Working with Multidimensional Data Using NumPy

EXPLORING MULTIDIMENSIONAL DATA USING NUMPY

Overview

Fundamental package for scientific computing in Python

Basic building block is a powerful n-dimensional array

Forms the core of the Python ecosystem of open source software for math, science and engineering

Offers easy to use functions to process multi-dimensional arrays

Course Outline

Exploring multidimensional data
- Creating, printing, basic operations
- Shape manipulation, deep and shallow copies

Complex indexing
- Indexing using array indices
- Broadcasting, stacking vectors
- Support Vector Machines for text and image classification, Gradient Boosting for regression

NumPy with other libraries
- SciPy and Pandas
- KNN with TensorFlow

NumPy Ecosystem

statsmodel

Estimate statistical models, and perform tests

scikit-image

Collection of algorithms for image processing

scikit-learn

Simple and efficient tools for machine learning in Python

pandas

Data analysis and manipulation

matplotlib

Plotting library for 2D graphs and visualizations

NumPy Ecosystem

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Estimate statistical models, and perform tests

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Data analysis and manipulation

matplotlib

Plotting library for 2D graphs and visualizations

NumPy

Demo

Creating multidimensional arrays

Demo

Printing arrays

Demo

Basic arrays operations

Demo

Universal functions to perform familiar mathematical operations

Demo

Indexing and slicing of arrays

Demo

Iterating over arrays

Demo

Changing the shape of an array

Demo

Splitting arrays

Demo

Image manipulation

Images as Arrays

Images as Arrays
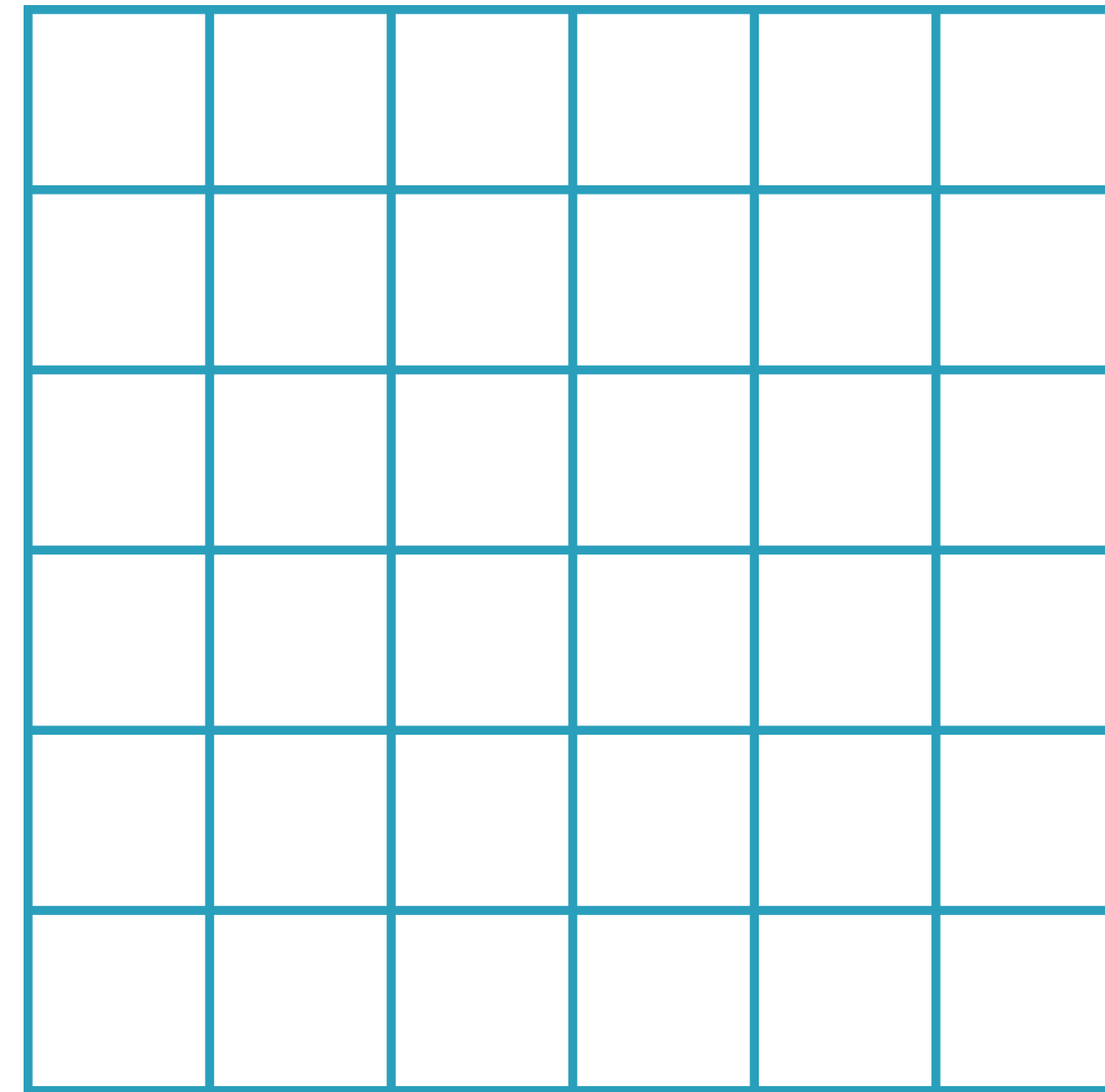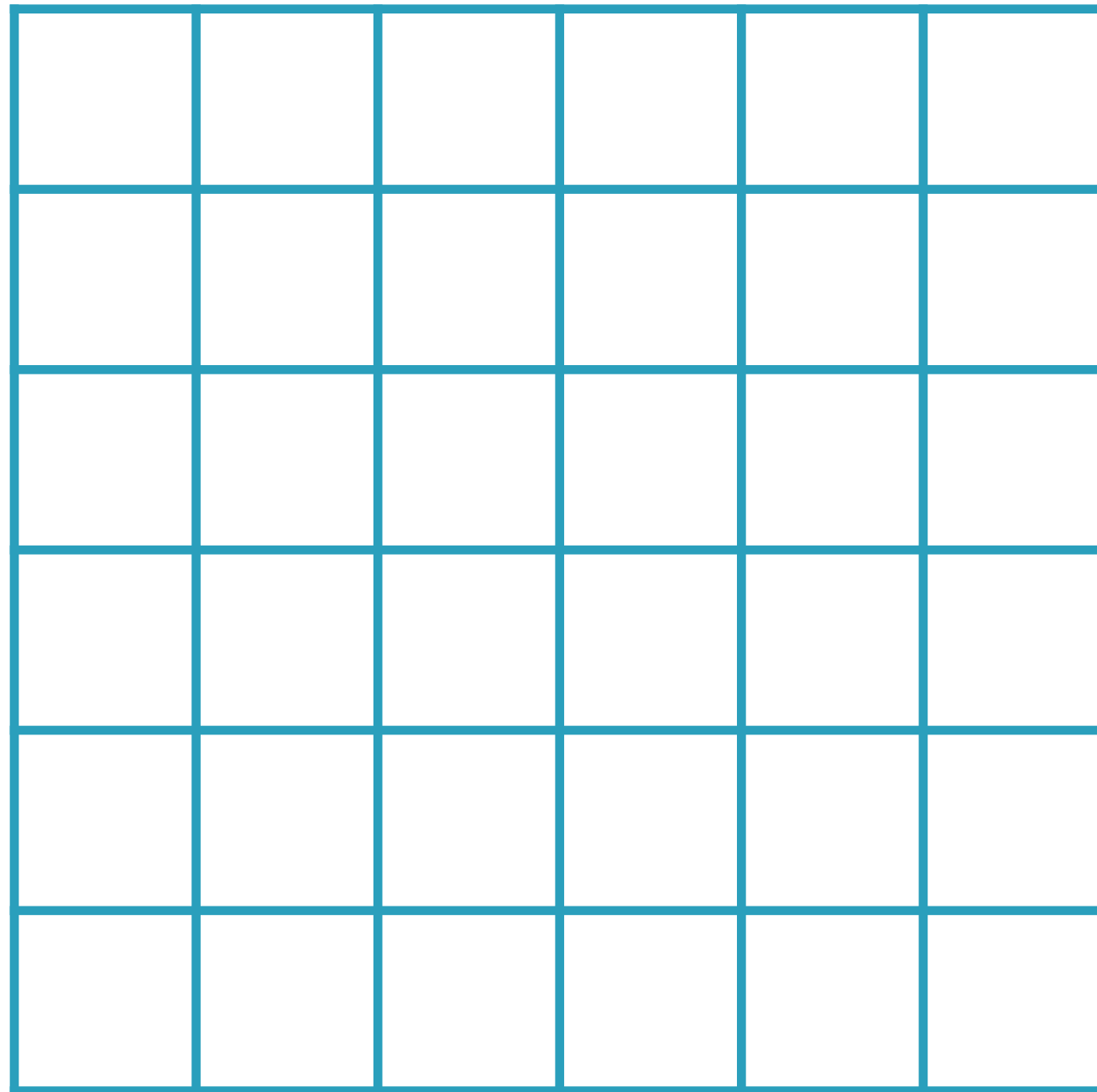

