# CNN Architecture

ML Instruction Team, Fall 2022

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# Convolutional Neural Networks: History

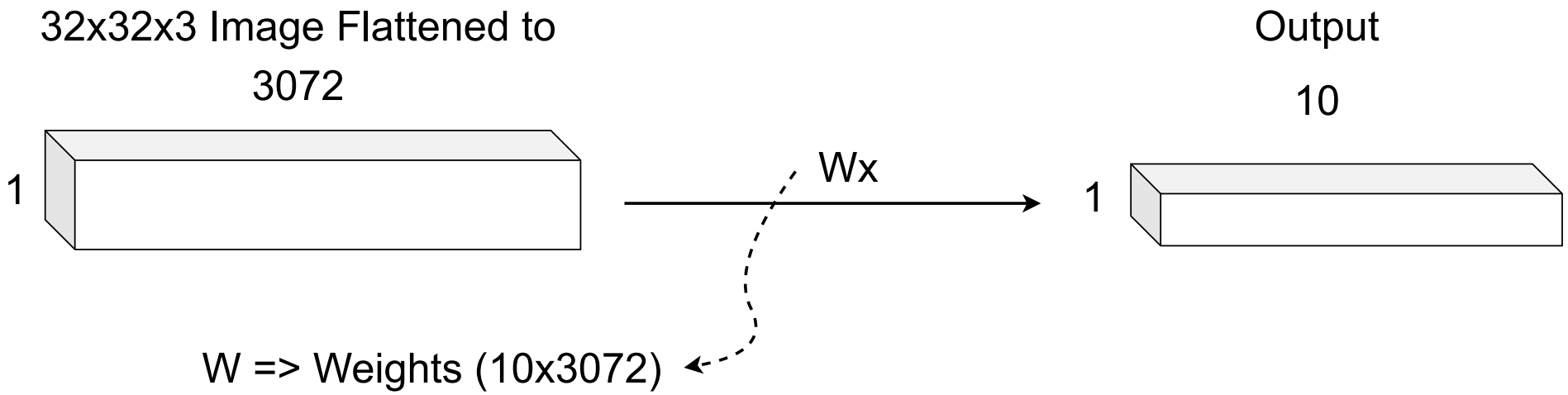
## Biological Inspiration of Convolutional Neural Networks

