Zijie Zhou

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Education

Northeastern University, Boston, MA
M.S. in Software Engineering Systems, 2025

Arizona State University, Tempe, AZ
B.S. in Computer Science, 2022

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Research Experience

Research Assistant, Number Project (with Prof. Robin Hillyard), 2024–present

- Contributed to a Scala-based numerical library combining exact arithmetic, fuzzy numbers, error bounds, and lazy evaluation.

- Implemented `Eq`, `Order/PartialOrder`, and `Show` instances for numeric types; integrated Cats Laws + Discipline to test algebraic laws (reflexivity, symmetry, transitivity, order compatibility).

- Designed `FuzzyNumber` and `Fuzziness` abstractions (Box/Gaussian) as semigroup/monoid structures for error propagation (e.g., variance addition under summation, relative error addition under multiplication).

- Applied `Foldable` and `Parallel` to separate nominal values from error folding, enabling multi-core parallelism and pipeline evaluation of numeric expressions.

- *Ongoing work includes further development of categorical semantics for error propagation and preparation of a technical report.*

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Relevant Coursework and Readings

Readings:

- Steve Awodey, *Category Theory*

- Benjamin C. Pierce, *Types and Programming Languages*

- Robert Harper, *Practical Foundations for Programming Languages*

- Noel Welsh and Dave Gurnell, *Scala with Cats*

Coursework:

- Big Data Systems Engineering with Scala (2025)

- Enterprise Software Design (2025)

- Principles of Programming Languages (2021)

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Publications and Talks

Work in progress

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Honors and Awards

- Successful Participant, Mathematical Contest in Modeling (MCM), 2021

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Research Interests

Programming Languages, Type Theory, Category Theory, Functional Programming, Homotopy Type Theory (HoTT).
Focus on:

- Type system foundations for extensible data types and modular mathematics

- Algebraic abstractions in numeric computing and error analysis

- Bridging functional programming libraries (Cats/Spire) with type-theoretic semantics