Each pixel holds a value based on the type of image

RGB Images
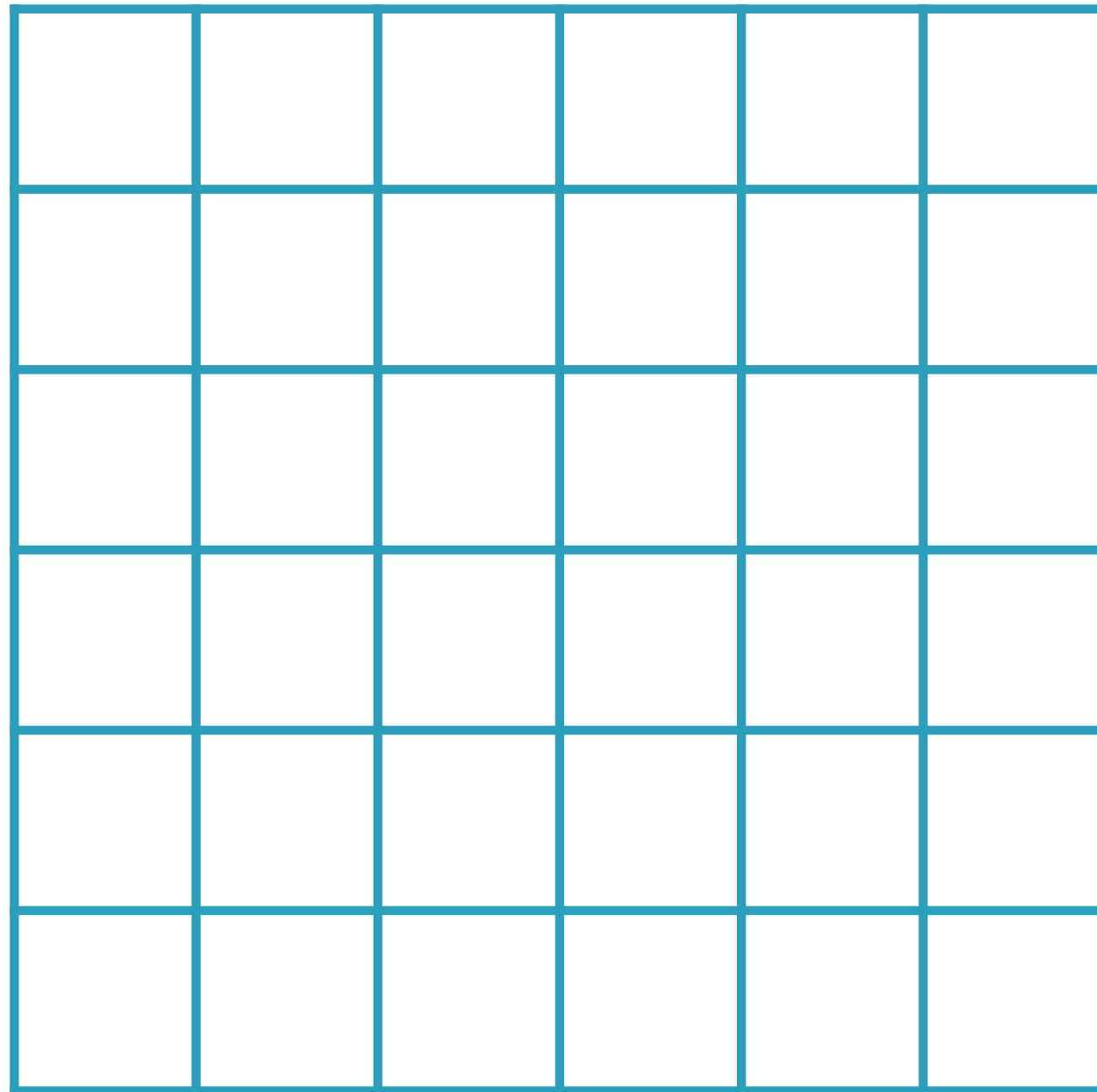
RGB values are for color images

