Tinotenda Cassim Chifamba - u19024895

COS 314 Assignment 1

The program is structured to read files from any of the files within any of the folders recursively. As of now, they are structured to read from Hard28, since I have been inputting all the file names and paths manually within the program.

The binsets use a 2D array to represent them as a state such that it is an array the size of the original dataset as a reference, however it is populated with the index of the bin that the data pack is located in. For example, an array of [0,1,0] shows that the first and last items are in Bin 0, while the second item is in Bin 1. This assumes that the dataset is of size 3 and will not change.

For perturbation, especially in ILS, the array has at least one value change to represent the item being moved from one bin to another, so as long as the values show a valid state of the bin set with the given values. This allows us to represent the neighborhood of the state based on a single value changing per cell of the array. E.g. [0,1,1] has neighbours [0,0,1] and [0,1,0], and not [0,0,0] since that shows two values changed at the same time and not one.

In the Tabu search, the values in the randomised based on the index and the neighbours of that random value are grabbed and sorted by the least bins it can use.

Based on the values below, the ILS is much closer to the optimum for most data sets than the Tabu search, although the Tabu search algorithm reaches near optimum values much quicker than the ILS based on the times taken.

This may be because the ILS search algorithm searches deeply in local neighbourhood, finding the local optimum and does not get out of it despite the number of iterations done, unless there is a heuristic used to guide it.

Tabu search is based more on the global search space, such that it would make use of the local neighbourhood only after it has randomly selected a starting point per iteration and compares the best of that local optimum with the current optimum of the whole space for improvements.

Based on these data and explanations, I have come to the conclusion that ILS works better for datasets that have close local optimums and Tabu search works best for very diverse and larger datasets.

	ILS			Tabu		
	Opt	Opt-1	Sum	Opt	Opt-1	Sum
Falkenauer_T	50	3	53	28	25	53
Falkenauer_U	2	9	11	11	0	11
Scholl_1	6	94	100	10	90	100

Scholl_2	8	92	100	1	99	99
Scholl_3	0	10	10	10	0	10
Schwerin 1	49	51	100	100	0	100
Schwerin 2	90	10	100	100	0	100
Hard28	11	17	28	5	14	19
Waescher	1	16	17	0	16	16

	ILS	Tabu
Falkenauer_T	1727.426	666.450
Falkenauer_U	43.817	14.435
Scholl_1	77.118	13.484
Scholl_2	59.309	8.981
Scholl_3	101.146	37.739
Schwerin 1	140.050	36.401
Schwerin 2	146.482	40.188
Hard28	237.034	111.545
Waescher	39.265	17.484