Difflicious

Readable and Flexible Diffs

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Scala Love 2022

Hello

- Software Developer at 

- @jatcwang
- I like types, libraries and tools :)

It’s Friday afternoon…

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“If it compiles, it works”

But the tests are failing…

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```
[info]   Complex(Map(0 -> Simple(0,zero), 1 -> Simple(1,ten)),List(Simple(1,first), Simple(2
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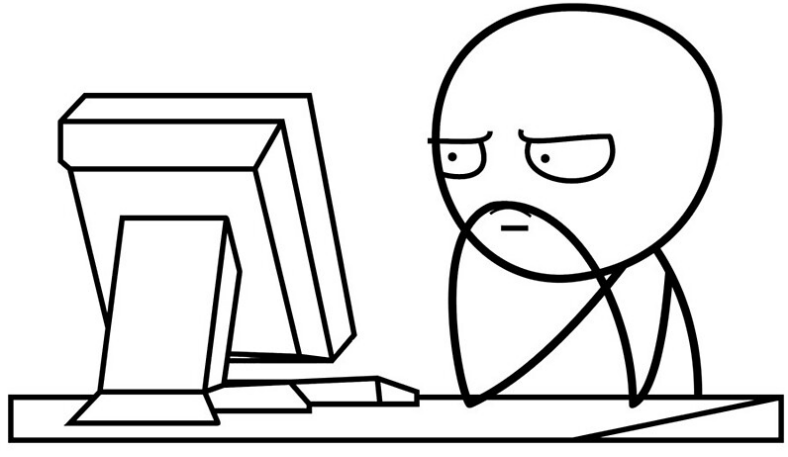

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A career in goat farming looks great all of a sudden…

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- Tell what's wrong at a glance
- Need more flexibility in our comparisons
- Difflicious to the rescue!

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- Add **difflicious** to your test dependencies
  - difflicious-munit
  - difflicious-scalatest
  - Scala 2.13 & 3

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  - Differ.apply (e.g. `Differ[List[Int]]`) to “summon” an instance

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  - Differ.apply (e.g. `Differ[List[Int]]`) to “summon” an instance
- Use `Differ`s to diff values

A SIMPLE EXAMPLE

```scala
import difflicious.Differ
import difflicious.implicits.*
import difflicious.munit.MUnitDiff.*

case class Foo(i: Int, s: String)

// Create the differ
given differ: Differ[Foo] = Differ.derived

val expected = Foo(1, "a")
val actual = Foo(1, "b")

// Assert no difference between two values
differ.assertNoDiff(actual, expected)
```

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```
Foo(
  i: 1,
  s: "b" -> "a"
)
```

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```
val expected = Vector(
  Map(
    "Bono" -> Set("Plant"),
    "Sven" -> Set("Plates")
  )
)
val actual = Vector(
  Map(
    "Bono" -> Set("Plant", "Plates")
    // Sven?
  )
)

// "Summon" an instance using Differ.apply
val differ = Differ[Vector[Map[String, Set[String]]]]

differ.assertNoDiff(actual, expected)
```

```
Vector(
  Map(
    "Bono" -> Set(
        "Plant",
        "Plates"
      ),
    "Sven" -> Set(
        "Plates",
      )
  ),
)
```

From the diff we see that:

- Bono unexpectedly showed up with Plates
- Sven is missing

PAIRING THINGS UP

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```
val expectedCats = List(
  Cat("Lucy", 14),
  // Sven?
  Cat("Bono", 8)
)

val actualCats = List(
  Cat("Bono", 7),
  Cat("Sven", 3)
  // Lucy?
)

Differ[List[Cat]].assertNoDiff(actualCats, expectedCats)
```

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```
val expectedCats = List(
  Cat("Lucy", 14),
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)

val actualCats = List(
  Cat("Bono", 7),
  Cat("Sven", 3)
  // Lucy?
)

Differ[List[Cat]].assertNoDiff(actualCats, expectedCats)
```

```
List(
  Cat(
    name: "Bono" -> "Lucy",
    age: 7 -> 14,
  ),
  Cat(
    name: "Sven" -> "Bono",
    age: 3 -> 8,
  ),
)
```

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```
val catsDiffer = Differ[List[Cat]].pairBy(_.name)

catsDiffer.assertNoDiff(actualCats, expectedCats)
```

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- We can use `pairBy` to get more meaningful diffs!