R, G, B: 0-255

RGB Images

255, 0, 0

RGB Images
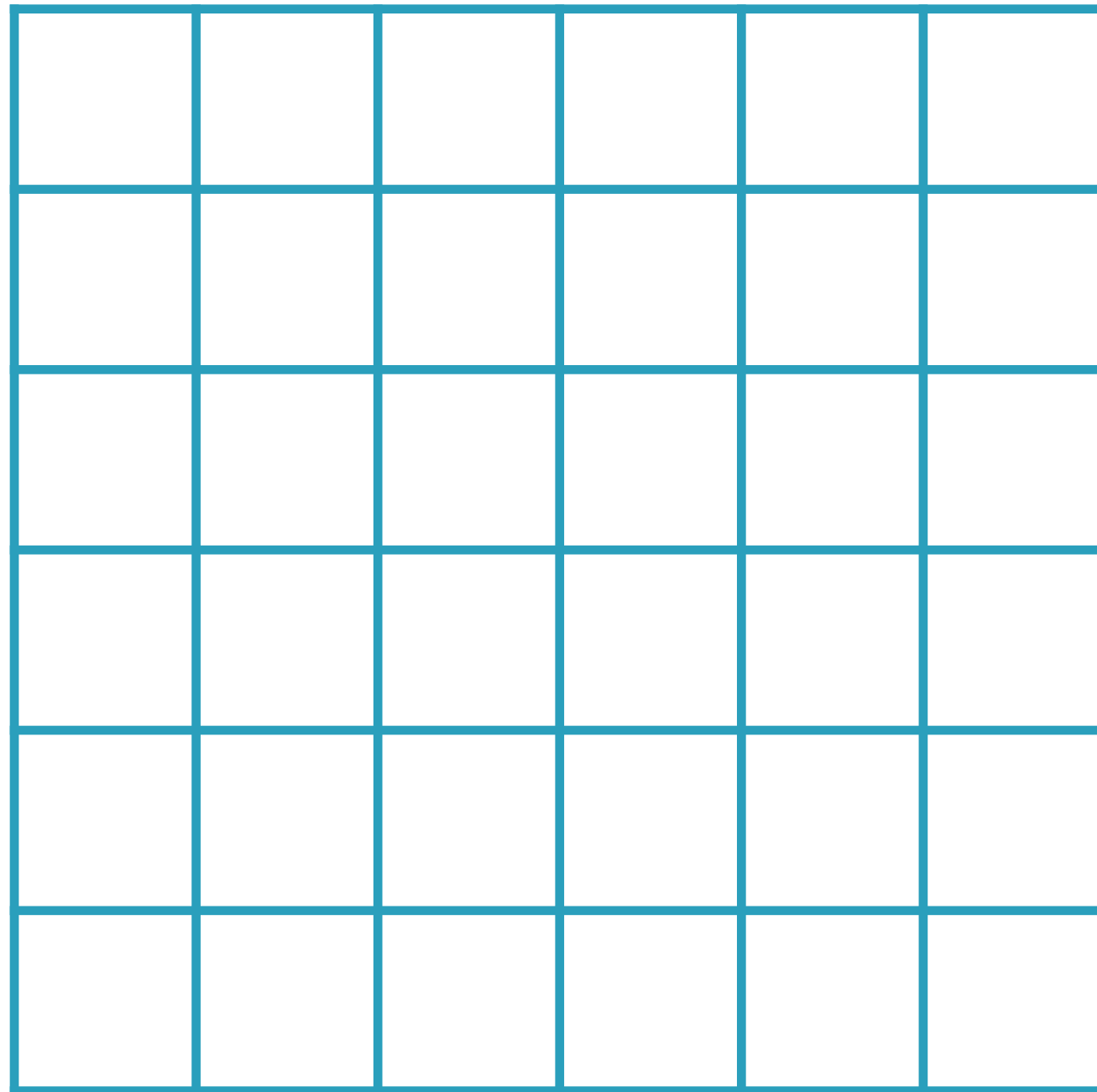
0, 255, 0

RGB Images
