A Smart Health Records Application

USING MACHINE LEARNING FOR PERSONALIZED, INTERACTIVE HEALTH

Smart Health Records App

Outline

- Business Problem
- Data Understanding
- Models
- Results
- Recommendations

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Business Problem

- Multiple heath networks create incomplete, spotty health records. Increased uncertainty, conflicting treatments/procedures.
- Medical Records Database aggregates and combines patient records across healthcare systems
- We will demonstrate the app's value with a simple scenario involving predicting vaccination status

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Vaccination Scenario Data Understanding

- Data from National Center for Health Statistics
- Survey data taken during 2009 H1N1 flu pandemic
- Shows number of vaccinated and unvaccinated for H1N1 vaccine
- Training Data column = actual classes
- Predicted Data = predicted classes

Class	Training Data	Predicted Data
Did not take vaccine (0)	21033	22970
Took vaccine (1)	5764	3738

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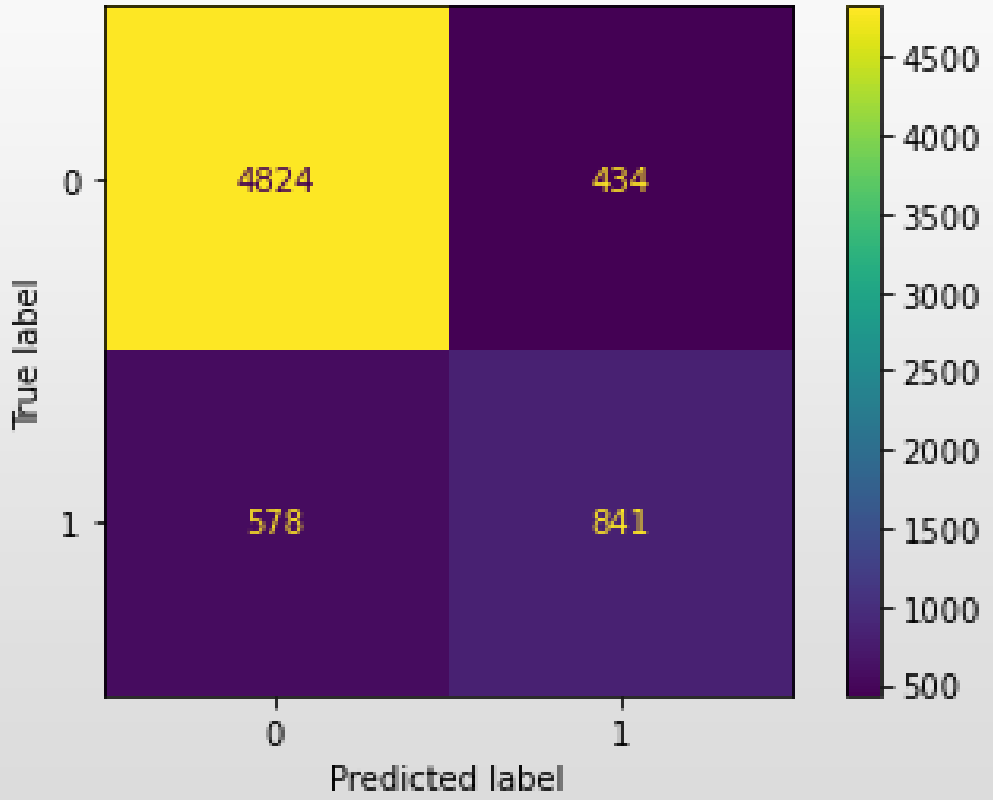
Vaccination Scenario: Logistic Regression Model

- Basic binary classification algorithm
- Handles majority class (unvaccinated) very well, minority class reasonable
- Logistic Regression Accuracy Score: 85%



