Evaluation of the Published Claims of the Stepanov-Style Argument for the Riemann Hypothesis in Meth8/VŁ4

Colin James III
Ersatz Systems, Colorado Springs, CO
info@cec-services.com
November 21, 2026

Copyright © 2026 Colin James III. All rights reserved.

Abstract

Levent Alpöge, a mathematician at Anthropic, published a note and a Lean archive that he says prove, with Claude, the Riemann Hypothesis (RH). Press reports describe the argument as a Stepanov-style one: Stepanov's method forces an auxiliary function to vanish to high multiplicity, and the note reportedly replaces the missing integer-case multiplicity with long chains of theta lifts. This paper lists those published claims, maps their propositional structure to the Meth8/VŁ4 quad-valent modal logic, and evaluates twelve formulas by truth table, including necessity (#) renderings. Only the two inference-chain forms, the hypothetical syllogism and the argument form with the chain as premise, are tautologies. Every other formula, including every # rendering, is non-tautologous. The Stepanov analogy alone does not entail RH in Meth8. The conclusion rests on three premises that Meth8 cannot check: that the chain supplies multiplicity, that multiplicity forces the bound, and that the bound is RH. Meth8 evaluates propositional structure only and does not check the mathematics.

1. Published claims

Press outlets reported the following claims on November 20 and 21, 2026. They come from secondary coverage of Alpöge's website note, read here through page summaries. This paper did not read the note or the Lean files.

- Result. Alpöge says he and Claude found a proof of RH and of the Generalized Riemann Hypothesis (GRH), and he expects, with more time, to reach the Extended Riemann Hypothesis [1][2][3].
- Starting point. The argument starts from Stepanov's method, which gave an elementary proof of RH for curves over finite fields (function fields), the case Weil proved earlier [1][5][6].
- Mechanism in function fields. The method builds an auxiliary function that vanishes to high multiplicity at many points, and that vanishing forces the bound sought [1][3].
- Obstacle over the integers. One report says derivatives supply multiplicity in function fields and have no natural counterpart for ordinary integers [3]. Another says only that high multiplicity is hard to obtain over the integers and does not mention derivatives [1]. A third says multiplicity is hard to define over the integers [4].
- Workaround. The note reportedly replaces multiplicity with long chains of theta lifts, each lift adding one unit of multiplicity. For a sum over prime powers up to X weighted by the von Mangoldt function, the chain must run about the square root of X lifts [1][3]. A third report says

the chain passes through totally definite unitary groups and gives an effective substitute for multiplicity [4].

- Role of Claude. The note credits Claude with the key step, including the chain length, and says Claude far outpaced the author near the end [1][3]. One report says Alpöge set the high-level architecture while Claude handled much of the algebra, trace formulas and technical lemmas [4].
- Other ingredients. Reports list relative trace formulas, Iwasawa theory, Bessel periods and a weakened form of the Vandiver conjecture [3], and arithmetic algebraic geometry, higher-rank automorphic forms and spectral analysis [4].
- Formalization. The note says Claude and Alpöge formalized the whole argument in Lean without unproven assumptions, and the main theorem uses Mathlib's statement of the zeta function [1][3] [4].
- Caveats in the note. No conventional paper accompanies the argument, parts of the sketch paraphrase Claude's summaries and may not make sense, the argument may contain suboptimal choices, and some steps are intuitions or open questions [1][3].

2. Verification status

At the time of writing, the reports differ, and the status remains unsettled.

- As of the November 20 reports, nobody outside the author's circle had confirmed that the archive builds or that its final theorem matches RH. The note does not give the archive's size, build instructions or axioms [3]. No outside party had confirmed the argument [1].
- A November 21 report says Andrew Sutherland of MIT coordinated an initial evaluation. It lists these checks: all 175,187 files compile under Lean and Mathlib 4.33.1, Lean's kernel replay accepts every module, the headline theorems use only the standard axioms propext, Classical.choice and Quot.sound, and the nanoda and lean4lean checkers accept the export [4].
- The same report says these checks show kernel acceptance and not that the mathematics is correct or that the Mathlib definitions capture the zeta function faithfully. It calls itself a secondary summary that did not check the note or the MIT dashboard [4]. This paper found those checks in that one report and treats them as unconfirmed.
- The report adds that Clay Institute rules require publication in a qualifying peer-reviewed journal and at least two years of open scrutiny before any prize deliberation [4].

3. Method: Meth8/VŁ4

Meth8/VŁ4 is a quad-valent modal logic with the values F=(0,0), N=(0,1), C=(1,0) and T=(1,1). Only T validates a tautology, and a theorem is a formula whose truth table is all T [8]. This paper follows the author's description of the system:

- Propositional variables (p, q, r, s, t) take values F and T only. N and C arise only through connectives and modal operators.
- Rows enumerate with the first variable varying fastest and F before T. Five variables give a 32-value table, and this paper writes each table in groups of four.
- The system writes a necessity claim as #X = (s=s), where (s=s) is the proof identity T.

Copyright © 2026 Colin James III. All rights reserved.