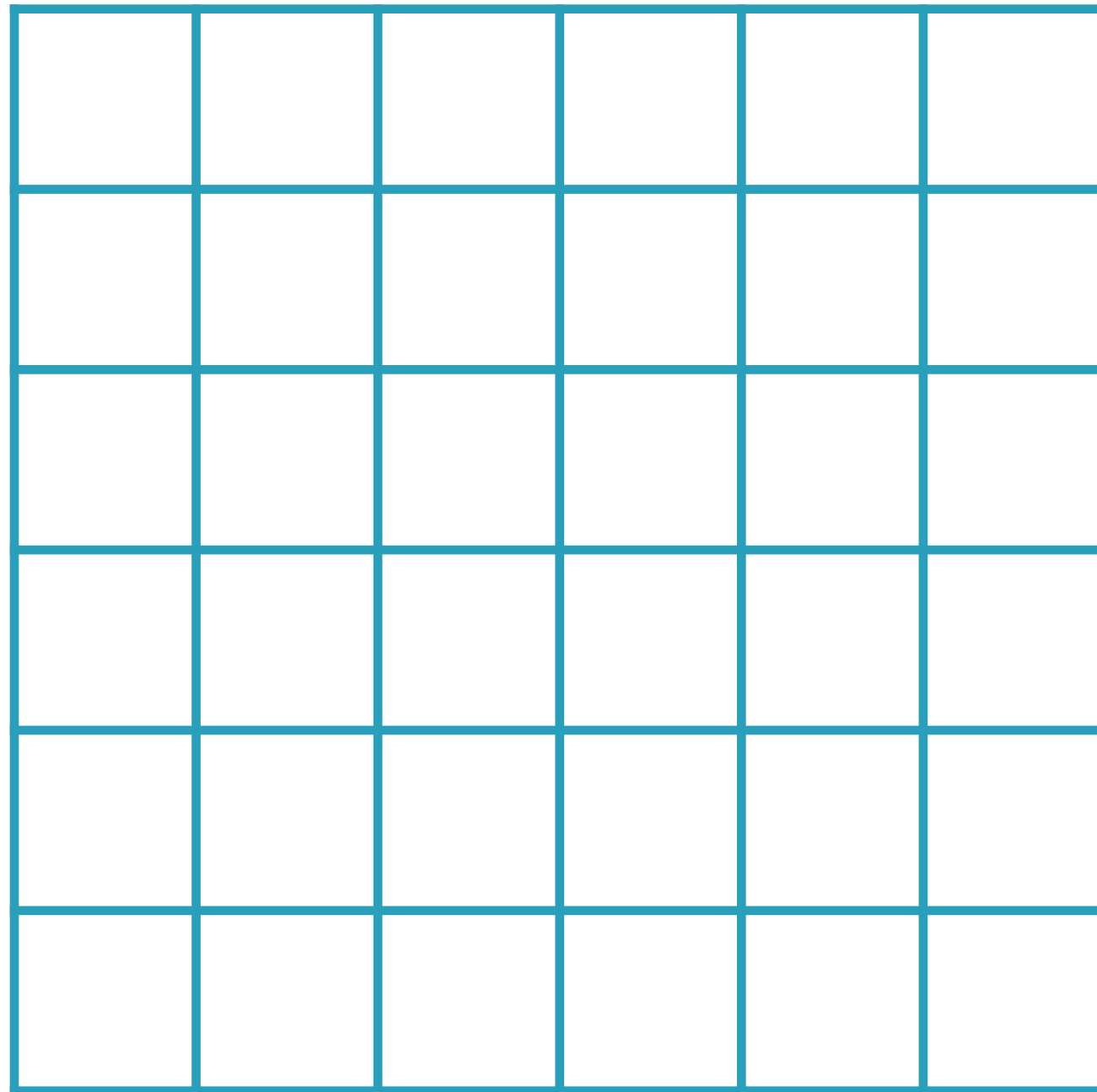
0, 0, 255

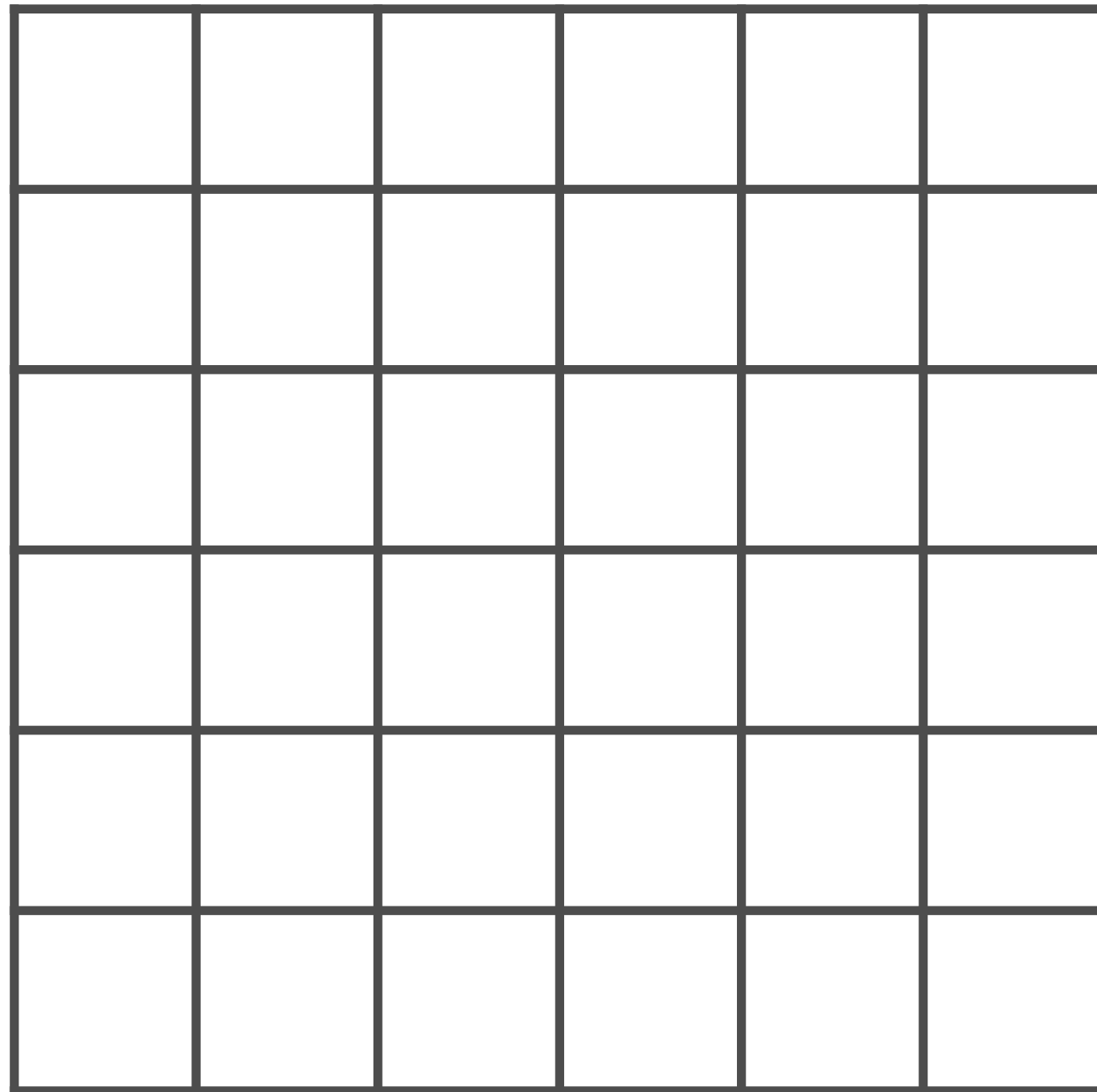**3** values to represent color, **3** channels

