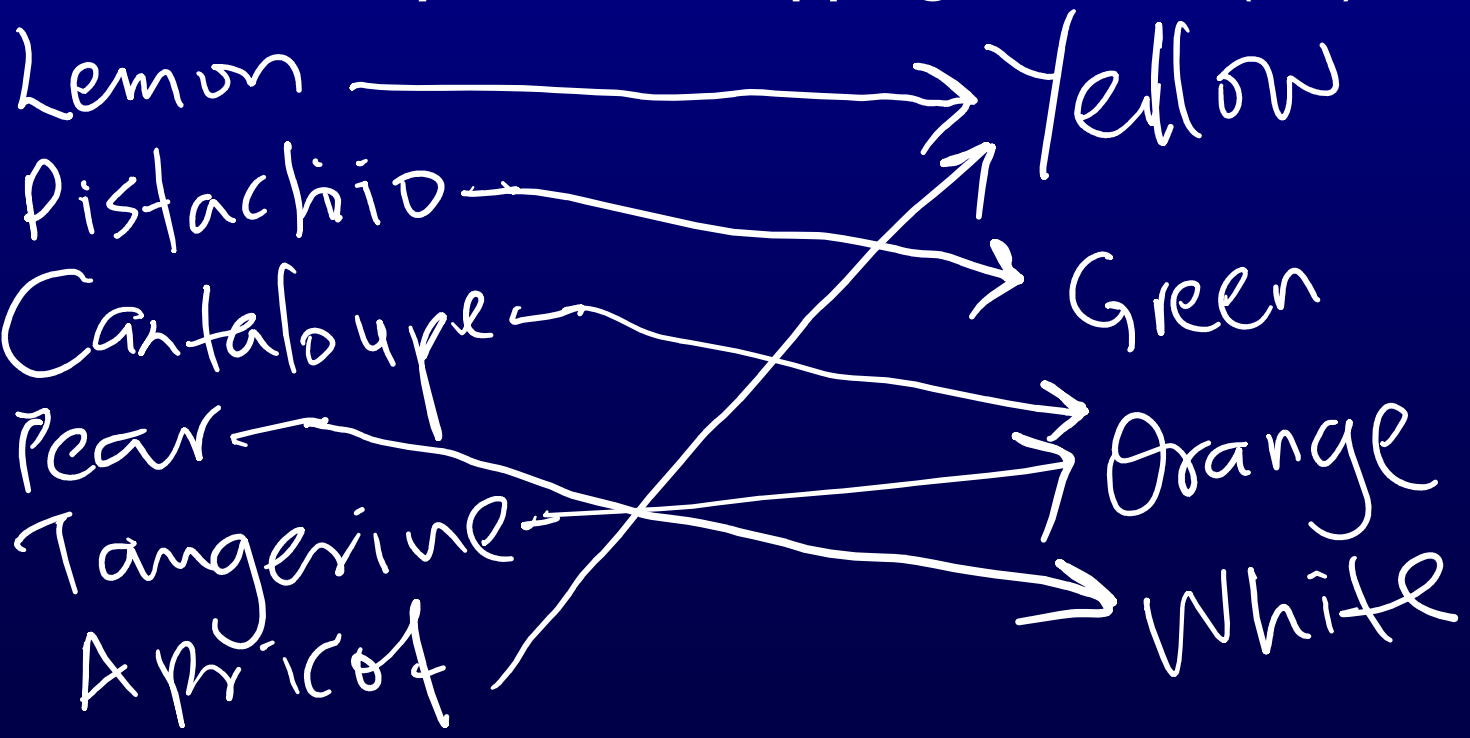
Subsumption revisited

- Criteria Subsumption : Test criterion *C1* subsumes *C2* iff every set of test cases that satisfies *C1* also satisfies *C2*

- Question from last class:

