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KEYNOTE 6: Eliminating Weapons of Math Destruction: Next-Generation Arithmetic

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Users of floating-point arithmetic (floats) have long experienced the disconnect between mathematically correct answers and what a computer provides. Choices made in the 1986 IEEE 754 Standard for floats lead to irreproducible results that destroy the confidence we experience, say, when working with integers. After 33 years, language support for mandated internal flags (rounding, overflow, etc.) remains nil, so float hazards are almost invisible. The Standard does not require correct or consistent rounding of transcendental functions, so bitwise portability of float-based programs is nonexistent.

The emerging posit standard is a fresh approach to computing with real numbers that is fast, bitwise-reproducible, and capable of preserving mathematical properties like the associative and distributive laws of algebra without sacrificing performance. Complete hardware-software stacks supporting this new kind of arithmetic are beginning to appear, so we now have the hope of eliminating IEEE 754 "weapons of math destruction" with something much closer to the logical behavior we expect from computers.

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