Grayscale Images
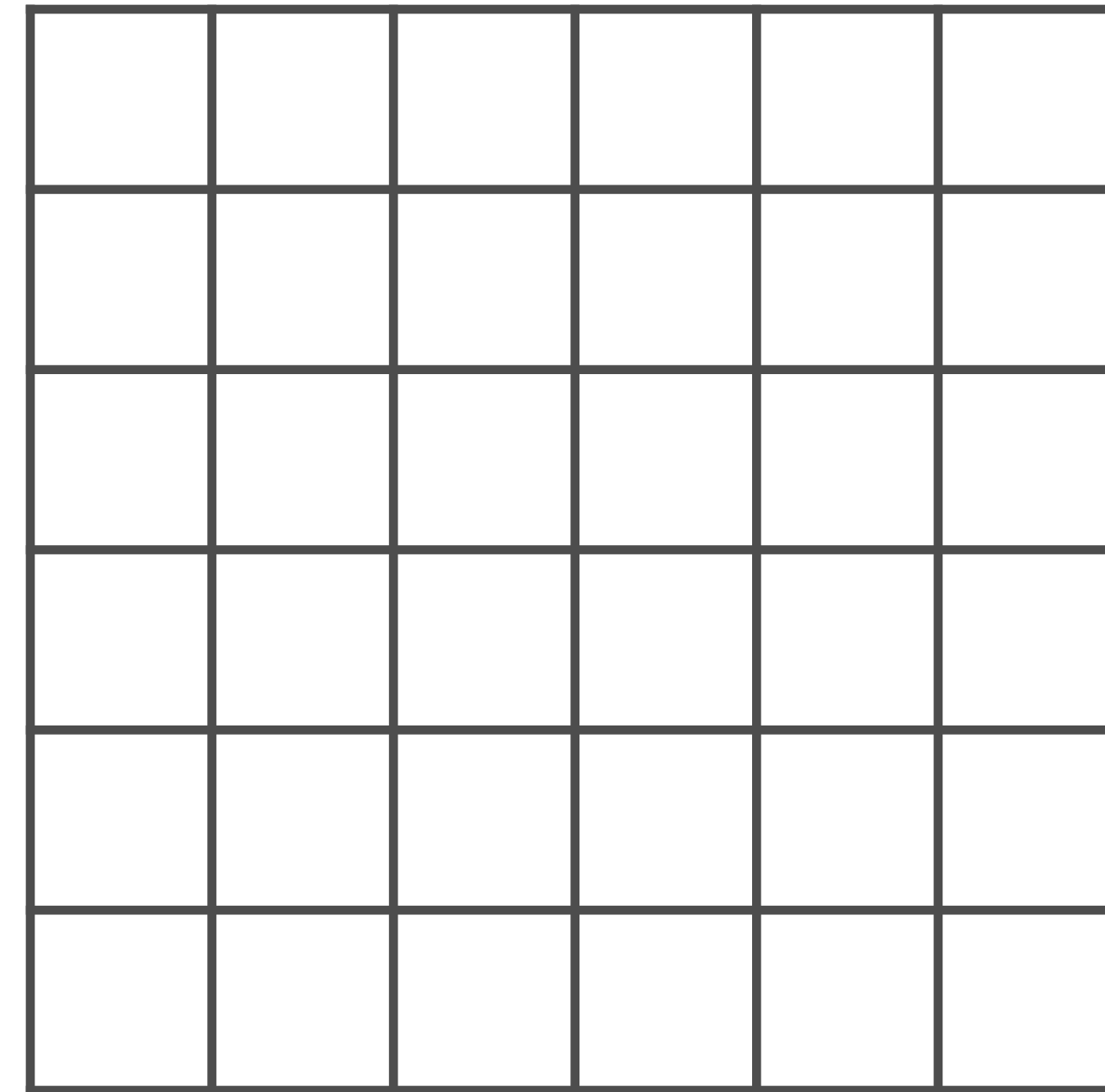
Grayscale Images
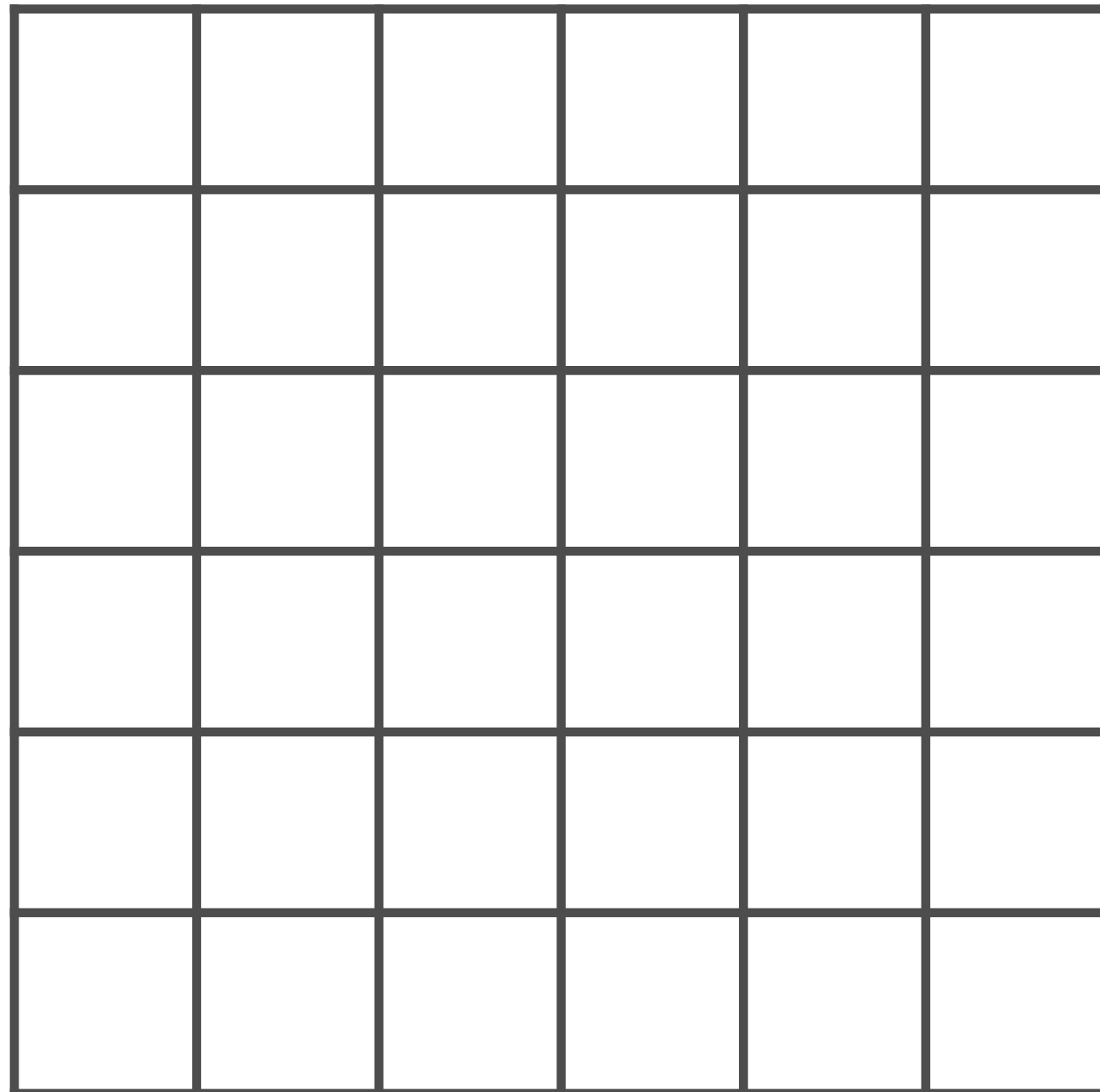
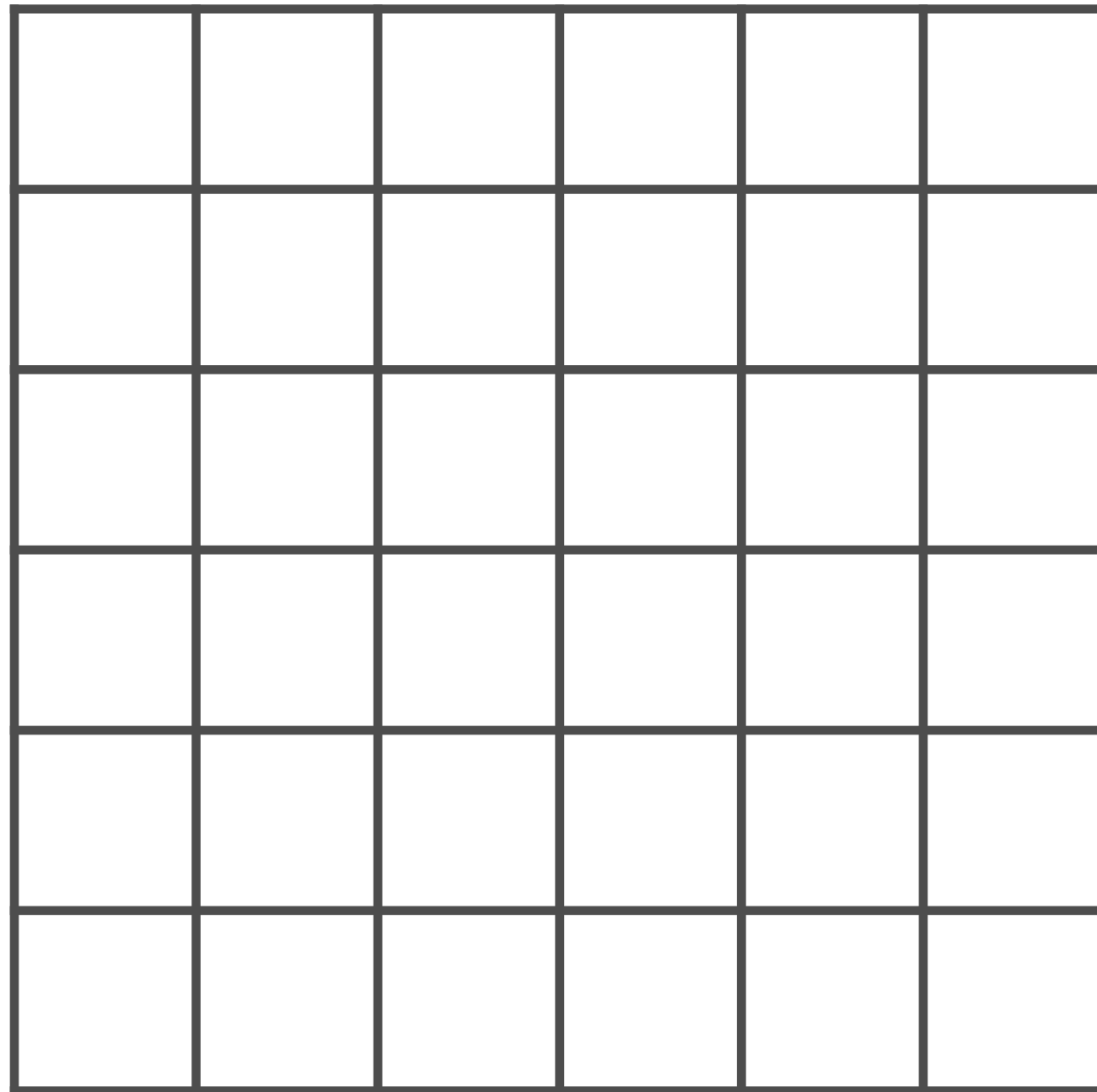**Each pixel represents
only intensity information**

