Abstract: In the last few decades managing large data has become a challenging task because of the increasing volume and complexity of the data being created or collected. The problem here is how to effectively manage and analyze the data and resulting information. The solution requires a comprehensive approach that contains all the stages from the initial data collection to its final analysis. Clustering is one of the solutions which is the fundamental technique in data mining that is based on grouping a set of objects in such a way that objects in the same group called cluster are more similar to each other than to those in other clusters. Traditional clustering techniques do not address all the requirements adequately.

In this paper, we propose Map Reduce Clustering Glowworm Swarm Optimization (MRCGSO) that provides scalable environment that handles large data sets and achieves a good speedup and utilization when more computing nodes are used. MRCGSO uses the MapReduce methodology for the parallelization since it provides fault tolerance, load balancing and data locality.

Keywords: Data mining, Parallel processing, Apache hadoop.

1. LITERATURE SURVEY
A parallel K-means algorithm clustering algorithm based on MapReduce was proposed in [4]. The algorithm finds the centroids by calculating the weighted average of each individual cluster points through the Map function; afterwards the Reduce function assigns a new centroid for each data point based on the distance calculations. Then, a MapReduce iterative refinement technique is applied to find the final Centroids.

In [5], a parallel genetic algorithm was proposed using the MPI library on a Beowulf Linux Cluster with the master slave paradigm.

In [6], an MPI based parallel particle Swarm optimization algorithm was introduced. However, MPI is not the best choice for parallelization because of the weakness of having to handle the failure of nodes.

In [7], MRPSO incorporated the MapReduce model to parallelize particle swarm optimization by applying it on computationally data intensive tasks. The authors presented a radial basis function as the benchmark for evaluating their MRPSO approach, and verified that MRPSO is a good approach for optimizing data-intensive functions.

In [8], the authors proposed a MapReduce based ant colony approach. They show how ant colony optimization can be modeled With the MapReduce framework. They designed and implemented their algorithm using Hadoop.

Comparing our proposed algorithm to the algorithms listed above, Map Reduce implementations were used to optimize single objective functions, whereas in our proposed algorithm, the algorithm searches for multiple maxima for multimodal functions. To the best of our knowledge, MRCGSO is the first the parallelization of glowworm swarm optimization.

Designs of Parallel Glowworm Swarm Optimization Tool Using Map Reduce

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2. TERMINOLOGY

Data mining: Data mining is a process of exploring patterns in huge data sets by converting it into useful information. There are many data mining techniques such as association rule mining, data classification, and data clustering.

Parallel Processing: Parallel processing is a processing in which many calculations are carried out simultaneously [9], working on the principle that large problems can often be divided into smaller ones, which are then solved at the same time.

Apache Hadoop: Apache Hadoop [10] is an open source framework which is the commonly used for map reduces implementation and supports data-intensive applications (petabytes of data) licensed under apache. It consists of two main components: Hadoop Distributed File System (HDFS), which is used for data storage, and Map Reduce, which is used for data processing.

3. PROPOSED METHODOLOGY

In our proposed methodology for implementation of MRCGSO, we have considered the input as student database which contains various details regarding examination marks scored by each students in each subject.

The steps are performed iteratively until optimized cluster is obtained

1 [Glowworm initialization]
Generate random position vector \( p_j \) for each glowworm within search space between minimum and maximum \( F_j = 0 \) the luciferin level and local decision range are initialized. Numbers of clusters and iterations to be performed are specified here

2 [Centroid selection]
In this step map and reduce functions are implemented. The map function takes the input dataset. Dataset is partitioned based on the number of mappers used. Each Mapper then calculates the sub-covered records (\( cr_j \)) and the sub-intra-distances (\( intraD_j \))

\[
IntraD_j = \sum_{i=1}^{n} \text{distance}(cr_j, g_j)
\]

The reduce function takes intermediate output from map function. It calculates the sum of sub-coverage and sub-intradiances from all mappers to find the glowworm’s coverage and intra-distance for the Whole data set. Where the coverage is the number of data instances Covered by the glowworm based on the whole data set, and the Intra-distance is the sum of distances between the glowworm and the covered data instances from the whole data set.

3 [Clustering movement]
This step reads the reducers Output and calculates the fitness of each glowworm, then continues the same CGSO process of updating the glowworm Position based on its glowworm neighbors.

\[
F(g_j) = \frac{1}{n} \frac{|cr_j|}{SSE} \times \frac{intraD_j}{mix_j}\times \frac{intraD_j}{mix_j}
\]

Example
Input:

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Internal marks</th>
<th>External marks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>16</td>
<td>75</td>
<td>91</td>
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<td>64</td>
<td>85</td>
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</table>

Fig: Block diagram

INPUT: Student dataset containing internal marks, external marks and total

OUTPUT: Clustered results based on marks

Notations:
In MRCGSO, each glowworm \( g_j \) in the swarm has the following information:
- Luciferin level \( (L_j) \) carried by glowworm \( g_j \)
- Fitness function value \( (F_j) \)
- M-dimensional position vector \( (p_j) \)
- Coverage set size \( (cr_j) \), which is the number of the data Instances that are covered by \( g_j \)
- Intra-distance \( (intraD_j) \), which is the distance between the \( cr_j \) set members and the \( g_j \) position
- Local decision range \( (rd) \), which is the range of the Glowworm to find the covered data records within this Range, and to find the glowworm’s neighbors.
Output:
Students who scored above 79 are in cluster1
Students who scored above 58 are in cluster2
Students who scored above 50 are in cluster3
Students who scored below 50 are in cluster4

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Internal marks</th>
<th>External marks</th>
<th>Total</th>
<th>Student belonging to cluster</th>
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<tbody>
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<td>75</td>
<td>91</td>
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CONCLUSION:
In this paper, we have proposed an automated tool for clustering the data using MRCGSO method. The proposed tool is tested for its correctness and completeness using engineering college students data.

REFERENCES:
[1] Naiolah Al-Madi, Ibrahim Aljarah and Simone A. Ludwig, "Parallel glowworm swarm optimization using map reduce" Dept of cse North Dakota State University Fargo, ND, USA