

The Unfeasible General Formula for P vs NP

A Conceptual Framework on Conditional Subsets, Infinite Formulas, and Non-Reversibility

This is purely theoretical and conceptual; no formal proof is claimed.

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Abstract

This work presents a conceptual exploration of a general formula for P vs NP, based on the following assumptions:

- A general formula for P vs NP must, *in principle*, contain *every possible algorithm and method* to solve every problem instance.
- Since each problem can have infinitely many solutions or approaches, the full set of solution methodologies, \mathcal{S} , is hypothesized to have cardinality $\geq 2^{\aleph_0}$, making the General Formula G **too immense to be fully represented or computed by macro-scale physics**.
- Only **conditional or selective subsets** ($\mathcal{C}_P \subset G$) are activated for specific problem instances P ; inactive variables are effectively set to zero.
- Finite problems can yield finite results because only the relevant subset is activated.
- **Full utilization of G** requires an infinitely large set of problems—including repeated instances—since each problem can be solved in infinitely many ways.
- A new conceptual class, NNP (Non-reversible NP), is introduced, characterized by **non-injective** (many-to-one) mappings, where reconstructing the input from the output is computationally infeasible.

This framework provides a conceptual bridge connecting computational complexity, fractal geometry, and theoretical physics.

Purpose: To provide a theoretical and quantitative exploration of P vs NP across mathematics, science, and physics, aiding future research with reference.

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1 P vs NP: Assumptions for a General Formula

General Formula Assumption: We hypothesize a General Formula G , a conceptual operator capable of solving *every* computational problem:

$$G : \mathcal{P} \rightarrow \mathcal{S},$$

where \mathcal{P} is the set of all possible problems and \mathcal{S} contains every conceivable algorithm, solution method, or formula. G is **infinitely large**, containing all possible solution branches and approaches.

1.1 Conditional Activation of Subsets

For a finite problem instance $P \in \mathcal{P}$, only a **conditional subset** $\mathcal{C}_P \subset G$ is activated. All other variables remain zero, ensuring finite outputs. For example, in $x+y+z+z^2+z^3+\dots$, if the problem involves only x and y , then z and its powers do not contribute.

1.2 Fractals and Complexity

Conditional subsets \mathcal{C}_P can be visualized as fractal-like structures embedded in the manifold of G . Each activated subset corresponds to the solution with minimal Big-O complexity, while inactive variables remain zero. This illustrates how infinite structures yield finite, computable results.

1.3 Full Utilization

The entire structure of G is activated only over an infinite sequence of problem instances, revealing all solution branches. Finite problems activate only relevant paths, maintaining computational feasibility.

2 Formalizing the General Formula

2.1 Definitions

- **Set of All Problems (\mathcal{P}):** Includes all P, NP, and hypothetical higher complexity classes.
- **Set of Solution Methodologies (\mathcal{S}):** All conceivable algorithms, formulas, and methods. $|\mathcal{S}| \geq 2^{\aleph_0}$.
- **General Formula (G):** Maps problems to all possible solutions, i.e., $G : \mathcal{P} \rightarrow \mathcal{S}$.
- **Conditional Subset (\mathcal{C}_P):** For a problem P , $\mathcal{C}_P \subset G$ contains only the methods relevant to P . All elements in $G \setminus \mathcal{C}_P$ are zero.

2.2 Representation Examples

2.2.1 Algebraic

Infinite series $x + y + z + z^2 + z^3 + \dots$ demonstrates how finite problems activate only specific variables.

2.2.2 Numerical

$$1 = \frac{2}{2}, \quad 1 = \sqrt{1}, \quad 1 = \sin^2(\pi/2) + \cos^2(\pi/2), \quad 1 = \sum_{k=0}^0 k^0, \dots$$

Each representation belongs to G ; finite problems select a relevant \mathcal{C}_P .

2.2.3 Geometric

- 1D line segment: multiple representations.
- 2D shapes (triangle, square): edges, rotations, and transformations.
- 3D shapes (cube, tetrahedron): coordinates, volumes, combinatorial arrangements.

2.2.4 Set-theoretic

For $S = \{a, b, c\}$, G contains all subsets, unions, intersections, and power sets. Conditional activation selects relevant subsets.

2.2.5 Computational / NP-type

- Base-3 counting: count numbers of length n satisfying a property P ; irrelevant numbers contribute zero.
- Graph coloring: 3 nodes, 3 colors; only valid colorings activated.

2.2.6 Combinatorial / Coordinate

2D grids illustrate multiple paths. G contains infinitely many formulas, only relevant ones are active.

3 A New Proposal: P vs NP vs NNP

Speculative Idea: NNP (Non-reversible NP) extends NP by emphasizing non-injective mappings, where input reconstruction is infeasible.

3.1 Conceptual Hierarchy

- **P problems:** Efficiently solvable. Mapping may be injective; minimal activation subset \mathcal{C}_P .
- **NP problems:** Solutions verifiable efficiently. Mapping reversible in principle but may require large \mathcal{C}_P .
- **NNP problems:** Highly non-injective ($f : I \rightarrow O$). Even with known output, reconstructing input is computationally infeasible; subset \mathcal{C}_P cannot easily yield inverse mapping.

This classification uses conditional subset activation from G to distinguish NNP problems from P and NP .

3.2 Binary Example (NNP)

Problem: Count 0s and 1s in a binary string of length n .

- Forward: Output (n_0, n_1) computed linearly; minimal \mathcal{C}_P activated.
- Reverse: $\binom{n}{n_1}$ strings produce same output. Exponentially many possibilities; reconstructing input infeasible.
- Conclusion: Illustrates non-injective, many-to-one property defining NNP. G contains all $\binom{n}{n_1}$ possibilities.

3.3 Defining NNP Problems

1. Identify the output: number, set, graph, string, etc.
2. Examine forward computability: feasible with activated subset \mathcal{C}_P .
3. Test non-reversibility: reconstructing input requires exponential resources; multiple inputs map to same output.
4. Map to G : conceptualize all possible solutions; activate \mathcal{C}_P for instance.
5. Classify: Label as NNP if conditions met. Hierarchy:

$$P \subset NP \subset NNP$$

Example: Counting 0s and 1s in a string illustrates NNP: easy forward computation, infeasible reverse reconstruction.

This classification ties back to the general formula, linking conditional subset activation to P , NP , and NNP .

4 Discussion

- The general formula G is an abstract, infinitely large structure, not meant to be physically realized.
- Conditional subsets \mathcal{C}_P explain why finite problems are solvable within G .
- NNP highlights a conceptual layer beyond NP, emphasizing non-reversibility.
- Connections to fractals, dimensionality, and combinatorial explosion illustrate how infinite structures yield finite, computable outputs.
- Future work could formalize metrics for subset activation, map fractal dimensions to computational complexity, or explore implications for cryptography and irreversible processes.

5 Conclusion

This paper proposes a conceptual framework unifying:

- A general formula G containing all possible solutions for all problems.
- Conditional subsets \mathcal{C}_P explaining finite computation.
- A new class NNP, highlighting non-reversibility and many-to-one mappings.

The framework is theoretical, exploratory, and purely conceptual, offering a foundation for further investigation into P vs NP, non-reversibility, and computational complexity.

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