0.0 - 1.0

Grayscale Images
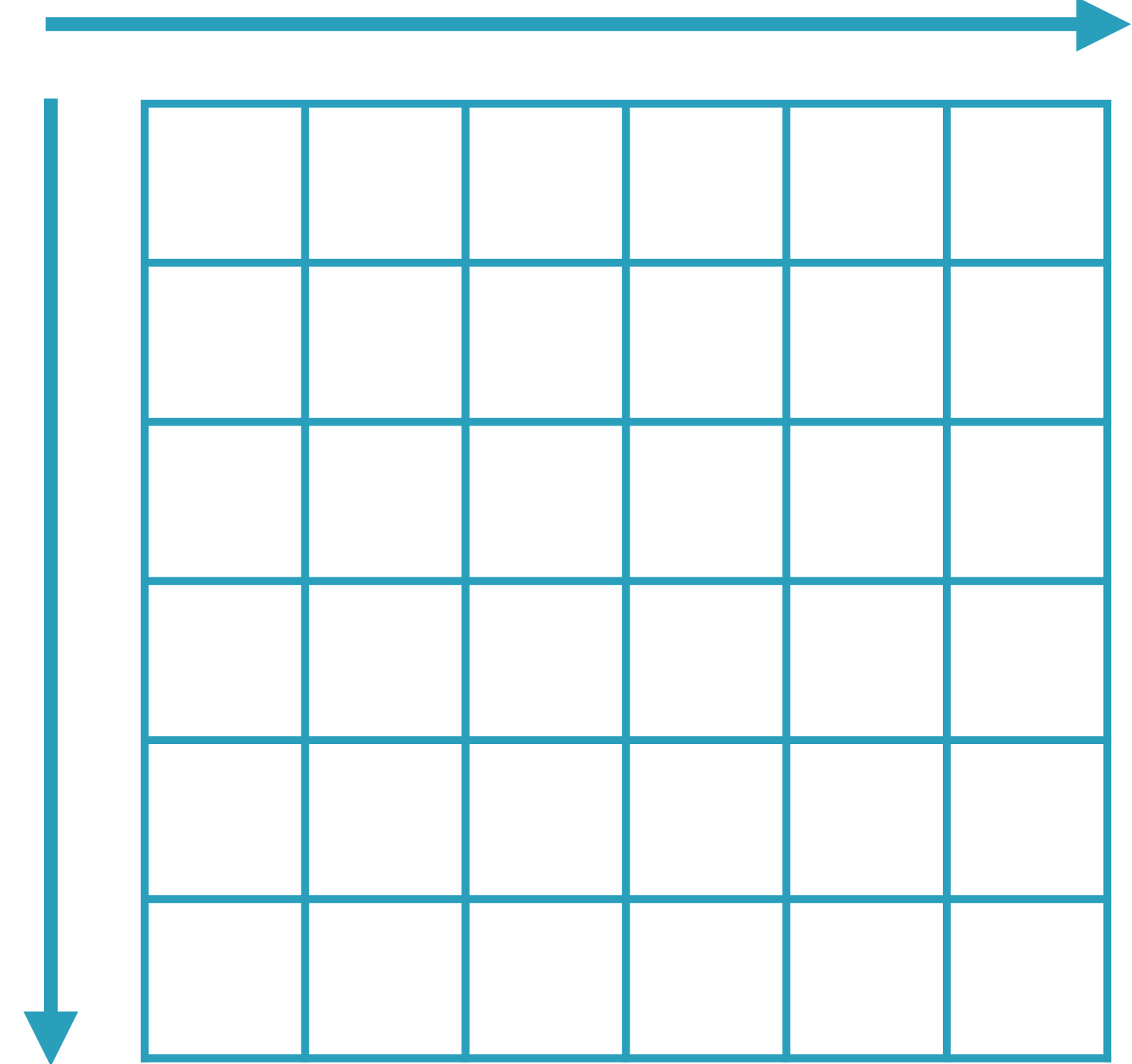
0.5
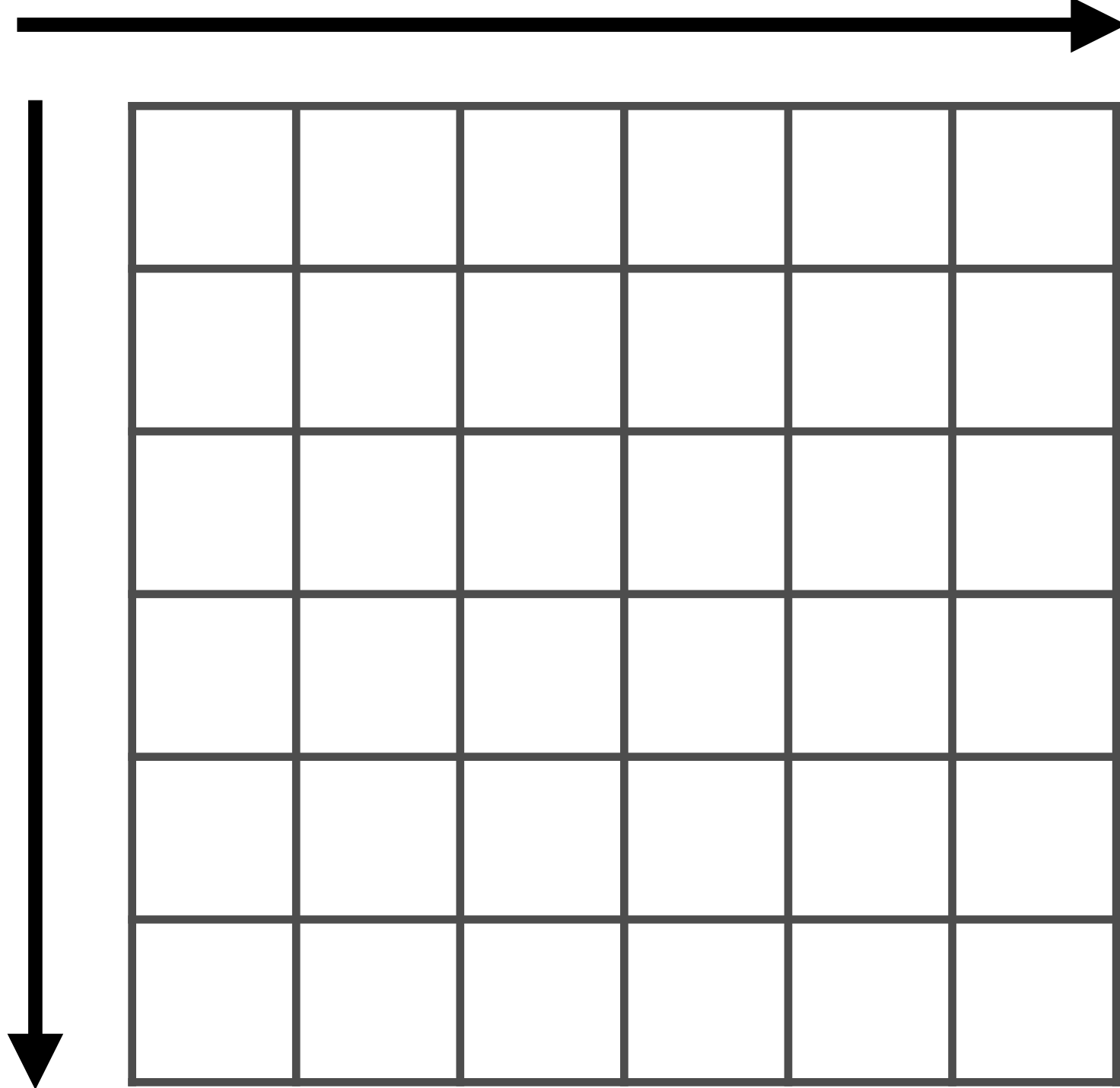
Grayscale Images

