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Overallocation Summary

For this objective we first extracted ‘max_values’ as a NumPy Array. Then we calculated the difference, for each TA, between their total assigned labs and their maximum allowed labs. After doing this for each of the TAs, we summed them all up. The output number was the total overallocation penalty.

Conflict Summary

For this objective we summed the columns of the ‘solution’ array, outputting an array containing how many labs each TA is assigned to. In this array, values greater than 1 indicate a scheduling conflict for that TA. The sum of these conflicts is outputted as the conflict penalty.

Undersupport Summary

Using the example array of the minimum required TAs, we calculated the difference between the minimum number of TAs required for each lab, and the actual number of TAs assigned to each lab. We then summed the number of labs that varied in their number of TAs from the required amount (only adding to the sum for those labs in which the number of assigned TAs was less than the required amount). This returns the total undersupport penalty.

Unwilling Summary

We implemented a Boolean mask (‘unwilling_mask’) over the dataframe, marking ‘U’ values as ‘True’ and other values as ‘False’. We then filtered between the ‘solution’ array and ‘unwilling_mask’ for TAs marked as ‘unwilling’, creating a new Boolean array where ‘True’

values mark TA's who were assigned to a lab that they had marked 'unwilling'. The total of these 'True' values is outputted as the unwilling penalty.

Unpreferred Summary

We implemented a Boolean mask ('willing_mask') over the dataframe, marking 'W' values as 'True'. We did the same for the preferred lab periods. We then filtered between the 'willing_mask' and 'preferred_mask' to create the 'unpreferred_mask'. Then once again, filtered between the 'unpreferred_mask' and the 'solution' array for TAs who were assigned to labs for which they are willing but do not prefer. The instances are summed up and outputted as the unpreferred penalty.