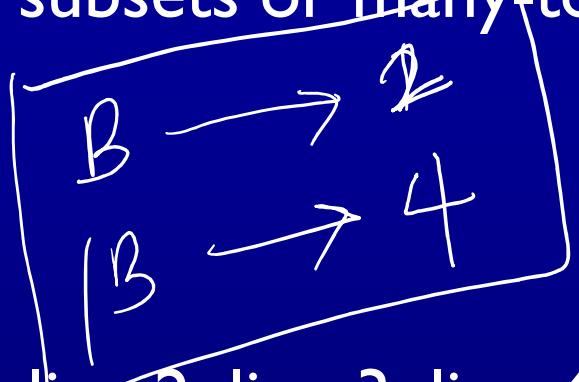
Subsumption ≠ Subset

- Subsumption cannot always be explained using subsets, e.g.,
  - C1: {Lemon, Pistachio, Cantaloupe, Pear, Tangerine, Apricot}
  - C2: {Yellow, Green, Orange, While}
- From last class: C1 subsumes C2. But TR(C1) ⊉ TR (C2)
- There is a many-to-one mapping from TR(C1) to TR(C2)



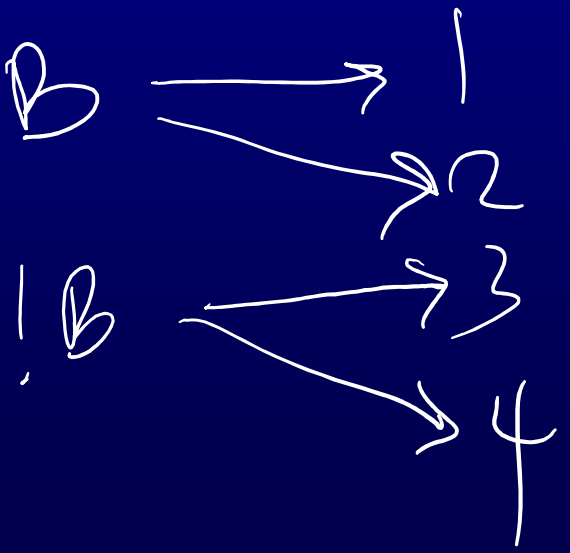
More on Subsumption

- Can we always show subsumption as subsets or many-to-one mappings?



- C1 = {program branches} = {B, !B}
- C2 = {program statements} = {line 1, line 2, line 3, line 4}

```
  int stringFactor(String i, int n) {
1.  if (i != null || n !=0) // --> B
2.    return i.length()/n;
3.  else
4.    return -1;
  }
```



Subsumption: wrong definition?

- Criteria Subsumption : Test criterion *C1* subsumes *C2* iff every set of test cases that satisfies *C1* also satisfies *C2*

- Comment from last class: definition should be, "*C1* subsumes *C2* iff every set of test cases that satisfies *C2* also satisfies *C1*"

- Which definition do you now think is correct?

- Hint: replace C1 with "Branch Coverage" and C2 with "Statement Coverage"

Summary on subsumption

- Formally, subsumption is a relation between two sets of test requirements
- Goal: given a test set T that satisfies criterion C1, what can we say about T with respect to another criterion C2?
- There are many ways to show a subsumption relation
  - Subset
  - Many-to-one mapping
  - One-to-one mapping
  - …