**Hubel and Wiesel**

- 1959
- 1961
- 1968

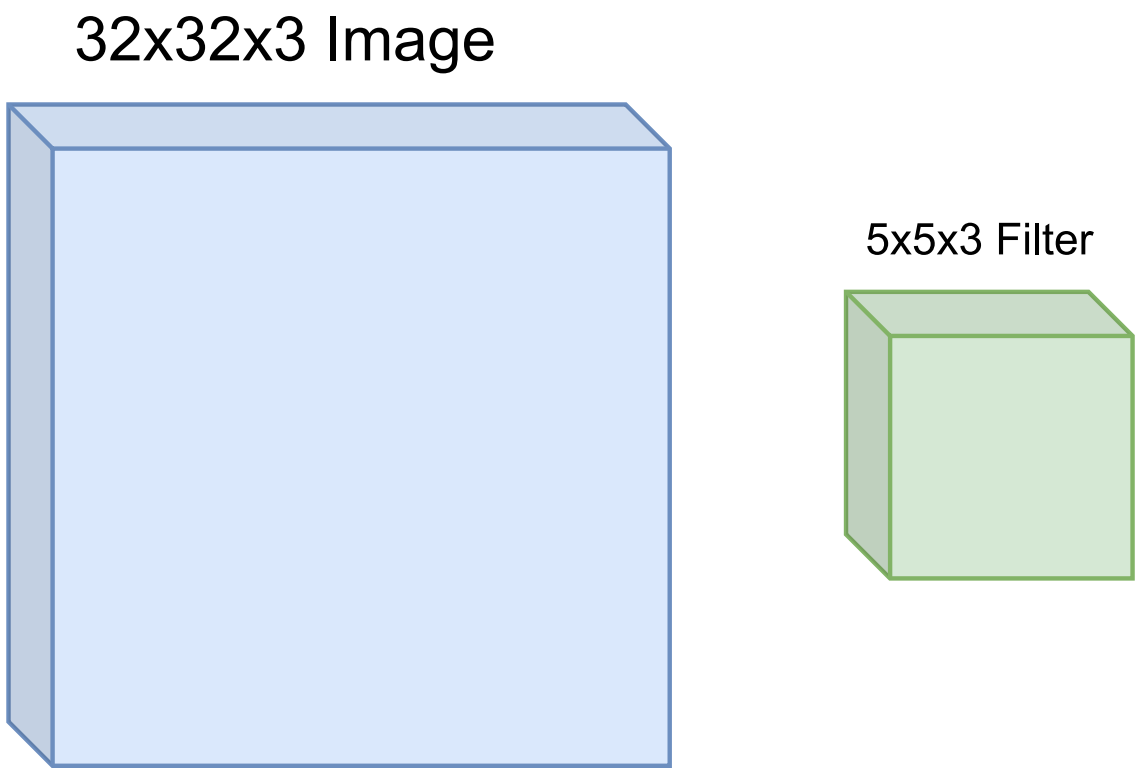
# CNNs

## What we've been using:
### Fully Connected Layers



# CNNs

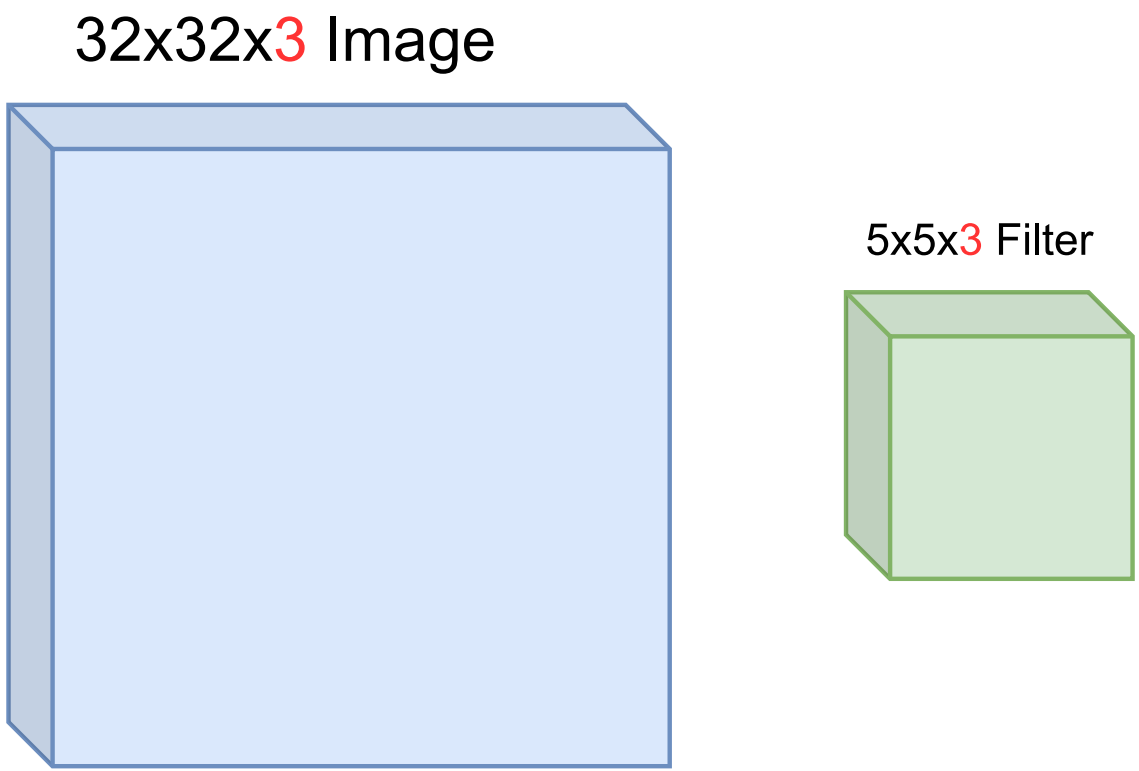
## What we're going to learn:
### Convolutional Layer



# CNNs

## Convolutional Layer

- Filters always extend the full depth of the input volume. (#Input channels == #Filter Channels)

