

# CS 520

Theory and Practice of Software Engineering  
Fall 2017

## OO design and Java 8 features

October 03, 2017

## Today

- MAP postmortem.
- Another MVC (source code) example.
- A primer on lambdas and method references (Java 8).
- A first paper/poster review.

## Course overview: the big picture

- **Software architecture and design**
  - Software modelling and UML crash course.
  - Best practices and OO design principles.
  - Architecture and Design patterns.
- **Empirical Software Engineering**
  - Reasoning about experimental designs and studies.
  - Understanding and reasoning about threats to validity.
- **Software testing, debugging, and repair**
  - Learning about cutting-edge research.
  - Hands-on experience, using testing and debugging techniques.
- **Class project**
  - Design, development, and testing of a research prototype, etc.



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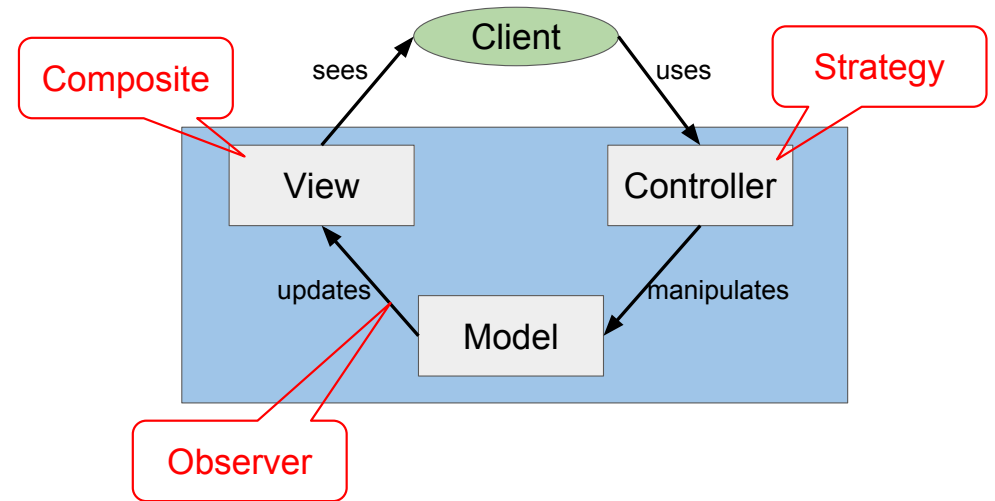
## MAP: Postmortem

### Overview

- Organization and logistics
- Material
- Grading and workload

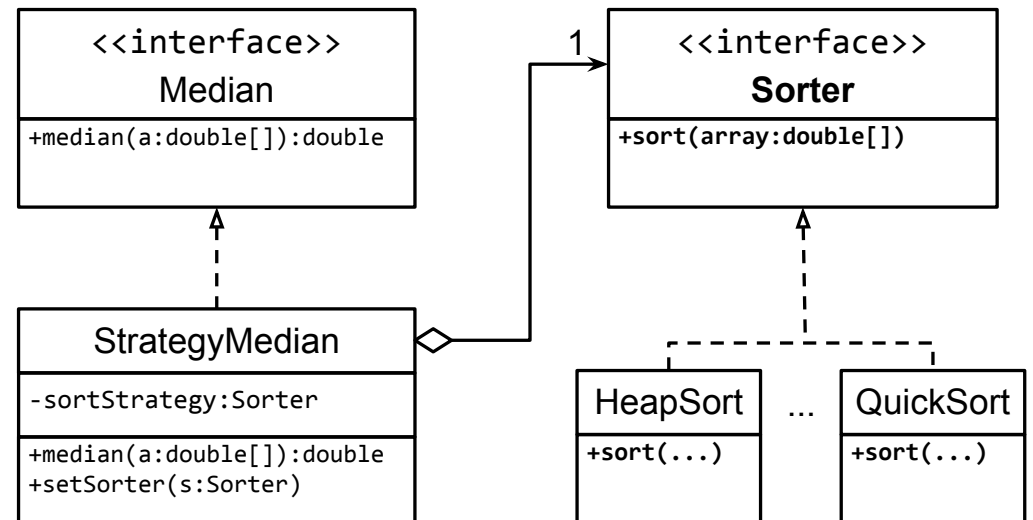
## MVC revisited

### Design patterns in an MVC architecture



## A primer on Java 8 features: Lambdas and method references

### Recall our Median implementation (strategy pattern)



Is this a reasonable solution, given the simplicity of the problem?

