

LARGE DEVIATIONS
HOMEWORK 2

Deadline for handing in solutions: March 8. (Note: same deadline as for Homework 1.)

1. **Large deviations for Bernoulli(p) random variables.** Let X_1, X_2, \dots be i.i.d. random variables with

$$X_i = \begin{cases} 0 & \text{with probability } 1 - p \\ 1 & \text{with probability } p \end{cases}$$

and let $S_n = \sum_{i=1}^n X_i$. Use Theorem I.4 to calculate the rate function for the large deviations behavior of S_n . Check that, for the special case $p = \frac{1}{2}$, it agrees with the rate function of Theorem I.3. Any further comments (noteworthy special cases etc) about the rate function?

2. Let X_1, X_2, \dots be i.i.d. random variables with

$$X_i = \begin{cases} 0 & \text{with probability } \frac{1}{4} \\ 1 & \text{with probability } \frac{1}{2} \\ 2 & \text{with probability } \frac{1}{4} \end{cases}$$

and let $S_n = \sum_{i=1}^n X_i$. Determine the rate function for the large deviations behavior of S_n . Compare to the rate function in Theorem I.3. Is it in fact the case that the rate function in the current case can be deduced directly from Theorem I.3?