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**Optimization of Feature Selection in Support Vector Machines (SVM) Using Recursive Feature Elimination (RFE) and Particle Swarm Optimization (PSO) for Heart Disease Detection**

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**Abstract**
Heart disease is one of the main health problems throughout the world. Early and accurate detection of heart disease is very important to reduce the death rate caused by this condition. One effective approach to detect heart disease is to use Support Vector Machine (SVM) as a machine learning algorithm. However, when using SVM, selecting the right features is very important to improve prediction performance. Inappropriate feature selection can lead to excess dimensions, high computing time, as well as the possibility of adding irrelevant information. Apart from that, the choice of C and gamma parameters can affect SVM performance. The RFE method is used to select the most informative and relevant subset of features from a given feature set. RFE combines a dimensionality reduction process with a machine learning process where the least important features are iteratively removed until the best feature subset is obtained, while the PSO method is used to optimize the C and gamma parameters of SVM. The results of the SVM-RFE PSO model trial showed increased accuracy in classifying heart disease. The accuracy value increased from 86.41% to 89.13%, indicating that this approach compares favorably with conventional SVM models or even SVM with RFE alone. These results illustrate that using the combination of RFE and PSO together is effective in improving the ability of SVM in classifying heart disease. © 2024 IEEE.

**Author Keywords**
Detection; Heart Disease; Machine Learning; PSO; RFE; SVM

**Index Keywords**
Adversarial machine learning, Cardiology, Diseases, Feature Selection, Medical problems, Support vector machines; Detection, Features selection, Heart disease, Machine-learning, Optimisations, Particle swarm, Particle swarm optimization, Recursive feature elimination, Support vectors machine, Swarm optimization; Dimensionality reduction

**References**

- Muharram, F.R.
  **The 30 Years of Shifting in The Indonesian Cardiovascular Burden-Analysis of The Global Burden of Disease Study**
  (2024) *J Epidemiol Glob Health*, 14 (1), pp. 193-212.
  Mar
- Yu, Y., Jain, B., Anand, G., Heidarian, M., Lowe, A., Kalra, A.
  (2024) *Technologies for non-invasive physiological sensing: Status, challenges, and future horizons*,
  Feb. 01, Elsevier Ltd
- Nashif, S., Raihan, M.R., Islam, M.R., Imam, M.H.
  **Heart Disease Detection by Using Machine Learning Algorithms and a Real-Time Cardiovascular Health Monitoring System**
  (2018) *World Journal of Engineering and Technology*, 6 (4), pp. 854-873.
- Chithambaram, T., Logesh Kannan, N., Gowsalya, M.
  **Heart Disease Detection Using Machine Learning**
  (2020) *Res Sq*, pp. 1-11.
- Dinh, A., Miertschin, S., Young, A., Mohanty, S.D.
  **A data-driven approach to predicting diabetes and cardiovascular disease with**

**machine learning**
(2019) *BMC Med Inform Decis Mak*, 19 (211), pp. 1-15.
[Online]

- Subramani, S.
**Cardiovascular diseases prediction by machine learning incorporation with deep learning**
(2023) *Front Med (Lausanne)*, 10.

- Saputra, D., Dharmawan, W.S., Irmayani, W.
**Performance Comparison of the SVM and SVMPSO Algorithms for Heart Disease Prediction**
(2022) *International Journal of Advances in Data and Information Systems*, 3 (2), pp. 74-86.
Nov

- Riski Indra Pratama, A., Amalia Latipah, S., Nurina Sari, B.
**OPTIMASI KLASIFIKASI CURAH HUJAN MENGGUNAKAN SUPPORT VECTOR MACHINE (SVM) DAN RECURSIVE FEATURE ELIMINATION (RFE)**
(2022) *JIPI (Jurnal Ilmiah Penelitian dan Pembelajaran Informatika)*, 7 (2), pp. 314-324.

- Pahwa, K., Kumar, R.
**Prediction of Heart Disease Using Hybrid Technique For Selecting Features**
(2017) *2017 4th IEEE Uttar Pradesh Section International Conference on Electrical, Computer and Electronics*, pp. 500-504.

- Joseph, V.R., Vakayil, A.
**SPlit: An Optimal Method for Data Splitting**
(2022) *Technometrics*, 64 (2), pp. 166-176.

- Joseph, V.R.
**Optimal ratio for data splitting**
(2022) *Stat Anal Data Min*, 15 (4), pp. 531-538.
Aug

- Al Bataineh, A., Manacek, S.
**MLP-PSO Hybrid Algorithm for Heart Disease Prediction**
(2022) *J Pers Med*, 12 (8).
Aug

- Gad, A.G.
**Particle Swarm Optimization Algorithm and Its Applications: A Systematic Review**
(2022) *Archives of Computational Methods in Engineering*, 29 (5), pp. 2531-2561.
Aug

- Cui, H., Shu, M., Song, M., Wang, Y.
**Parameter selection and performance comparison of particle swarm optimization in sensor networks localization**
(2017) *Sensors (Switzerland)*, 17 (3).
Mar

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