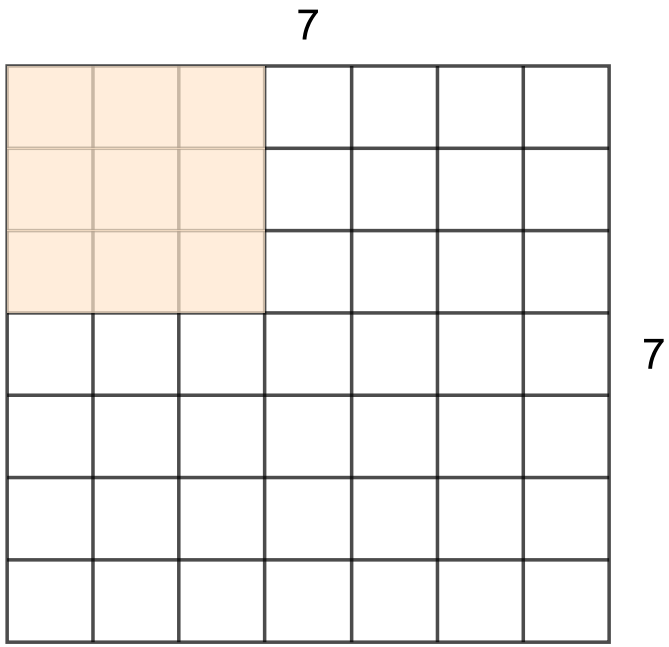


# What is a Stride

The amount of movement between applications of the filter to the input image is referred to as the stride, and it is almost always symmetrical in height and width dimensions.

Closer look

- 7x7 input with 3x3 filter



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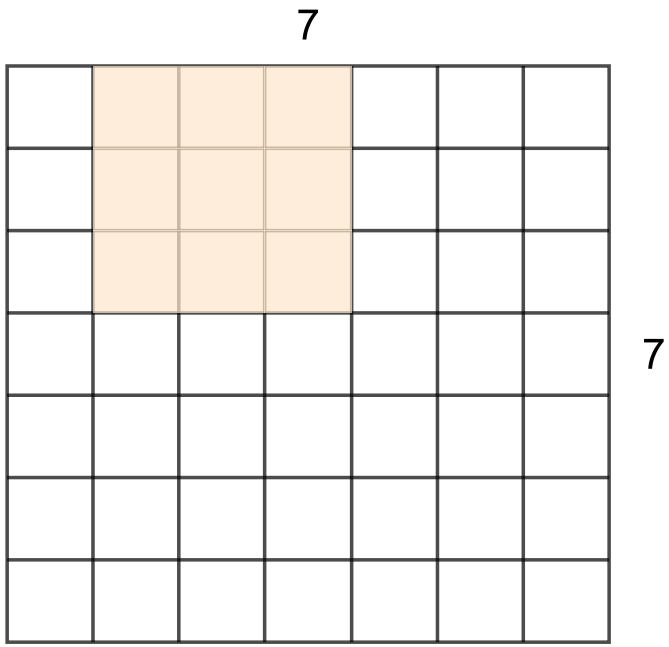

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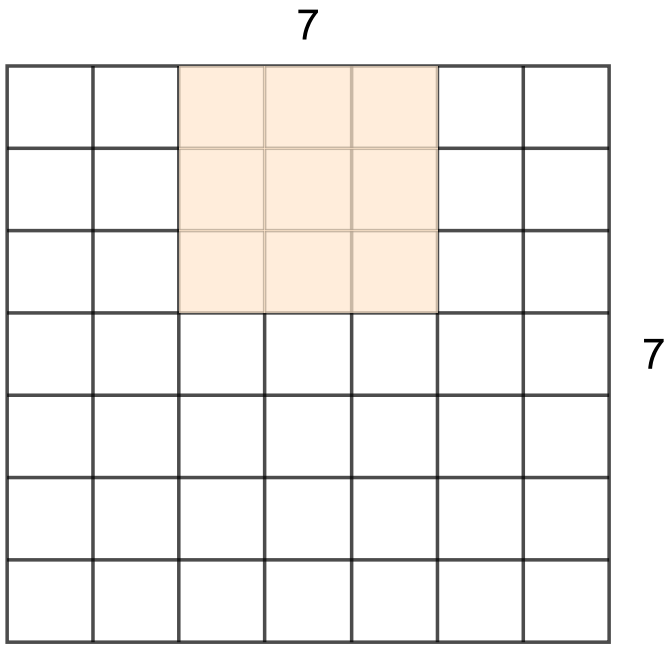

