

We are bending the latex rule for this assignment. Submit a pdf file that is either generated from latex or a scan of handwritten work for this assignment. Note that the latex source for this homework writeup is posted on the assignments page if you want some help with the matrix format. Homework assignments are to be completed individually. Homeworks need to be submitted electronically via RamCT AND by email to cs560@cs.colostate.edu by 11:59pm on the due date.

Total points: 100

1. [10 points] Iteration Space in Matrix Format

For the below loop, express the iteration space as a polyhedral set using a one matrix format. Make sure to look at the handwritten notes from March 29th and for April 5th.

```
for (i=0; i<N; i++) {
  for (j=i+1; j<N-2; j++) {
    A[i][j] = ...
    ... A[i-1][j+2] ...
  }
}
```

2. [20 points] Applying the transformation to the iteration space

Apply the transformation $T_{I \rightarrow I'} = \{[i, j] \rightarrow [i', j'] \mid i' = j \wedge j' = i\}$ to the iteration space from problem 1 and show the resulting one matrix format for the new iteration space I' . Note that the one matrix format for the transformation is as follows:

$$T_{I \rightarrow I'} = \{[i, j] \rightarrow [i', j'] \mid \begin{bmatrix} i' \\ j' \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} i \\ j \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \end{bmatrix}\}$$

3. [10 points] Array accesses

For the loop from problem 1, show each array access in a one matrix format.

4. [20 points] Transform the array accesses

For the above loop, show how the transformation $T_{I \rightarrow I'}$ transforms the array accesses, and show the new array accesses in a one matrix format.

5. [20 points] Data dependence relation

For the above loop, show the data dependence relation using the one matrix format.

6. [20 points] Transform the data dependence relation

For the above loop, show how the transformation $T_{I \rightarrow I'}$ transforms the data dependence relation, and show the new data dependence relation in a one matrix format.