```
val catsDiffer = Differ[List[Cat]].pairBy(_.name)

catsDiffer.assertNoDiff(actualCats, expectedCats)
```

```
List(
  Cat(
    name: "Bono",
    age: 7 -> 8
  ),
  Cat(
    name: "Sven",
    age: 3
  ),
  Cat(
    name: "Lucy",
    age: 14
  )
)
```

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```
// Example business logic:
// Register dogs, returning dogs with their ID
def registerDogs(dogData: List[DogData]): List[Dog] =

  val dogIds = writeToDatabaseReturningIds(dogData)

  fetchDogsById(dogIds) // We cannot predict the IDs generated!
```

```
case class DogData(name: String)
case class Dog(id: Int, name: String)
```

Ignoring fields (2)

Let’s ignore dog IDs from comparison

```
given Differ[Dog] = Differ.derived

val expectedDogs = List(Dog(0, "Wolfy"), Dog(0, "Bamboo"))

val dogData = List(DogData("Wolfy"), DogData("Bamboa"))
val actualDogs = registerDogs(dogData)
```

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val actualDogs = registerDogs(dogData)
```

```
// Setup differ with field ignores
val dogDiffer: Differ[List[Dog]] = Differ[List[Dog]].ignoreAt(_.each.id)

dogDiffer.assertNoDiff(actualDogs, expectedDogs)
```

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Let’s ignore dog IDs from comparison

```
given Differ[Dog] = Differ.derived

val expectedDogs = List(Dog(0, "Wolfy"), Dog(0, "Bamboo"))

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val actualDogs = registerDogs(dogData)
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```
// Setup differ with field ignores
val dogDiffer: Differ[List[Dog]] = Differ[List[Dog]].ignoreAt(_.each.id)

dogDiffer.assertNoDiff(actualDogs, expectedDogs)
```

```
List(
  Dog(
    id: [IGNORED],
    name: "Wolfy",
  ),
  Dog(
    id: [IGNORED],
    name: "Bamboa" -> "Bamboo",
  ),
)
```

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There are other useful configuration methods like `.configure` and `.replace`

```
given Differ[Employee] = Differ.derived
given Differ[DogZoo] = Differ.derived

val newDogsDiffer: Differ[List[Dog]] = // a heavily configured Differ[List[Dog]]

val configuredDogZooDiffer = Differ[DogZoo]
  // .configure allows you to "focus" on a differ inside to make multiple tweaks
 to it
  .configure(_.employees)
 (_.ignoreAt(_.each.age).ignoreAt(_.each.hoursWorked).pairBy(_.name))
  // .replace will replace the Differ at the given path
  .replace(_.dogs)(newDogsDiffer)
```

Path Expressions

Differ Type	Allowed Paths	Explanation
Seq	.each	Traverse down to the Differ used to compare the elements
Set	.each	Traverse down to the Differ used to compare the elements
Map	.each	Traverse down to the Differ used to compare the values of the Map
Case Class	(any case class field)	Traverse down to the Differ of the field
Sealed Trait / Enum	.subType[SomeSubType]	Traverse down to the Differ for the specified sub type

Putting it all together

Let’s track office capacity and that everyone is dressed correctly :)

```scala
sealed trait Person:
  def name: String

object Person:
  case class Contractor(name: String) extends Person
  case class Employee(name: String, attire: String) extends Person

case class OfficeCapacity(
  home: Set[Person],
  office: Map[Int, Person]
)
```

```scala
// Derive default differs
given Differ[Person] = Differ.derived
given Differ[OfficeCapacity] = Differ.derived

val officeCapacityDiffer = Differ[OfficeCapacity]
  // Pants optional when WFH ;)
  .ignoreAt(_.home.each.subType[Employee].attire)
  // Pair people by name when comparing
  .configure(_.home)(_.pairBy(_.name))
```

What a diff output might look like:

```
OfficeCapacity(
  home: Set(
    Employee(
      name: "Sarah",
      attire: [IGNORED],
    ),
    Contractor != Employee
    === Obtained ===
    Contractor(
      name: "Paolo",
    )
    === Expected ===
    Employee(
      name: "Paolo",
      attire: [IGNORED],
    ),
  ),
  office: Map(
    1 -> Employee(
        name: "Percy",
        attire: "casual" -> "suit",
      ),
  ),
)
```

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- Use `Differ.useEquals` if just want to compare a type by `==`

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- Use `Differ.useEquals` if just want to compare a type by `==`
- **IntelliJ**: need to adjust some settings to not make all test failure color red
  - Editor | Color Scheme | Console Colors | Console | Error Output, uncheck the red foreground color

Thank you!

- SoftwareMill
  - Many inspirations from **diffx**
- EPFL & all other Scala 3 contributors
  - *Givens* save keystrokes
  - Macros are tremendous fun