

## Weekly Exercise 1

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### Probability theory

**Exercise 1 (Consequences of the axioms).** Let  $P$  be a probability measure, and assume that  $A$  and  $B$  are events. Prove the following statements

1. If  $A \subseteq B$ , then  $P(A) \leq P(B)$ ,
2.  $P(A \setminus B) = P(A) - P(A \cap B)$ ,
3.  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ ,
4.  $P(A \cup B) \leq P(A) + P(B)$ .

### Programming

**General Information.** In this lecture, you are free to choose your preferred programming language, e.g., C/C++, Python, Matlab. However, please note that, we mainly provide support for C++ and Matlab. We suggest you to use [OpenCV library](#) for image processing for both C++.

**Exercise 2.** Load, modify and save an image. This exercise is intended to get you familiar with the programming interface to process images. Your task is to load a color image, **write your own function** to convert the image to grayscale with the following formular,

$$g = 0.299 \cdot R + 0.587 \cdot G + 0.114 \cdot B$$

and then save the grayscale image.