Project 4
Research Paper Review

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1. Prediction and optimization of nitrogen losses in co-composting process by using a hybrid cascaded prediction model and genetic algorithm

2. The author of this research paper are : Elif Tugçe ˇ Kabak, Ozge Cagcag Yolcu, Fulya Aydın Temel, Nurdan Gamze Turan

- All are from Turkey country
- This was conducted in 3 University: Ondokuz Mayıs University, Marmara University, Giresun University

3. It was published in year 2022

4. This paper was cited by other papers 5 times

- Simulation, prediction and optimization of typical heavy metals immobilization in swine manure composting by using machine learning models and genetic algorithm
  - 2022, Journal of Environmental Management
- Modeling and optimization of process parameters in co-composting of tea waste and food waste: Radial basis function neural networks and genetic algorithm
  - 2022, Bioresource Technology
- Evaluation of key microbial community succession and enzyme activities of nitrogen transformation in pig manure composting process through multi angle analysis
  - 2022, Bioresource Technology
- Recent trends and advances in composting and vermicomposting technologies: A review
  - 2022, Bioresource Technology
- Machine learning-assisted multiscale modeling of an autothermal fixed-bed reactor for methanol to propylene process
  - 2022, AIChE Journal

Continue

5. 69 research papers referenced in the paper

6. This paper was published by Chemical Engineering Journal

7. The submission date is CEJ November 30,2022 and link: https://www.elsevier.com/journals/chemical-engineering-journal/1385-8947/guide-for-authors (It was in 2022 not in 2023)

8.

Modeling and optimization of process parameters in co-composting of tea waste and food waste: Radial basis function neural networks and genetic algorithm - 8

Evaluation of key microbial community succession and enzyme activities of nitrogen transformation in pig manure composting process through multi angle analysis - 6

Simulation, prediction and optimization of typical heavy metals immobilization in swine manure composting by using machine learning models and genetic algorithm - 3

Recent trends and advances in composting and vermicomposting technologies: A review -2

Machine learning-assisted multiscale modeling of an autothermal fixed-bed reactor for methanol to propylene process-1

9. It has been 16 times cited by referenced papers. Name : Composting of animal manures and chemical criteria for compost maturity assessment

10. We are in contact with the author through email and CC professor. Here is the reference code which is related. Link :https://www.kaggle.com/datasets/atharvaingle/crop-recommendation-dataset

11. We are in contact with author. Here the code is done with selection of feature which is very similar to done in the paper so this code can be used for refer ence https://www.kaggle.com/code/dj67rockers/crop-recommender#Feature-Selection-

12. Nitrogen losses in co-composting

- Prediction and optimization of nitrogen losses in co-composting process by using a hybrid cascaded prediction model and genetic algorithm
- In this study, nitrogen loss in the co-composting of PW and FW was examined, as well as the effects of several physical and chemical parameters affecting the maturation of compost and compared to the mono-composting of PW and FW.
- It has been demonstrated that the H-CFNN-PM that was suggested in this work may be utilized as a valid and reliable tool for predicting nitrogen loss, and that by optimizing this tool, parameter values that would result in the least nitrogen loss can be determined.

13. Problem Explanation

- Investigators looked on the impact of co-composting food waste and chicken waste on nitrogen losses and maturity. The effectiveness of co-composting and mono-composting of each waste was compared using various combination ratios.
- The results were not valuable when it is costly and difficult to renew the composting process by creating a new experimental setup.

14. Benefits of Techniques used

- The suggested prediction produced predictions with MAPE values of about 1-2% on all data points containing the training, validation, and test datasets for the various hidden layer neuron numbers of CFNN. H-CFNN-PM can also predict out-of-sample data with MAPE values.
- H-CFNN-PM suggested is utilized as a valid and reliable tool for predicting nitrogen loss, and that by optimizing this tool, parameter values that would result in the least nitrogen loss can be determined. These results are extremely valuable, especially given how expensive and challenging it is to restart the composting process with a new experimental setup.

15. Summary

- The impact of co-composting food scraps and chicken manure on nitrogen losses and maturity was examined in this study. Also predict nitrogen losses across all reactors was a hybrid linear and nonlinear technique based on a cascaded forward neural network. On all data points encompassing the training, validation, and test datasets, the suggested model predictions with errors (MAPE) values of between 1% to 2%. Particularly when contrasted to Response Surface Methodology (RSM), which generates predictions with MAPE values of roughly 15% on all data points, these results might be regarded as exceptional. The genetic algorithm's (GA) best values.

16. Literature review

- The writers have examined a few works that have some minor discrepancies from other works. According to the literature review, nitrogen loss was seen when the temperature in the system was raised.
- The second reviewed research focused much more on what variables were involved in nitrogen loss. One of the issues was heat. Furthermore, PH, EC, and MC were parameters that interfered with nitrogen loss was discovered by the papers.
- Some articles claimed that machine learning models and statical approaches might be useful in determining the best compost with the least nitrogen loss.
- Thus the author discovered that using Artificial neural network would be great options along with the statistical method like H-CFNN-PM that would give optimal nitrogen loss is shown in the paper.

17. Pros

- These prediction models make it possible to decrease the number of experiments, cost, time, and manpower required for experiments, and determine the results for experiments that are technically inapplicable.
- We get parameter values that will produce the minimum nitrogen loss.
- It makes the wastes hygienic, solving the disposal problem, obtaining value-added products, reducing greenhouse gas emission, and low cost.
- It reduce the negative impact of the livestock sector on the environment
- When we consider FFNN and H-CFNN-PM together with reduced errors from RSM which is a hybrid model can create a best prediction model of amount of nitrogen loss in terms of rmse and map criteria.

Cons

- All the situations in the experiments are not taken into consideration and considered only the values.
- These findings are invaluable, especially when it is costly and difficult to renew the composting process by creating a new experimental setup.
- In these the author takes in consideration many parameters, but insects is one of the parameter that would also affect the soil which is not considered by the author also the effects of different chemicals which are already present in soil.

18. Address deficiencies

- Renew the composting process by creating a new experimental.
- The author has not kept in mind that maximizing the nitrogen might also lead to decreasing different nutrients in the compost.

19. Contributions

- The use of nitrogen loss prediction models to provide site-specific in-season N recommendations is a recent development. These models combine information on the soil, the weather, the crop, and the management into a complex network of mathematical equations that calculate key physical and physiological processes crucial to crop development and yield formation.
- Based on explicit model-generated estimations of N supply, N loss, and crop N uptake at the time of in-season application, computer simulation models for nitrogen loss make their predictions.

20. Future recommendations

- The proposed model does not work even when it is costly and difficult to renew the composting process by creating a new experimental setup as suggested by author so they future recommend that improvement in model.
- Even though it is expensive and challenging to restart the composting process by setting up a fresh experimental setup, as described by the author, it is difficult to build that and once it is built, we get more accurate results.

21. Machine learning algorithms

- This model only uses ANN algorithms.

Thank you