0.5

1 value to represent intensity, **1** channel
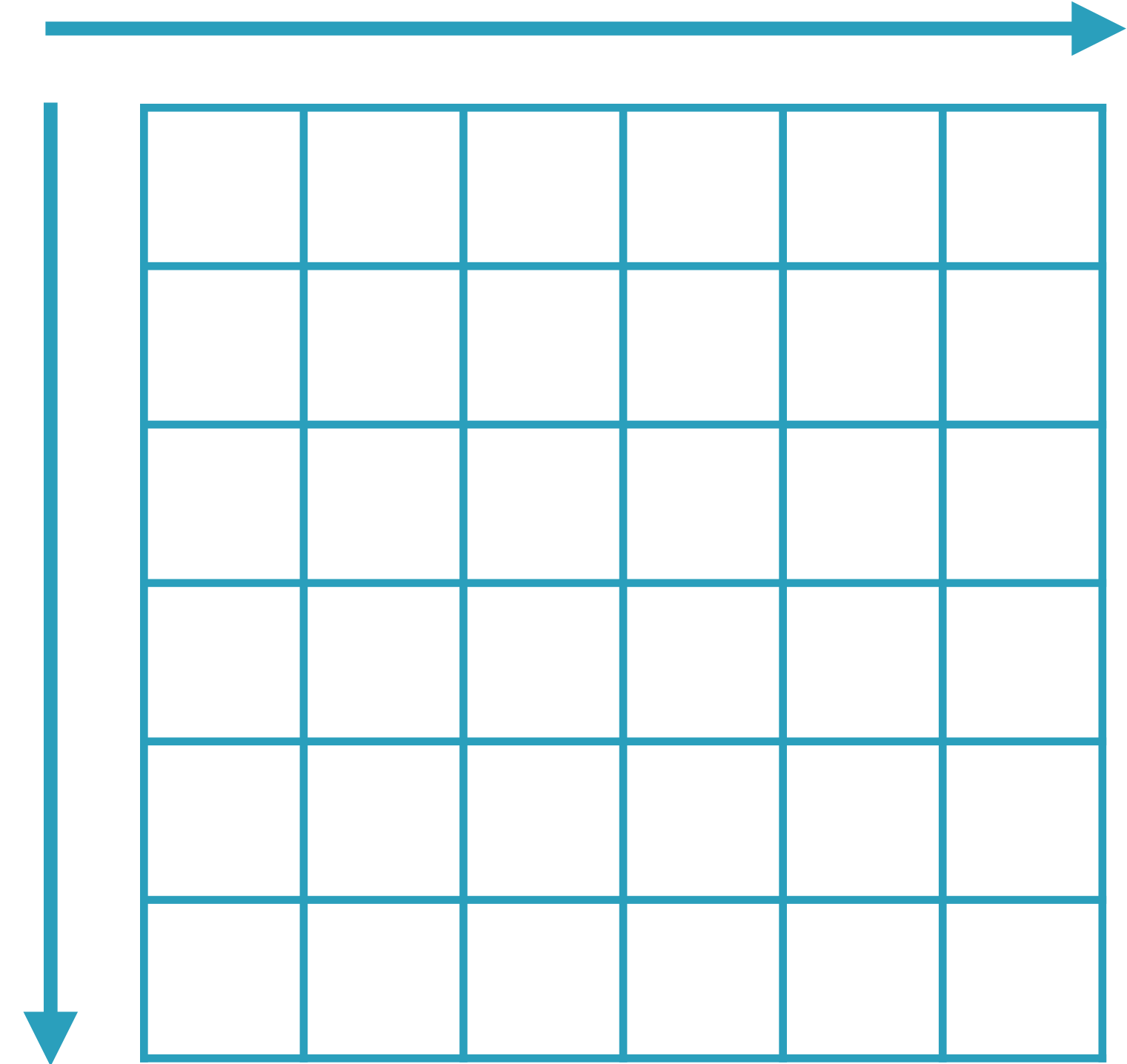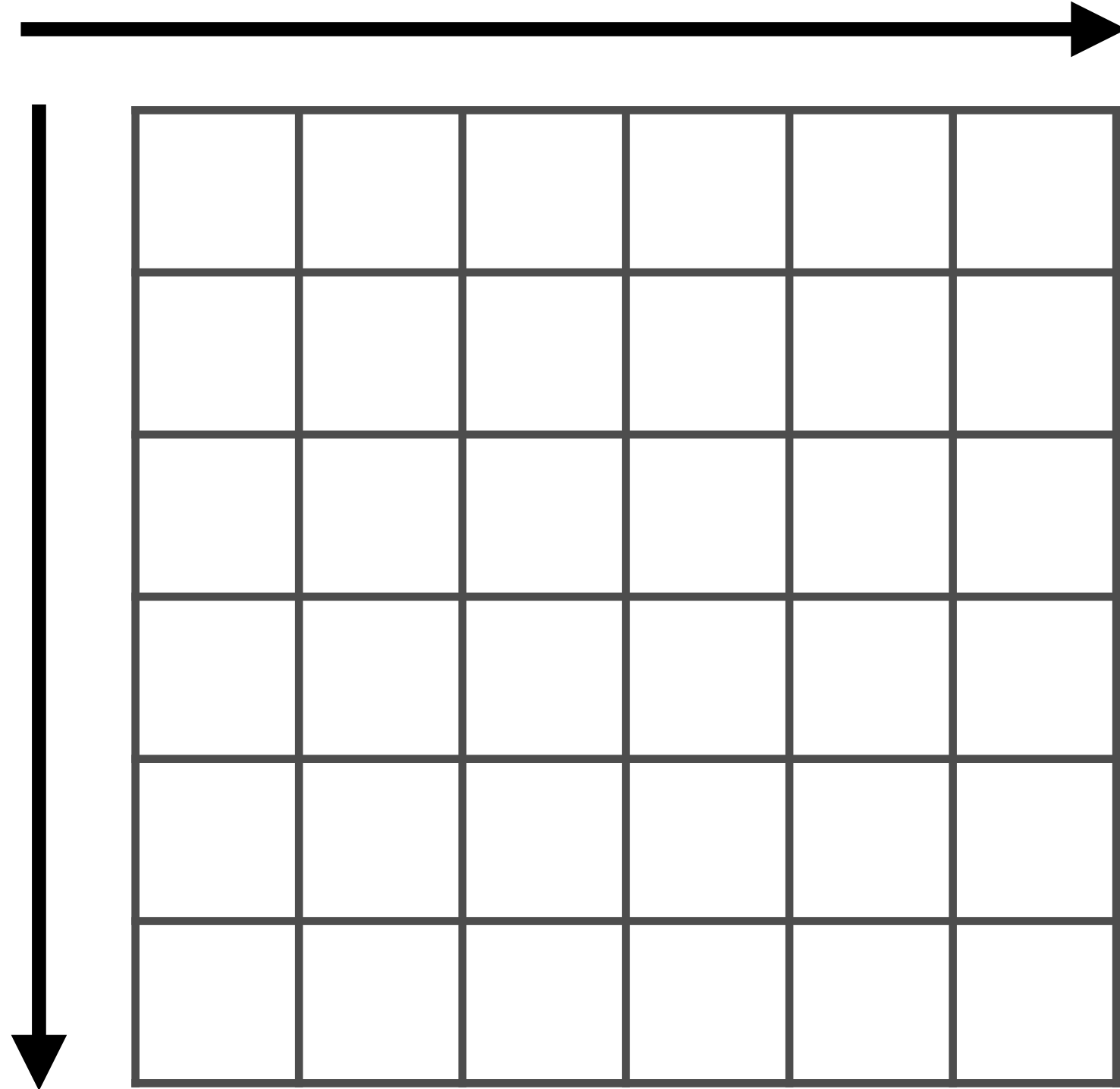
Images as Arrays

