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**Research Topic**

**Unraveling Key Factors of Wildfire Risks in British Columbia – Leveraging Genetic Algorithm and Particle Swarm Optimization.**

**Supervisors**

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**Abstract**

**Wildfires are a pervasive global issue with profound implications for human settlements, environmental sustainability, and biodiversity. In British Columbia (BC), the consequences of these natural calamities are particularly acute, affecting air quality and posing immediate risks to both human and animal populations. This research aims to develop a machine-learning model designed to predict the occurrence and intensity of wildfires in BC accurately. The study explores various feature selection approaches, including Random Forest Feature Importance, and compares the efficacy of Particle Swarm Optimization and Genetic Algorithms in feature selection. The research also aims to identify the most critical variables influencing wildfire prediction. To optimize the predictive models, Genetic Algorithms (GAs), Particle Swarm Optimization (PSO), and Random Forest Feature Importance were employed for feature selection. We also utilized Bayesian Optimization for hyperparameter tuning, supplemented by Grid Search and Random Search techniques. The analysis, grounded in historical wildfire and environmental data, identified pivotal variables such as Total Cloud Cover, Surface Sensible Heat Flux, Distance to Fire Center, and Soil Water Volume as significant contributors to wildfire risk. While models trained on features selected by PSO and GA achieved accuracies up to 77%, we found that models trained on the complete feature set outperformed them, with Random Forest and XGBoost models reaching 82.3% and 82.8%, respectively.**