ONE YEAR IN

A BEGINNER'S TAKE ON THE DIFFICULTIES OF LEARNING HASKELL

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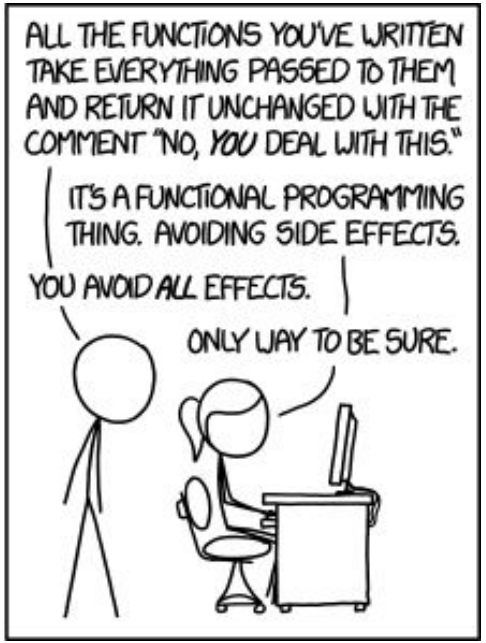
My Background

- BS in Engineering Physics
- Previous experiences heavy in Perl, C, and Ruby with mix of C++, Java, Python, etc.
- Started with Haskell in April 2016 at Holland & Hart
    - Haskell powers our next-generation legal AI that works to automate paralegal and attorney work at H&H
- Started teaching new hire in April 2017

HOLLAND&HART LLP ™

How to Learn Haskell

- With Practice:
  - Jump into the deep end
  - Build your own project
- With Teaching:
  - Look into haskell forums
  - Help newcomers with questions
- With Reading:
  - Tutorials
  - Comics
  - Blog posts
  - Stackoverflow
  - Papers

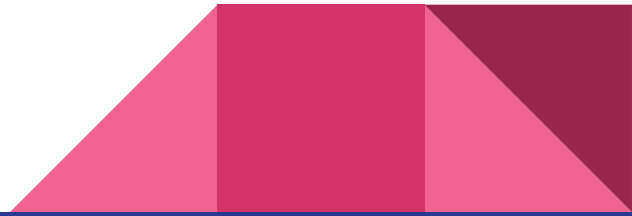


My Journey

- Initial Tech Stack
- First Projects
- Road Blocks
- V2
- New Hire

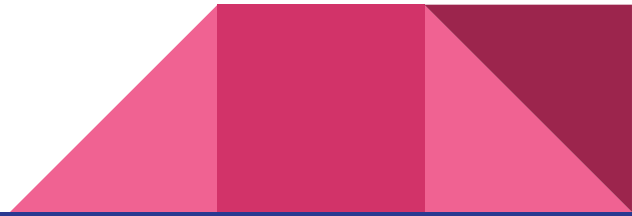
Initial Tech Stack

- “Implicit Semantic Arrows” - Kleisli Arrows with special context wrappers
- Template Haskell
- QuasiQuoters
- Unique DSL’s
- Lenses/Prisms
- Happstack, Conduit, Parsec, Aeson
- Monad Transformers



Starting Out

- Worked on expanding existing applications
  - Forced me to understand complex code
- Built two new projects from scratch
  - API Translation Layer for archaic DMS
  - Chat bot for natural language search
  - Often got stuck trying to find the right way to do things



Roadblocks - The “Haskell” Way vs TIMTOWTDI

- Which way is “correct”, idiomatic Haskell?

```haskell
-- | doMath takes a number, adds three to it, then multiplies by
three, then performs integer division by seventeen
doMath :: Int -> Int
doMath x = do
  let a = x + 3
  let b = a*3
  let c = b `div` 17
  c

doMathV2 :: Int -> Int
doMathV2 x = let a = x + 3
                 b = a * 3
             in b `div` 17
```

```haskell
doMathV3 :: Int -> Int
doMathV3 x = ((x + 3) * 3) `div` 17

doMathV4 :: Int -> Int
doMathV4 = (`div` 17) . (*3) . (+ 3)
```

Roadblocks - Recursion

- Switch from thinking in loops to thinking in folds or maps
  - No more off-by-one errors!
- Fix, Cata, ⊥
  - Catamorphisms are confusing, and entirely foreign concept
  - Especially confusing for newcomers due to implicit recursion

Roadblocks - Language Extensions

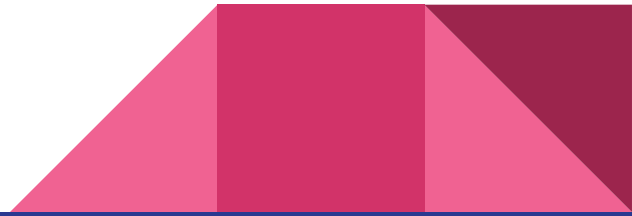
- Compile errors don't always help you figure out when you're speaking the wrong dialect
  - Arrow Syntax
    - error: parse error on input `->' for: proc x -> do
  - Scoped Type Variables
    - Could not deduce (Bounded a1) arising from a use of ‘minBound’ from the context: Bounded a bound by the type signature for: myTest :: Bounded a => a

V2

- Switched to Free Arrows
  - Centralized algebras for effects
  - Individual “compilers” that allow us to bake in our effects
- Free Arrows in GHCI
  - ….>>>(((Pure)+++((Tag(Tag((Pure)>>>(((Pure)+++(((Pure)***((((Effect)>>>(Pure))>>>(((Pure)+++(Pure))>>>(Pure)))>>>(((Pure)+++(Pure))>>>(Pure))))>>>(Pure)))>>>(Pure)))>>>(((Pure)+++((Pure)>>>(((Pure)+++(((Pure)>>>(((Pure)+++((Pure)>>>(((Pure)+++(((Pure)>>>(((Pure)+++(((((Pure)>>>(((Pure)+++(((Pure)>>>(((Pure)+++((Pure)>>>(((Pure)+++((Effect)>>> …..
- Type Level Programming

New Hire

- Uncovered a significant flaw in the system
  - Suddenly understood category theory while discussing an instance for Applicative Monoid
- Within two weeks, making significant contributions via work in a centralized area (parsec)
- Hardest part for him is learning Type Programming (syncing effects and errors, picking the right compilers)
- Now giving him his own project to build from scratch



Questions?


CODE WRITTEN IN HASKELL IS GUARANTEED TO HAVE NO SIDE EFFECTS.
...BECAUSE NO ONE WILL EVER RUN IT?