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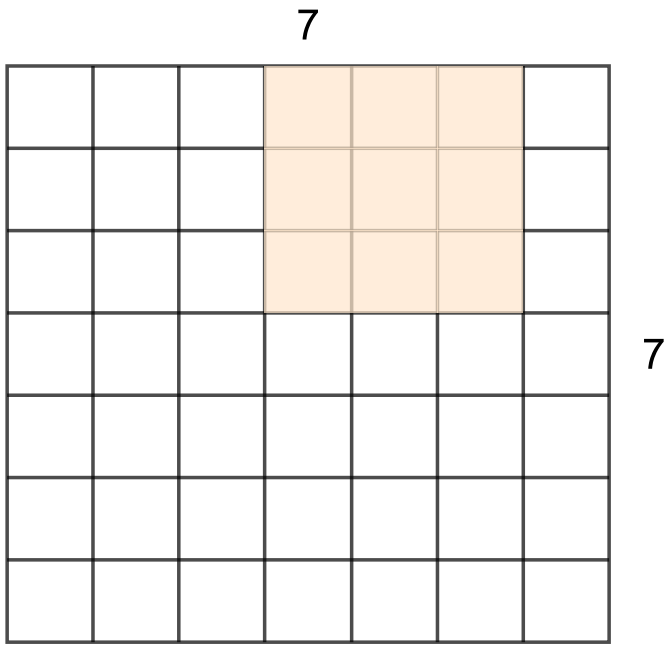
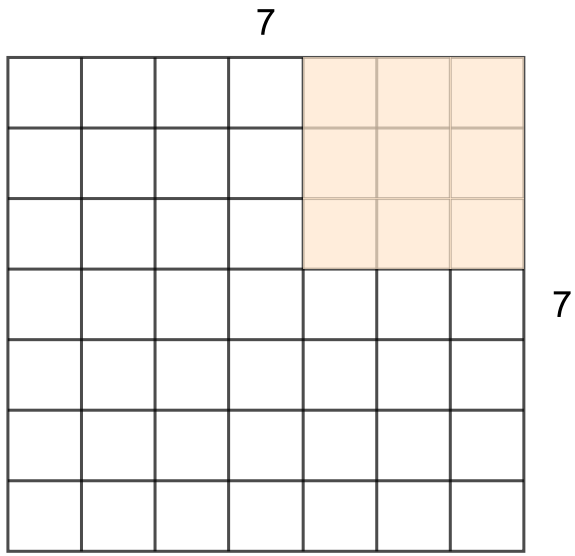


# What is a Stride

The amount of movement between applications of the filter to the input image is referred to as the stride, and it is almost always symmetrical in height and width dimensions.

Closer look

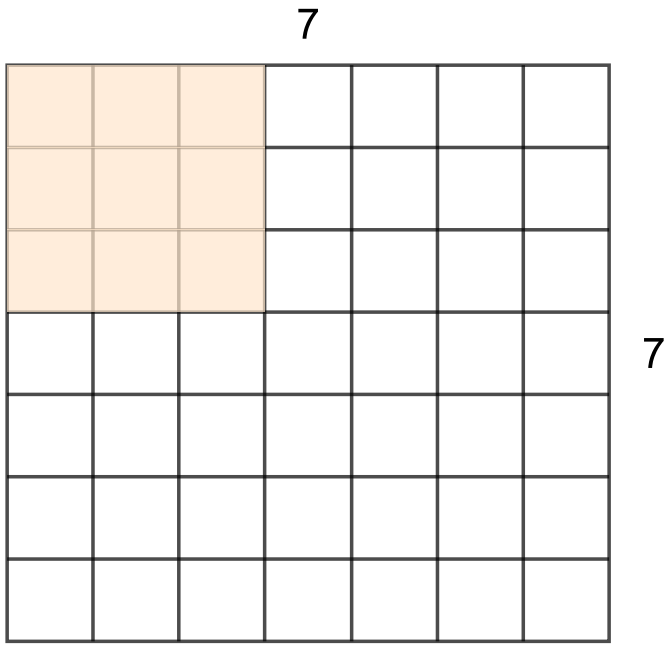
- 7x7 input with 3x3 filter
- This was a Stride 1 filter
- => Outputs 5x5



