PARTICLE SWARM OPTIMIZATION

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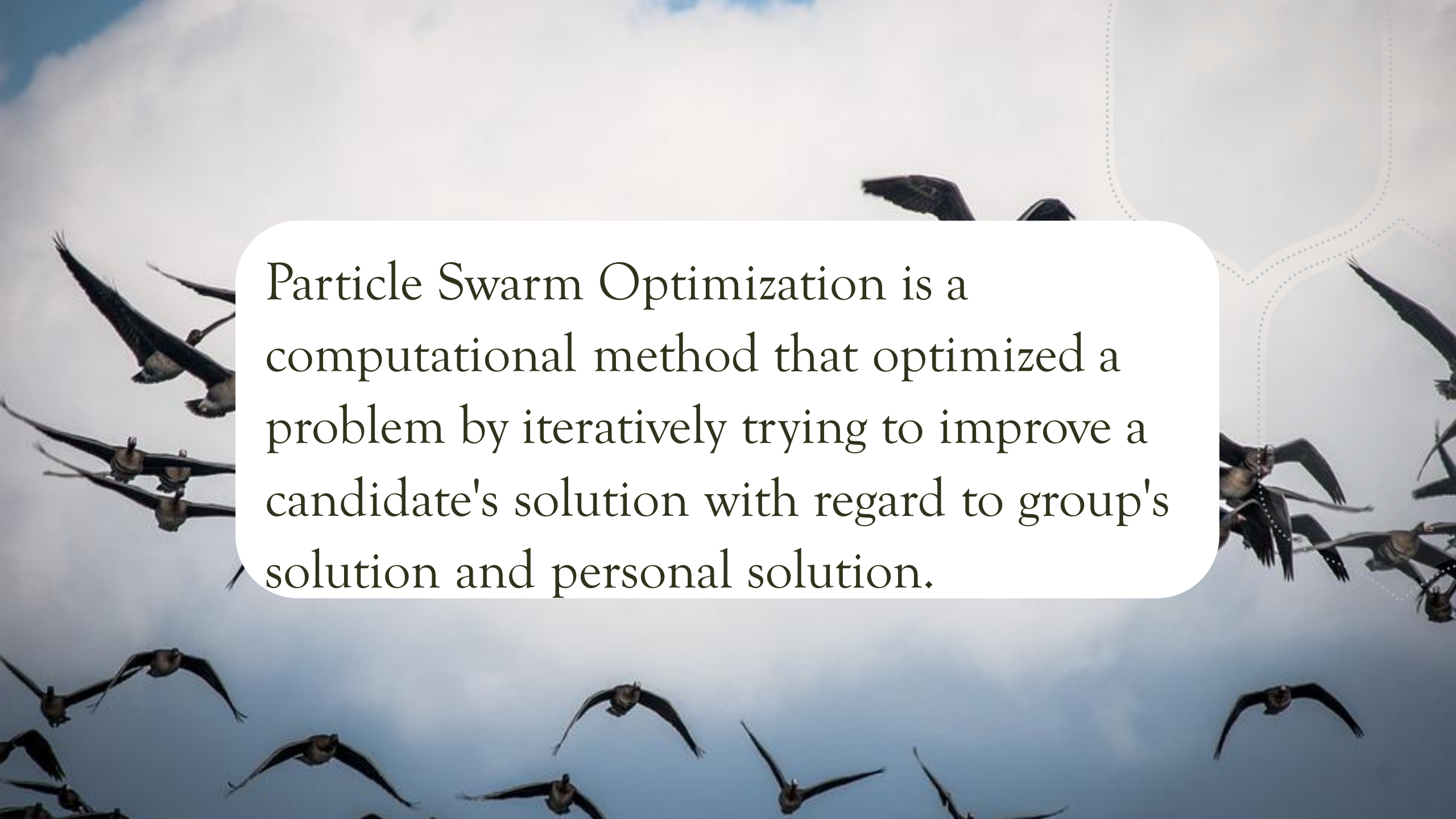
WHAT IS PARTICLE SWARM OPTIMIZATION?



Particle Swarm Optimization is a computational method that optimized a problem by iteratively trying to improve a candidate's solution with regard to group's solution and personal solution.

THE INSPIRATION BEHIND THE ALGORITHM

The algorithm is inspired by nature.

It mimics the behavior of the birds in nature, when they are looking for food.

The location of the food is unknown.

A bird uses its best position, but also the group's best , and by merging the two it will update its position to be closer to the food.

PROBLEM STATEMENT

- Training an ensemble of weak models is beneficial for generalization, so we wanted to extend this concept by training models with unequal voting rights.
- We wanted to overcome the difficulties associated with vanishing gradient and exploding gradient.
- We tried to adapt feed-forward neural networks to perform well on tabular data.

For all that, we tried to use the Particle Swarm Optimization algorithm in hope for good results.

OUR APPROACH

- Trained Ensemble of Models for Classification
- Trained Ensemble of Models for Regression
- Trained Using PSO a MLP
- Trained Using PSO a RNN

RESULTS

- The training of the ensemble of classification models did not exceed the unweighted ensemble or the best model.
- The training of the ensemble of regression models has made some small improvements in performance for models with almost equal results.
- We were able to solve the exploding gradient problem and the vanishing gradient problem for a small version of a Vanilla RNN.
- We have a slightly better performance for the PSO trained MLP than the gradient-based trained MLP.

FUTURE IMPROVEMENTS

- Parametric-efficient method
- Training neural networks architectures that are intended for tabular data
- Training bigger architectures for recurrent neural networks.
- Combining gradient-based training with PSO training.

CONCLUSIONS

We 've come to the conclusion that the Particle Swarm Optimization algorithm is not suitable for the ensemble of models for classification, due to the nature of the algorithm.

The results on training neural networks with this algorithm gives hopes for future improvement.