Each connective table has the antecedent as row and the consequent as column, both in the order F, C, N, T, and reads row-major:

Operator	Symbol	Table (row-major)
Conjunction	&	`FFFF FCFC FFNN FCNT`
Implication	>	`TTTT NTNT CCTT FCNT`
Equivalence	=	`TNCF NTFC CFTN FCNT`
Negation	~	`F→T, T→F, C→N, N→C`
Necessity	#	`F→F, C→F, N→N, T→N`
Possibility	%	`F→C, C→C, N→T, T→T`

4. Mapping

Five propositional atoms carry the claims:

Atom	Meaning
p	Stepanov's method proves RH for function fields.
q	Over the integers, no derivative-based multiplicity exists (the gap).
r	A chain of about the square root of X theta lifts supplies the missing multiplicity.
s	The multiplicity forces the sought bound over the integers.
t	A proof of RH exists.

Twelve formulas express the claims. B3 and B4 express the two inference steps the reports attribute to the argument, and B9 and B10 express how those steps combine. Possibility (%) models "possible" in place of "is." This paper reads the unverified status of a claim as C (contingent). That reading is the author's interpretive choice, not a definition of the system.

ID	Claim
B1	Stepanov's method proves RH for function fields
B2	A chain of theta lifts supplies the missing multiplicity
B3	Multiplicity from the chain forces the bound
B4	The bound yields a proof of RH
B5	Function-field success alone implies a proof of RH
B6	Function-field success and the integer gap imply a proof of RH
B7	Function-field success and the chain imply the bound
B8	Function-field success and the chain imply a proof of RH
B9	The two inference steps compose (hypothetical syllogism)
B10	Argument form: both steps plus the chain give a proof of RH
B11	The chain implies that a proof of RH is possible

Copyright © 2026 Colin James III. All rights reserved.

ID	Claim
B12	A possible chain implies that a proof of RH is possible

5. Results

Table 1 gives the plain truth table of each formula. Table 2 gives each formula under necessity, written #X = (s=s).

Table 1. Plain forms

ID	Formula	Result (32 rows)	T count
B1	p	FTFT FTFT FTFT FTFT FTFT FTFT FTFT FTFT	16/32
B2	r	FFFF TTTT FFFF TTTT FFFF TTTT FFFF TTTT	16/32
B3	r>s	TTTT FFFF TTTT TTTT TTTT FFFF TTTT TTTT	24/32
B4	s>t	TTTT TTTT FFFF FFFF TTTT TTTT TTTT TTTT	24/32
B5	p>t	TFTF TFTF TFTF TFTF TTTT TTTT TTTT TTTT	24/32
B6	(p&q)>t	TTTF TTTF TTTF TTTF TTTT TTTT TTTT TTTT	28/32
B7	(p&r)>s	TTTT TFTF TTTT TTTT TTTT TFTF TTTT TTTT	28/32
B8	(p&r)>t	TTTT TFTF TTTT TFTF TTTT TTTT TTTT TTTT	28/32
B9	((r>s)&(s>t))>(r>t)	TTTT TTTT TTTT TTTT TTTT TTTT TTTT TTTT	32/32
B10	((((r>s)&(s>t))&r)>t)	TTTT TTTT TTTT TTTT TTTT TTTT TTTT TTTT	32/32
B11	r>%t	TTTT CCCC TTTT CCCC TTTT TTTT TTTT TTTT	24/32
B12	%r>%t	TTTT CCCC TTTT CCCC TTTT TTTT TTTT TTTT	24/32

Table 2. Necessity renderings

ID	Formula	Result (32 rows)
B1	#p=(s=s)	FNFN FNFN FNFN FNFN FNFN FNFN FNFN FNFN
B2	#r=(s=s)	FFFF NNNN FFFF NNNN FFFF NNNN FFFF NNNN
B3	#(r>s)=(s=s)	NNNN FFFF NNNN NNNN NNNN FFFF NNNN NNNN
B4	#(s>t)=(s=s)	NNNN NNNN FFFF FFFF NNNN NNNN NNNN NNNN
B5	#(p>t)=(s=s)	NFNF NFNF NFNF NFNF NNNN NNNN NNNN NNNN
B6	#((p&q)>t)=(s=s)	NNNF NNNF NNNF NNNF NNNN NNNN NNNN NNNN
B7	#((p&r)>s)=(s=s)	NNNN NFNF NNNN NNNN NNNN NFNF NNNN NNNN
B8	#((p&r)>t)=(s=s)	NNNN NFNF NNNN NFNF NNNN NNNN NNNN NNNN
B9	#(((r>s)&(s>t))>(r>t))=(s=s)	NNNN NNNN NNNN NNNN NNNN NNNN NNNN NNNN
B10	#(((((r>s)&(s>t))&r)>t))=(s=s)	NNNN NNNN NNNN NNNN NNNN NNNN NNNN NNNN
B11	#(r>%t)=(s=s)	NNNN FFFF NNNN FFFF NNNN NNNN NNNN NNNN

Copyright © 2026 Colin James III. All rights reserved.