# Stride

## Now let's use Stride 2

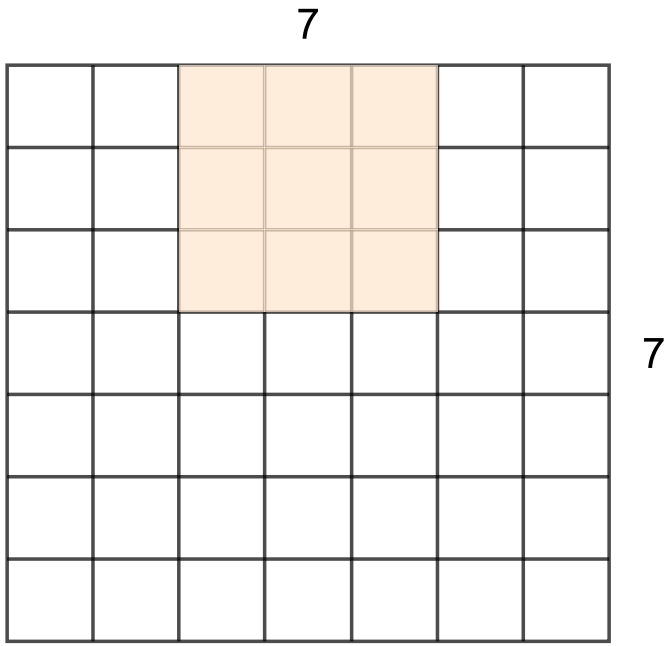
- 7x7 input with 3x3 filter



# Stride

Now let's use Stride 2

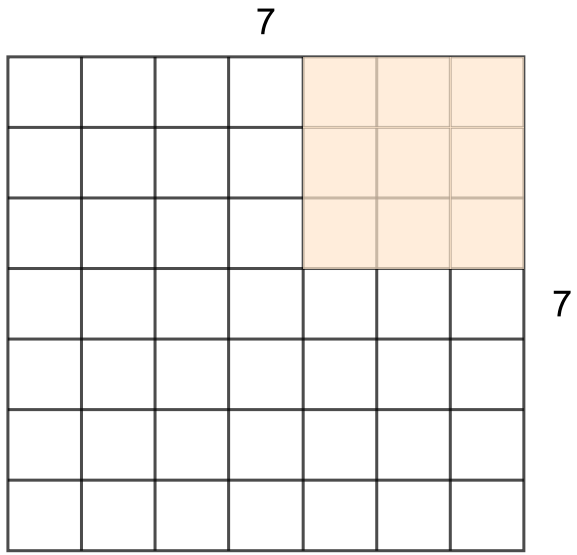
- 7x7 input with 3x3 filter



# Stride

Now let's use Stride 2

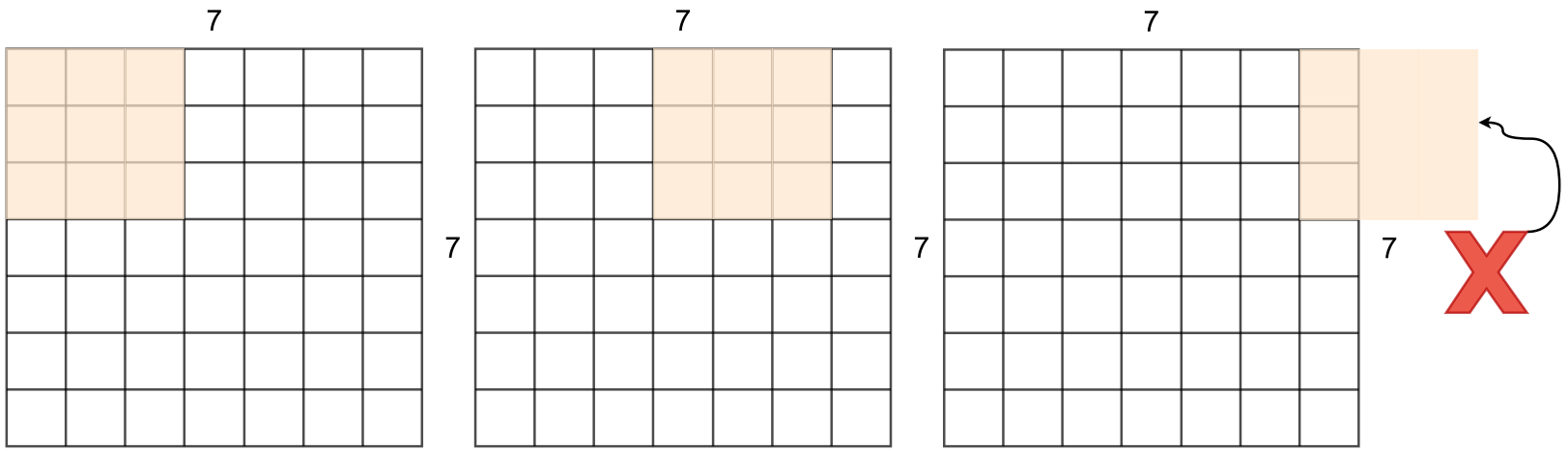
- 7x7 input with 3x3 filter
- This was a Stride 2 filter
- => Outputs 3x3