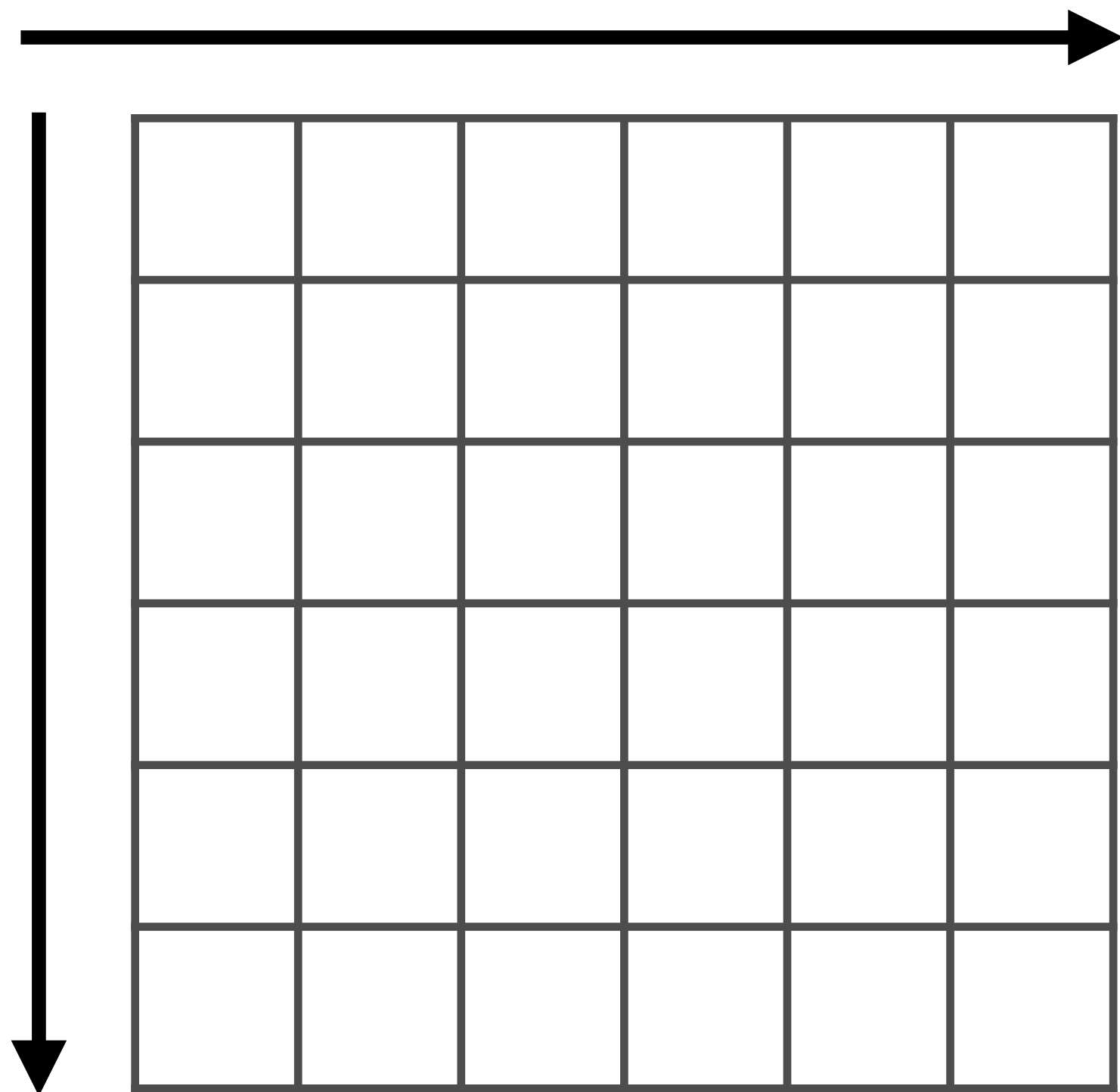**Single channel and multi-channel images**

Images as Arrays

Images can be represented by a 3-D matrix
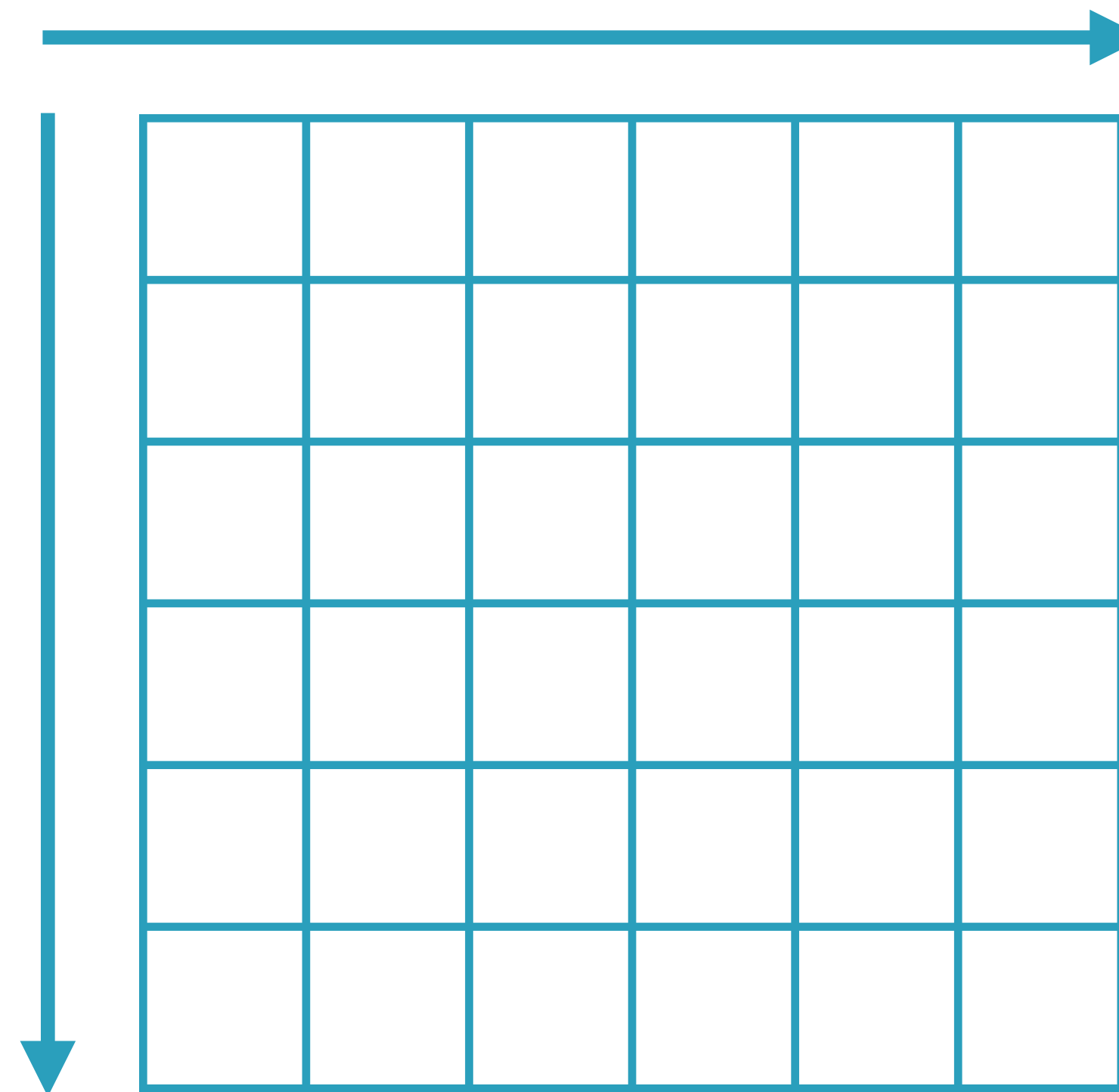
Images as Arrays

The number of channels specifies the number of elements in the 3rd dimension

Images as Arrays

(6, 6, 1)   (6, 6, 3)

Demo

Views - shallow copies of an array

Demo

Making deep copies of arrays

Summary

Fundamental package for scientific computing in Python

Basic building block is a powerful n-dimensional array

Offers easy to use functions to process multi-dimensional arrays

Basic operations, universal functions, reshaping, splitting, making shallow and deep copies