ID	Formula	Result (32 rows)
B12	#(%r>%t)=(s=s)	NNNN FFFF NNNN FFFF NNNN NNNN NNNN NNNN

Observations from the computed tables:

- Only B9 and B10 are tautologies (all T). Both remain tautologies when r, s and t range over all four values F, C, N and T (64 of 64 rows).
- B3 and B4, the two inference steps, are not tautologies. Each fails in the eight rows where its antecedent holds and its consequent does not. B3 also fails over four values (36 of 64 rows are T).
- B5, B6 and B8 fail in rows where p holds and t does not: eight rows for B5, and four rows each for B6 and B8. B7 fails in four rows where p and r hold and s does not. The Stepanov analogy therefore does not entail a proof of RH, with or without the integer gap.
- B11 and B12 give the same plain result, with C in the failing rows instead of F.
- No necessity rendering is a tautology. In every case #X yields N in rows where X is T and F in rows where X is F or C. B9 and B10 give all N under #, so the argument form is a theorem only in its plain form.
- B11 and B12 give the same # result as well. The # operator removes the distinction between F and C.

6. Discussion

B10 shows the reported argument has a valid form. Given the chain (r), the step that multiplicity forces the bound (r>s) and the step that the bound is RH (s>t), a proof of RH follows, and B9 shows the two steps compose. The form carries no weight of its own. Meth8 treats r, r>s and s>t as unconstrained premises, so the result says what the argument needs and not whether it has it.

B5 and B6 show that the analogy with function fields does not carry the conclusion. This agrees with the reports' own account: the function-field method rests on multiplicity from derivatives, and the integer case lacks it (q). The chain (r) therefore bears the whole burden of the claim, and B7 and B8 show that adding p to r does not close the gap without the step r>s.

The step r>s is where the Stepanov analogy lives. In function fields, high multiplicity forces the bound. Whether multiplicity from theta-lift chains has the same force over the integers is a claim about number theory that the press reports state but cannot check. As a hypothesis, not a measurement, a successful Lean check would settle r>s and s>t only if the theorem statement is faithful to RH, and the reports leave that question open.

One tension in the reports remains unresolved here. One report lists a weakened form of the Vandiver conjecture among the ingredients [3], while the note reportedly says the Lean formalization has no unproven assumptions [1][3]. The reports do not say how the formalization treats that step. This paper marks it open and does not map it.

The earlier paper in this series [7] evaluated the release and its verification as a black box, with atoms for the archive building (r) and the statement being faithful (s). It found the same logical shape: a valid argument form whose premises lie outside Meth8's reach. This paper opens the box one level and finds that the internal argument has that shape too.

Copyright © 2026 Colin James III. All rights reserved.

This evaluation has limits. Meth8 evaluates the propositional skeleton over a finite universe. It does not examine theta lifts, trace formulas, Lean code or the correctness of the theorem statement. It cannot confirm or refute RH. The result is a structured statement of what would have to hold for the claim to stand.

7. Conclusion

In Meth8/VŁ4, the Stepanov-style argument for RH is not a theorem on the strength of its published claims. Of the twelve formulas this paper evaluates, only the hypothetical syllogism and the argument form with the chain as premise are tautologies, and no necessity rendering is. The claim stands or falls on independent confirmation of three premises: that theta-lift chains supply multiplicity over the integers, that this multiplicity forces the bound, and that the bound is RH.

Note on preparation

Claude assisted in drafting this paper. Claude is the model Alpöge's note names as his collaborator. A short script implementing the connective, necessity and possibility tables above computed the truth tables, and the script reproduced the author's published example %r>%s.

References

[1] Quantum Zeitgeist, "Riemann Hypothesis: New Claude Proof Claim, 167-Year Problem." https://quantumzeitgeist.com/riemann-hypothesis-proof-claim-anthropic-claude/

[2] P. Pillitteri, "Anthropic mathematician claims a Riemann hypothesis proof made with Claude." https://pasqualepillitteri.it/en/news/35468/riemann-hypothesis-proof-claude-alpoge (read as a search excerpt only)

[3] OfficeChai, "Claimed Riemann Hypothesis Proof Made With Claude Appears On Anthropic Mathematician Levent Alpöge's Website." https://officechai.com/ai/claimed-riemann-hypothesis-proof-made-with-claude-appears-on-anthropic-mathematician-levent-alpoges-website/

[4] CASRAI, "Anthropic Mathematician Releases 175,000-File Lean Archive Claiming Riemann Hypothesis Proof," November 21, 2026. https://casrai.org/news/anthropic-levent-alpoge-claude-lean-riemann-hypothesis-claim-2026

[5] "The Riemann Hypothesis for Function Fields over a Finite Field," arXiv:0806.0044. https://arxiv.org/pdf/0806.0044

[6] "The Riemann Hypothesis over Finite Fields: From Weil to the Present Day," arXiv:1509.00797. https://arxiv.org/pdf/1509.00797

[7] C. James III, "Evaluation of the Alpöge–Claude Riemann Hypothesis Lean Release in Meth8/VŁ4," 2026.

[8] C. James III, Meth8/VŁ4 System Description. https://ersatz-systems.com/Grok3b.description.M8VL4.pdf

Copyright © 2026 Colin James III. All rights reserved.