# Stride

## Stride 3?

- 7x7 input with 3x3 filter

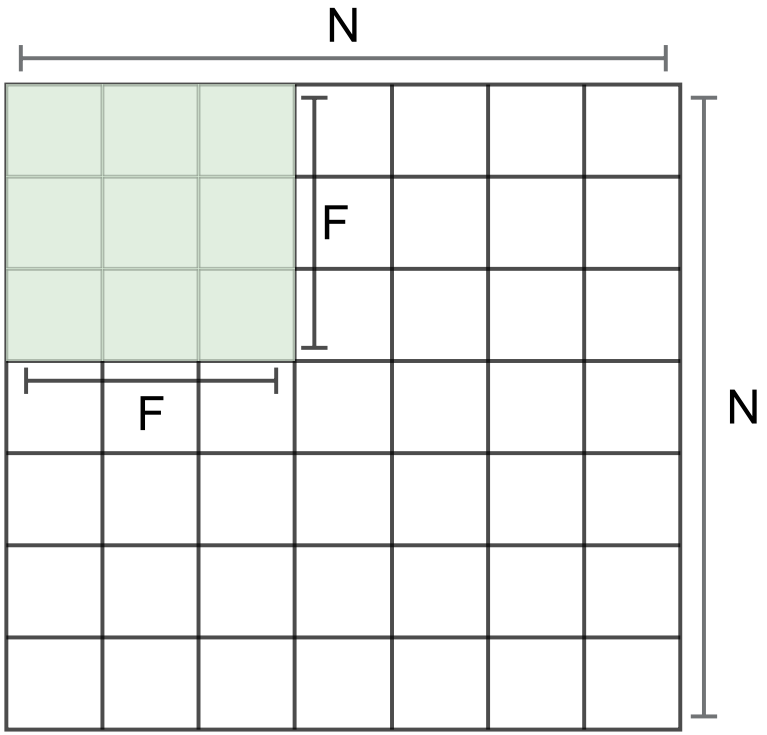


# Stride

So 7x7 input with 3x3 filter and stride 3 doens't work!

Let't do the calculations:

$$OutputSize = (N - F)/Stride + 1$$

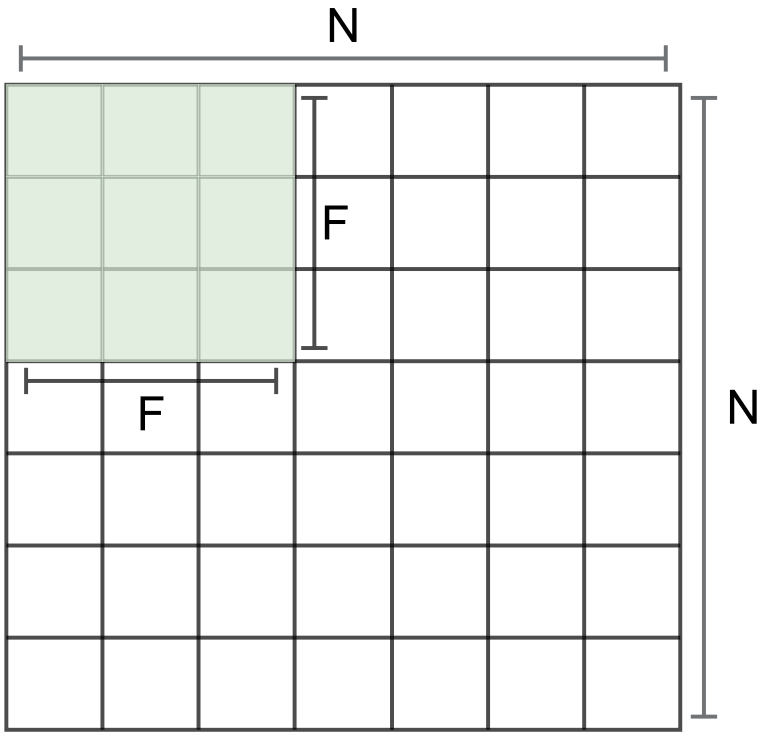


# Stride

$$OutputSize = (N - F)/Stride + 1$$

N = 7, F = 3 =>

- Stride 1 ==> $(7 - 3)/1 + 1 = 5$
- Stride 2 ==> $(7 - 3)/2 + 1 = 3$
- Stride 3 ==> $(7 - 3)/3 + 1 = 2.33$ :))



# Padding

# Final Notes

**Thank You!**

**Any Question?**