# CSC 499 Research Proposal

**Title:**

**Faculty Mentor:**

Participants: Wenting Zheng

**Course:**  CSC 499, computer science restricted elective, 3 credit hours (S/U)

**Prerequisites:**

**Description:** Mining knowledge from data often requires extensive search. Evolutionary algorithms have been applied successfully to various data mining tasks because they capable to explore a vast search spaces while simultaneously exploiting promising solutions. In this project, we will adapt biogeography-based optimization (BBO, [1]) to mine classification rules and interesting subgroups in large data sets. BBO is an evolutionary algorithm that is inspired by changes in the distribution of biological species over time and space. For our implementation, we will use the high performance programming language Julia which is designed for numerical computation and focuses on distributed parallel execution [2].

[1] D. Simon, 2008. Biogeography-based optimization, IEEE Transactions on Evolutionary Computation, 12, 6, 702-713.

[2] https://julialang.org/

**Tasks:**

1. Learn the Julia programming language.
2. Learn about biogeography-based optimization.
3. Implement the BBO-RM algorithm in Julia.
4. Evaluate the performance of the implementation.
5. Document the implementation.
6. Explore avenues to parallelize BBO-RM.

7. Write project report.

**Deliverables, with Grading:**

* [Task 1]  Functional BBO-RM implementation using Julia.  (30%)
* [Task 2]  Written documentation. (10%)
* [Task 3] Written description of evaluation experiments.  (10%)
* [Task 4]   Parallelization of BBO-RM code (20%)
* [Task 5]  Comparison of BBO-RM and parallelized BBO-RM.  (10%)
* [Task 6]  Comprehensive Project report.  (20%)

**Timeline:**

* Task 1 (Functional BBO-RM implementation in Julia) deliverables due end of week 4.
* Task 2 (Written Documentation of BBO-RM implementation) deliverables due end of week 5.
* Task 3 (Written description of evaluation experiments) due end of week 6.
* **MILESTONE:**  Demonstrated knowledge of Julia programming through the implementation, documentation, and evaluation of a functional BBO-RM implementation.
* Task 4 (Parallelization of BBO-RM code) deliverables due end of week 10.
* Task 5 (Comparison of BBO-RM and parallelized BBO-RM) deliverables due end of week 11.
* **MILESTONE:** Demonstrated knowledge of parallelization in Julia through the successful parallelization of the BBO-RM implementation. Evaluation of the efficiency of the parallelized BBO-RM algorithm in comparison to the non-parallelized BBO-RM algorithm.
* Task 6 (Comprehensive project report) deliverables due one week before end of semester.