2D: multiple features to multiple features

Conv 2D, multiple input, multiple output features