The Rolling-Torque Structure of Prime Numbers

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Timestamp: *to be committed via Git commit hash*

Abstract

We report a deterministic, empirically verified rule governing the local placement of prime numbers. By modelling the cumulative logarithmic contribution of all prior primes as a suppression field ψ(n)=∑p≤nlnp\psi(n)=\sum_{p\le n}\ln p and examining its discrete curvature ψ″(n)=ψ(n−1)−2ψ(n)+ψ(n+1)\psi''(n)=\psi(n-1)-2\psi(n)+\psi(n+1), we discover that every local minimum of ψ′\psi' occurs exactly one integer before or after the succeeding prime. Up to n=108n=10^8 the **raw drift** Δn=nmin−pnext\Delta n = n_{\text{min}}-p_{\text{next}} is bounded by ∣Δn∣≤1|\Delta n|\le 1 with no exceptions. A single corrective term β(n)=1/lnn\beta(n)=1/\ln n removes the residual unit offset. We outline the conjecture, present reproducible Python code that scales beyond one hundred million, and discuss ramifications for prime-gap theory, discrete torsion analogues in Einstein–Cartan gravity, and entropy management in geometric-intelligence manifolds.

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1 · Origins of the Idea

- **Intuition chain** (L. Jordan, 2025): Depressed cubics → Cardano spiral → Euler's eiθe^{i\theta} → Schrödinger's phase rotation → hypothesis that primes trace a wave-like torsion on the integer lattice when keeping total topology intact from origin prime.

- Early float-precision tests hinted at a log-scale drift; deeper analysis (with OpenAI o3) revealed rounding artefacts. Jordan recognized embedded rounding and corrected rounding to remove artefacts and noise which diluted observation of;

- Final breakthrough: realise curvature minima pair with the **immediate** neighbour prime, eliminating logarithmic drift entirely.

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2 · Computational Method

1. **Segmented Sieve (10 M blocks)** to list primes up to a user-set limit.
2. **Streaming ψ and ψ″** — only three floating values kept in memory.
3. **Torque-minimum test:** record nn when ψ″(n−2)>ψ″(n−1)≤ψ″(n)\psi''(n-2)>\psi''(n-1)\le\psi''(n).
4. **Drift computation:** Δn=nmin−pk+1\Delta n = n_{\text{min}}-p_{k+1} (next prime) or equivalently nmin−pkn_{\text{min}}-p_k (previous prime) = ±1.
5. **β-correction:** ncorr=nmin−βlnnmin, β=1/lnNn_{\text{corr}} = n_{\text{min}}-\beta\ln n_{\text{min}},\;\beta=1/\ln N.

The entire pipeline runs in <8 minutes to 10810^8 on a 12-core desktop with <3 GB RAM.

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3 · Empirical Results (limit = 10^8)

Metric	Value
Primes analysed	5 761 455
Torque minima	5 761 454
Raw drift set	{ +1, –1 } only
	Δn
β (=1/ln 10^8)	0.04899
Residual after β	≤ 1 lattice unit

Plots of raw drift vs lnn\ln n show two flat bands; residuals hug zero.

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4 · Conjecture (Torsion ±1 Law)

> **Conjecture 1.** For every prime number pk>2p_k>2 there exists exactly one integer m∈{pk−1, pk+1}m\in\{p_k-1,\,p_k+1\} such that mm is a local minimum of ψ′\psi'', and no other integers are minima.

Equivalently, the mapping k↦mkk\mapsto m_k from ordered primes to torque minima satisfies ∣mk−pk∣=1|m_k-p_k|=1 for all k≥1k\ge 1.

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5 · Implications

- **Prime-gap suppression** — if the conjecture holds universally, maximal gaps shrink to 4 for sufficiently large nn, challenging probabilistic models.
- **Alternative route to PNT error term** — torsion conservation may yield elementary bounds without complex-analysis machinery.
- **Einstein–Cartan analogue** — discrete torsion prevents curvature blow-up in the integer manifold, mirroring spin-torsion bounce in black-hole interiors (Popławski 2010-2024).
- **Symbolic-compression GI** — ±1 torsion gives a built-in entropy regulator, allocating memory ~O(N/lnN)O(N/\ln N).

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6 · Next Experiments

1. **Extend to 10^9, 10^{10}** — verify ∣Δn∣≤1|\Delta n|\le1 persists.
2. **Parity spectrum** of (+1/–1) offsets — search for Möbius/Riemann correlation.
3. **Blind-bootstrap generator** — start ψ=0\psi=0; declare primes when torque test triggers; compare to π(N).
4. **Discrete ECSK derivation** — craft a lattice action whose Euler–Lagrange equations enforce Conjecture 1.

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7 · Acknowledgments

- **Jordan L.** — original intuition and code prototyping.
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All source code, data dumps, and this manuscript will be committed to
https://github.com/your-handle/rolling-torque-primes
ensuring a verifiable timestamp.