



JAIN

DEEMED-TO-BE UNIVERSITY

SCHOOL
OF ALLIED
HEALTHCARE
AND SCIENCES

Prediction of contamination using ML and AI for restaurant food

U.Adhiksha , Thejaswini S J

Dr . Estuti Chandra [Asst. Prof.]

contact no : 9880195804



Methodology

A predictive ML model was built using four key data sources:

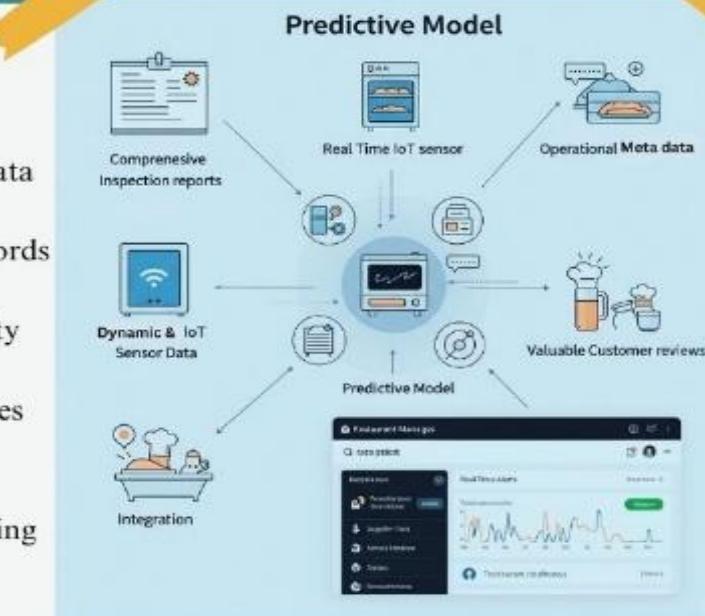
- Inspection Reports – Historical inspection records from restaurant
- Environmental Sensors-Temperature , humidity ,ph sensor with 5-minute logging intervals
- Operational Metadata – Staff compliance scores based on (specific metrics like hand -washing frequency, uniform cleanliness checklist)
- Customer Feedback – Online reviews mentioning quality/sickness

Theoretical and practical Implications

1. ML validation shows ensemble models work best with complex ,multi-source data
2. Staff stability is identified as a key hygiene factor in restaurant .
3. IoT-MI combo supports FDA's smart food safety goals

Limitations

1. Systems requires consistent sensor maintenance
2. Performance may vary across different restaurant types
3. Requires staff training for optimal implementation



ML Model Architecture for Contamination Prediction

We used ensemble voting classifier combining Random Forest (100 trees), Gradient Boosting (learning rate=0.1), and 3-layer by Neural Network

42 feature extracted including temperature abuse, cross-contamination, and staff compliance.

A stacked ensemble model with 10-fold cross-validation boosted prediction accuracy and robustness.

Training data :80 per , validation: 10per, Testing: 10per split

Results

Accuracy: 95%
(Precision: 92%, Recall 89%, F1-Score: 0,90)
87% improvement
in early
risk detection
compared to
manual
inspection
methods



Conclusion

By using AI and real-time data, we move from reacting to food safety problems to preventing them. This system helps restaurants act before harm occurs, making food safer for everyone. It's not just innovation it's a new standard for public trust and protection in every meal.

TOP PREDICTORS

- Temperature deviation >2°C (importance: 0,23)
- Staff hand-washing compliance score (importance: 0,19)
- Equipment cleaning intervals (importance: 0,16)

References

- 1.WHO.(2020). Foodborne diseases : Overview
- 2.Scallan, E., et al. (2011). Emerging Infectious Diseases.
- 3.Panigarhi, S., et al (2020). Trends in food science and Technology
- 4.FDA. (2023). Food Code .
- 5.Pedregosa, F., et al. (2011). Scikit-learn : JMLR
6. Misra, N. N., et al. (20021) . Computers and Electronics in Agriculture.
7. Poonam, et al. (2024). Comprehensive Review on ML /AI in Food Contamination Prediction.