Mnemosyne

A Functional Systems Programming Language

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What is Mnemosyne?

A functional systems programming language with compile-time memory management.

- But what does that mean?

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- **Functional programming** models computation as the evaluation of functions [4, 7]
  - **It focuses on** immutability, purity, and function composition
  - **Advantages:** expressiveness [3, 4], modularity (easy to test and parallelize) [3, 4], safety

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- **Mnemosyne is inspired by:**
  - **Lisp**'s syntax and homoiconicity
  - **Haskell and ML**'s typeclasses, pattern matching and monads
  - **Rust**'s memory management

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- **Systems programming** is the implementation of software that provide services to other software [5, 6].
- High quality systems are necessary for high quality applications.
- But there are some significant challenges in this field [2, 6]

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- Almost all systems programming today is done in C and C++
- **Why?** C manages memory at compile-time
  - Most languages manage memory through garbage collection (GC) [1]
  - GC is unsuitable for most low-level systems
  - C programmers manage memory manually (`malloc()` and `free()`)

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- **Manual memory management leads to errors** such as buffer overflows, memory leaks, and null pointer dereferences
- **What if there was another way?**

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- Mnemosyne manages memory automatically at compile time
- **How?**

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- Mnemosyne manages memory automatically at compile time
- **How?**
  - Stack allocation
  - Ownership analysis
  - Controlled mutability

References

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