Confusion Matrix for Logistic Regression Model

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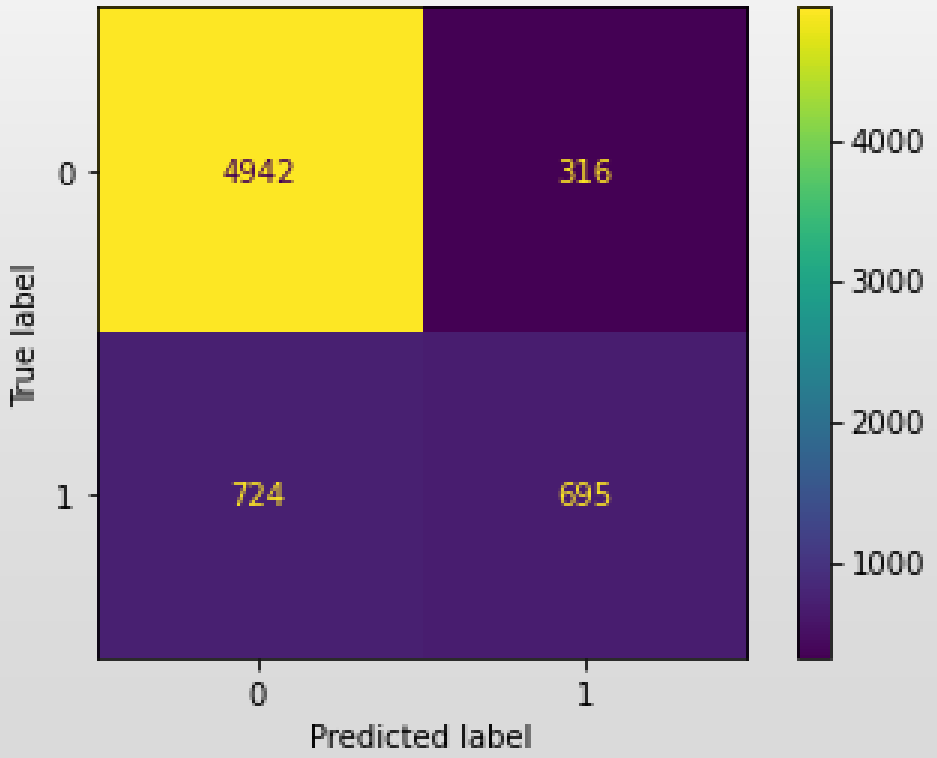
Vaccination Scenario: SVM model

Notes

- SVM are more complicated models that are often quite accurate
- Results similar to previous model
- SVM Accuracy Score: 84%