## A lot of code and new classes for just calling sort

```
// The Sorter interface.
public interface Sorter {
    public void sort(double[] numbers);
}

// A concrete Sorter implementation.
public class QuickSort implements Sorter {
    public void sort(double[] numbers) {
        java.util.Arrays.sort(numbers);
    }
}

@Test
public void testQuickSort() {
    Median m = new Median();
    m.setSorter(new QuickSort());
    double actual = m.median(1, 2, 3, 4);
    assertEquals (2.5, actual, EPS);
}
```

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What are alternatives to creating a new class to wrap QuickSort?

## Live coding: lambdas and method references

See code example (online)

- lambda
  - Test class *AllTests* provides four test cases.
  - Four possibilities to test the same behavior of *StrategyMedian*.
    - Using a concrete class *QuickSort*.
    - Using an *anonymous inner class*.
    - Using a *lambda expression*.
    - Using a *method reference* (Method references simplify lambda expressions that call a single method).

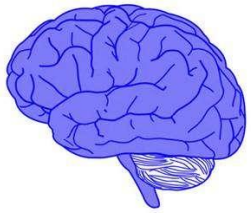
Use ant to compile and test the code:

```
$ant -p          => list all targets
$ant compile    => compile the code
$ant test       => run all four tests, which test the same behavior
```

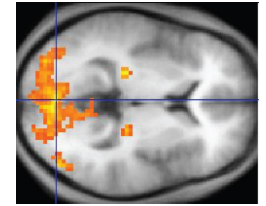
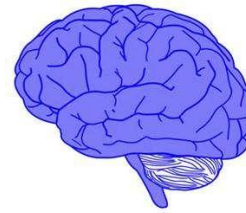
Key concepts: target typing and type inference.

## A first paper/poster review

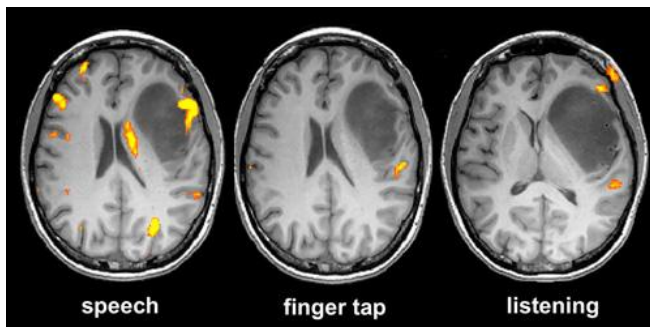
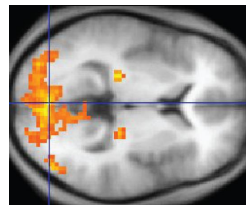
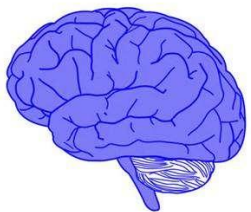
What's this?



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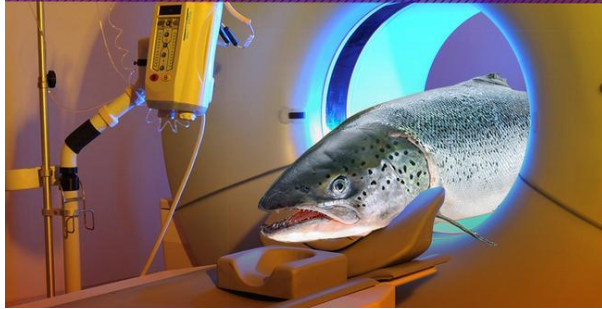
Studying brain activity using fMRI scans



Now, what's this?



## There is an obvious experiment to conduct...



<https://curiosity.com/topics/why-did-researchers-put-a-dead-fish-in-an-fmri-curiosity>

## A first paper/poster review

The image shows the cover page of a scientific paper. The title is "Neural correlates of interspecies perspective taking in the post-mortem Atlantic Salmon: An argument for multiple comparisons correction". The authors listed are Craig H. Bennett, Anjali A. Barot, Michael B. Miller, and George L. Wolford. The paper is published in the journal "Frontiers in Human Neuroscience". The cover includes sections for Introduction, Methods, Results, Discussion, and References. There are also small images of brain scans and a color scale legend.

<http://prefrontal.org/files/posters/Bennett-Salmon-2009.pdf>

## A first paper/poster review

Important questions to answer:

- What is the **motivation** of the paper?
- What are the **main objectives** of the paper?
- What are **strengths** and **weaknesses** of the paper?
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Generally, when interpreting results and statistics, check for red herrings and dead salmons :)