CS 4390/5390 Fall 2025
Advanced Compilers
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25 points

Data Flow Analyses using the Worklist Algorithm

For this assignment, you will answer a couple of questions about dataflow analysis and then implement two data flow analyses using the generic worklist algorithm. Please use the existing implementation of the worklist algorithm in examples/df.py from the Bril repository at https://github.com/sampsyo/bril/ for tasks 3 and 4 below.

1. Fill in the table below with the necessary information for each type of analysis.

	Domain	Direction	Init	Merge	Transfer
Reaching Definitions	Sets of defs	Forward		Union	
Live Variables	Sets of vars	Backward		Union	$f(out_b) = use_b \cup (out_b - kill_b)$
Constant Propagation	Valuation or T				
Available Expressions	Sets of expressions				

2. Write a convincing argument that the worklist algorithm is guaranteed to converge to a solution, given a certain condition. Be sure to state that condition. You do not need to use lattice theory -- you may if you wish but you can also just give a convincing logical argument.
3. Implement reaching definitions analysis
4. Implement available expressions analysis.
5. Construct a test set and use it to thoroughly test your implementations using Turnt.

In addition to your answers to 1 and 2 above, please turn in your code files, your test cases, and a README file. The easiest way to do this is to create a github repository for the class and create a directory for this assignment with a subdirectory called test for your test cases. Your README file should include a description of the code along with usage instructions.

Grading: Each analysis question or implementation is worth 5 points. The README and test cases make up the remaining 5 points.