The classic Thue-Morse sequence has been extensively studied. It is obtained from the 2-base representation of \( n \), by taking the sum of the digits mod 2. We study a generalization of this sequence, namely, we consider the sequence \( t_{k,m} \) to be the sum of the base \( k \) digits mod \( m \) of the integer \( n \). We give new proofs for the following known results: \( t_{k,m} \) contains no overlaps if and only if \( m \geq k \) \((k \geq 2, m \geq 1)\), \( t_{k,m} \) contains arbitrarily large squares for \( k \geq 2, m \geq 1 \), \( t_{k,m} \) contains arbitrarily large palindromes if and only if \( m \leq 2 \), and \( t_{k,m} \) is ultimately periodic if and only if \( m|k-1 \).

Another topic is investigating the connection between the weight and the nonlinearity of various types of Boolean cryptographic functions. We compute the weight and the nonlinearity of some classes of functions, in particular we show that the weight and the nonlinearity of the function \( S_{N,p} = x_1x_2 \ldots x_p + x_{p+1}x_{p+2} + \ldots + x_{p(N-1)}x_{pN} \) are equal. We also prove that the weight and nonlinearity are not necessarily equal for general degree two functions, and together, these two integers determine the function completely up to an affine equivalence. We show that this does not hold for functions of higher degrees by counterexamples.

We analyze the rotation symmetric homogeneous cubic functions \( F_n = x_1x_2x_3 + x_2x_3x_4 + \cdots + x_{n-1}x_n x_1 + x_n x_1 x_2 \), and we prove part of a conjecture by Cusick and Stănică that these functions have the same weight and nonlinearity; more precisely, we show that this holds for the case when \( n \) is divisible by 3.