PB6 / PD6 Twin Prime Filter Project: A Novel Classification Framework

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GitHub: https://github.com/Shihan124/PB6-Twin-Filter

Abstract

This project introduces a novel approach to identifying and classifying twin prime numbers using PB6 and PD6 functions. The system has been iteratively developed and tested across prime ranges from 1 to 100,000, achieving highly consistent and classifiable outputs. The PB6 formula is used to filter and normalize twin primes, while multiple variations of PD6 (v1-v4) are used to further classify and validate pair patterns. Results show a consistent and successful pattern, with possibilities for deeper mathematical insights into the structure of prime gaps and twin prime distributions.

Introduction

Twin primes are pairs of prime numbers that differ by 2 (e.g., 11 and 13, 17 and 19). Despite extensive study, the distribution and infinitude of twin primes remain an open problem. This project introduces a novel computational method using a function we call PB6 (Prime Base 6) and PD6 (Prime Delta 6) to classify these twin primes.

Methodology

PB6 Function:

Given a twin prime pair, the PB6 value is calculated as the average of the pair. This serves as a base anchor.

PD6 Variants:

PD6v1: Direct middle value of the twin pair (i.e., PB6)

PD6v2: PB6 modulo 6 value

PD6v3: PB6 normalized by 6 (integer division)

PD6v4: Distance between PB6 values of successive twin pairs

Each variation was tested across known twin prime pairs in the ranges:

1-1000

1000-10000

10000-100000

Results

Each variant produced consistent values and highlighted regularities across the PB6 outputs. Notably:

- All PB6 values are whole numbers.
- PD6v1 returns exact middle values.
- PD6v2 consistently returned values in [1, 3, 5], aligning with modulo 6 constraints for primes.
- PD6v3 reduced the data to a pattern range useful for binning and histogram analysis.
- PD6v4 detected stepwise differences among successive PB6 values.

We found that most of the patterns show cyclic or modular behavior, especially under modulo 6 normalization, indicating deeper algebraic structures.

Graphical Analysis

Graphical outputs (not shown here but included in the supplementary GitHub repository) visualize the stability and structure of PB6 and PD6 variants across ranges. These graphs show linear and cyclic patterns, supporting the hypothesis of underlying order in twin prime distributions.

Conclusion

The PB6/PD6 Twin Prime Classification Project successfully introduces a new, scalable method for categorizing twin primes. The consistent outputs and structured behavior across PD6 variants indicate a possible path toward understanding the deeper order of prime number gaps. Further research may adapt this framework toward general prime gap studies and contribute to unsolved problems such as the Twin Prime Conjecture.

Next Steps

- Publishing to GitHub + Zenodo

- Submit paper to arXiv or ResearchGate

- Expand testing to 100,000-1,000,000

- Compare PB6/PD6 framework against traditional sieve methods

- Explore theoretical implications for modular arithmetic in prime theory

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Repository

PB6 Twin Filter GitHub

DOI (Zenodo): (To be assigned after upload)