Hands-on Demo

- Maven

CS 5154

Input Space Partitioning

Owolabi Legunsen

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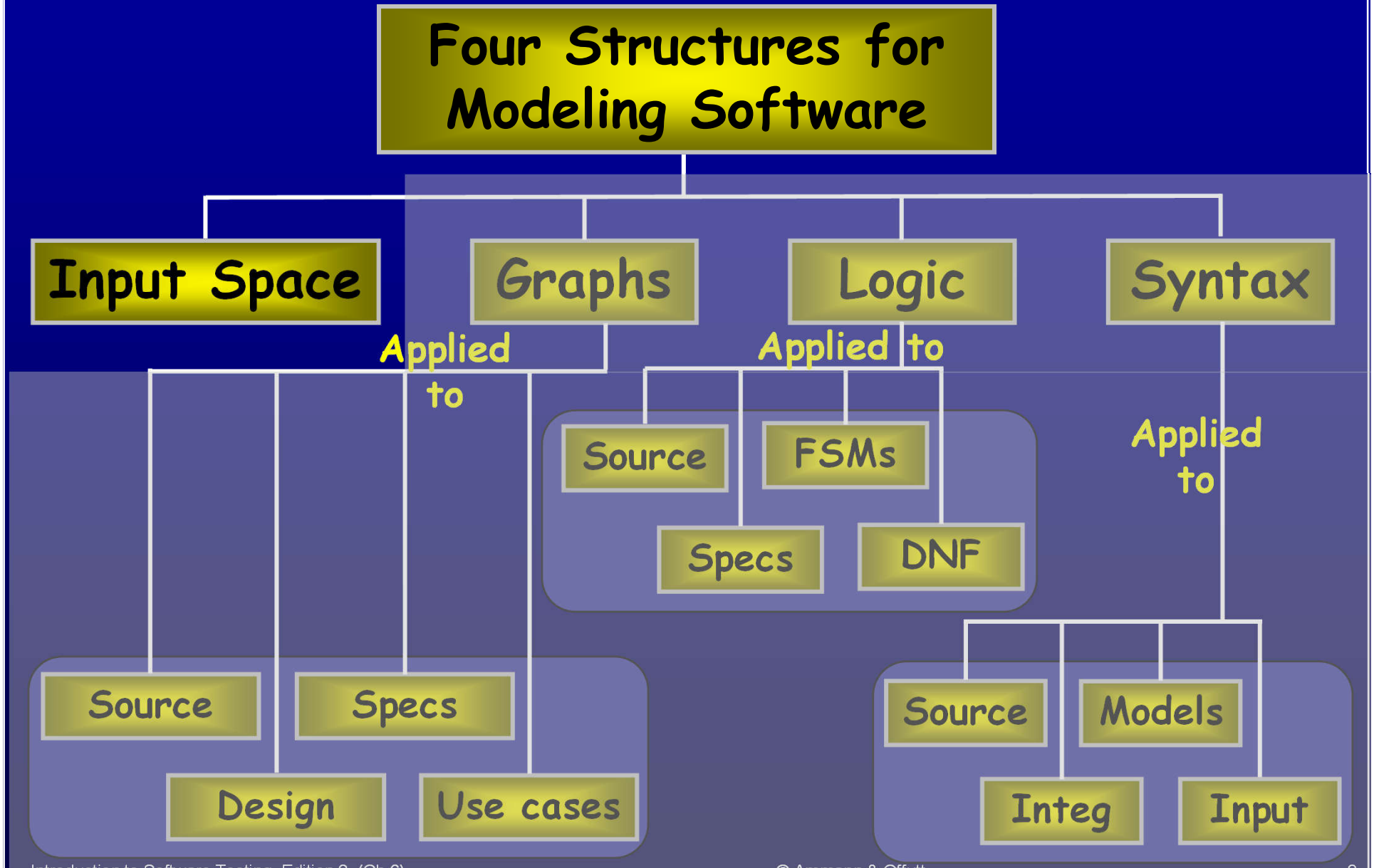
The following are modified versions of the publicly-available slides for Chapter 6 in the Ammann and Offutt Book, "Introduction to Software Testing"
(http://www.cs.gmu.edu/~offutt/softwaretest)

1st of four structures we'll cover



Why Input Space Partitioning?

- No implementation knowledge is needed
  - Just the input space
- Easy to apply without automation
- Can adjust the procedure to get more or fewer tests
- Equally applicable at several levels of testing
  - Unit, Integration, System, etc.

Recommended Reading

Empir Software Eng (2014) 19:558–581
DOI 10.1007/s10664-012-9229-5

An industrial study of applying input space partitioning to test financial calculation engines

Jeff Offutt · Chandra Alluri

Published online: 23 September 2012

Editor: James Miller

Input Domains and ISP

- Input domain: all possible inputs to a program
  - Most input domains are so large that they are effectively infinite
- *Input parameters* define the scope of the input domain
  - Parameter values to a method, data from a file, global variables, user inputs
- ISP: First partition input domain into regions (called *blocks*)
  - values in each block are assumed equally useful for testing
- ISP: Then choose at least one value from each block

Input domain: Alphabetic letters

Partitioning characteristic: Case of letter

- Block 1: upper case
- Block 2: lower case