Confidence Matrix for Support Vector Machine Model



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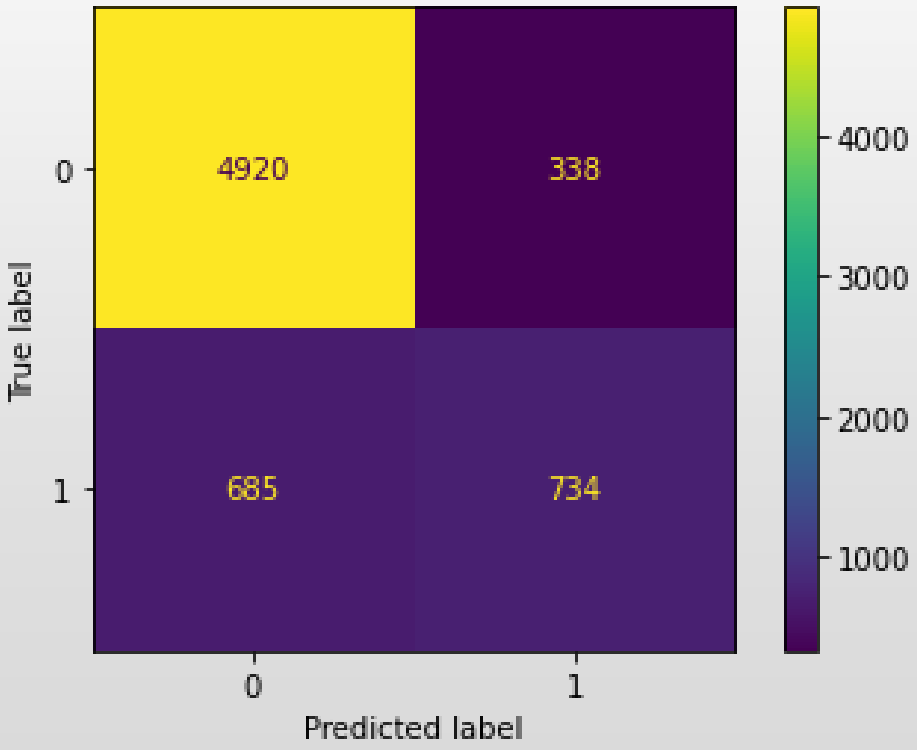
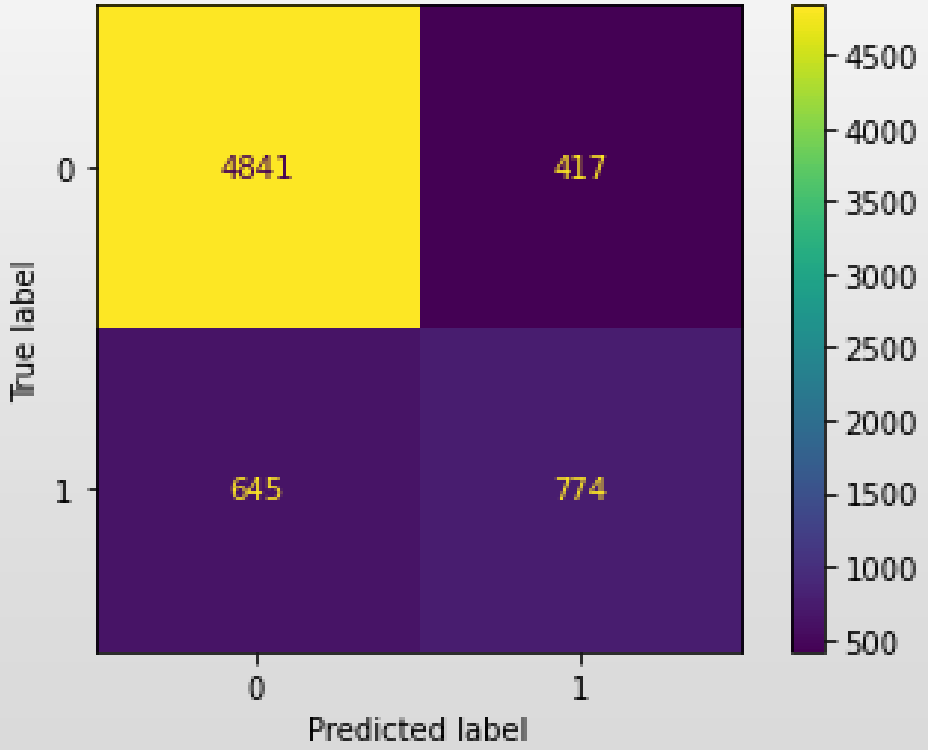
Vaccination Scenario: Gradient Boosting Classifiers

GradientBoostingClassifier



Accuracy: 85%

XGBClassifier



Accuracy: 83%

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Vaccination Scenario: Predictive Modeling Results

- All models performed similarly, with accuracy ranging from 77-85%
- Results suggest prediction improvement with increased data and features
- The application would send vaccination reminders and recommendations to the correctly classified patient 85% of the time

Model	Accuracy (%)
Logistic Regression	85%
Support Vector Machine	84%
Decision Tree	77%
Random Forest	84%
XGBClassifier	84%
Gradient Boosting Classifier	84%
Gradient Boosting Classifier (post-tuning)	85%

- Data
  - Does not include social network data or patient history.
  - Include data from many other sources.
  - Develop synthetic data to model effect of social network on medical decisions

- Models
  - Explore other models (Naïve Bayes, K-Nearest Neighbor, for example) or even clustering techniques.
  - Develop ensembles and or voting models

- Future Work
  - Integrate other data streams into predictive models
  - Develop UX/UI and backend

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Shortcomings, Limitations, and Future Directions

Thank you!

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Questions? Comments?

Feel free to contact me using the information below.

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