

CIS 5520

Advanced Programming

Fall 2022

- Make a nametag
- Work on IOExercise, if you haven't already
- Discussion starts at ~12:15



Today: Wed Sep 27

- HW #2 due Thursday
- HW #3 released Friday, new partners
- Read QuickCheck module & complete Canvas quiz by Sunday midnight
- Today: In-class exercises
 - IOExercise (from last time)
 - MonoidFoldable

Semigroup/Monoid

```
class Semigroup a where                                -- associative binary operator
    (<>) :: a -> a -> a                                -- a <> (b <> c) == (a <> b) <> c
instance Semigroup [a] where
    (<>) = (++)
class Semigroup a => Monoid a where                  -- with identity element
    mempty :: a                                        -- a <> mempty == a
instance Monoid [a] where                            -- mempty <> a == a
    mempty = []
```

Foldable

class Foldable t **where**

foldMap :: Monoid m => (a -> m) -> t a -> m

...

instance Foldable [] **where**

foldMap :: Monoid m => (a -> m) -> [a] -> m

foldMap f = List.foldr (\x acc -> f x <> acc) mempty

toList :: Foldable t => t a -> [a] -- this is an iterator