Predicting Cervical Cancer Test Results

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Data Science Intensive Capstone Project, April 2024 Cohort

The problem

- Cervical cancer is 100% preventable but causes 350,000 deaths every year

Who would care?

- Healthcare Professionals
- Patients

Data Information

- Survey conducted at hospital in Venezuela

https://archive.ics.uci.edu/dataset/383/cervical+cancer+risk+factors

Data Information

- Survey conducted at hospital in Venezuela
- 858 Records, 36 Features

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Data Cleaning

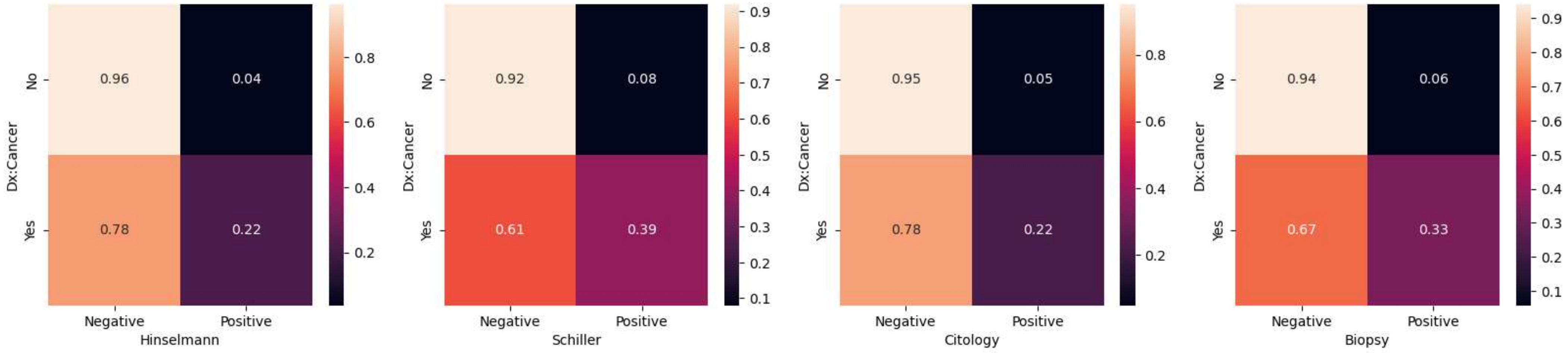
- Missing Values
- Dropped records with too many missing fields

Data Cleaning

- Missing Values
- Dropped records with too many missing fields
- Mean imputation and standardization for numerical values

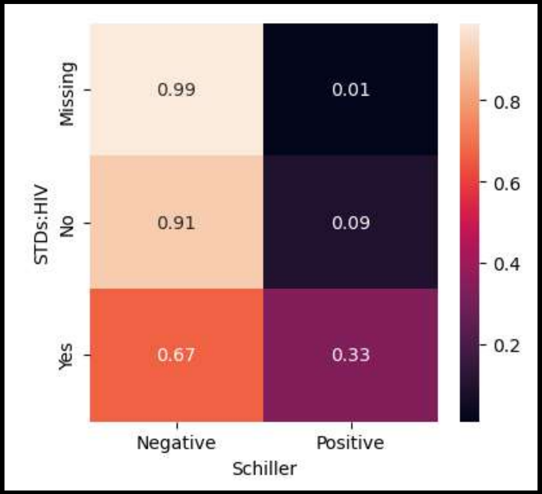
Data Exploration

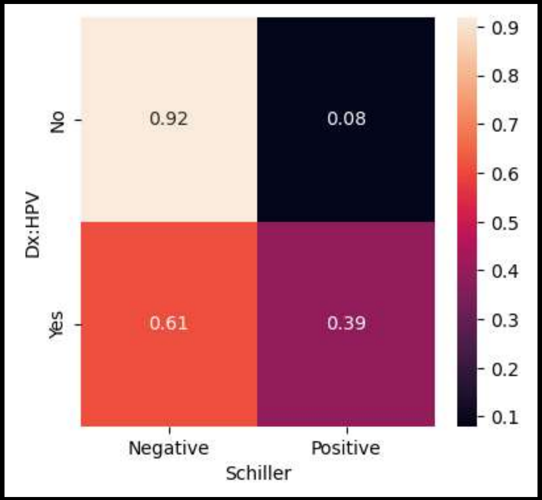
- Most significant test: Schiller

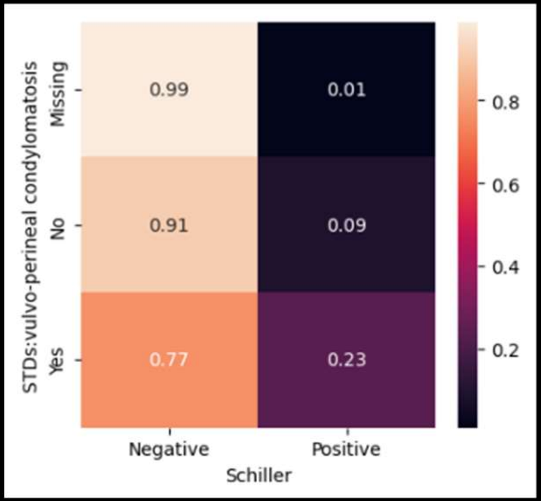


Data Exploration

- Important features:
  - HIV
  - HPV
  - Vulvo-perineal condylomatosis







Machine Learning Modeling

- Logistic Regression
- Random Forest
- SVM
- Metric: F-macro

Results

	Best Score	Train Time
Logistic Regression	0.851064	13.617378
Random Forest	0.888462	181.422026
SVM	0.872447	0.139997

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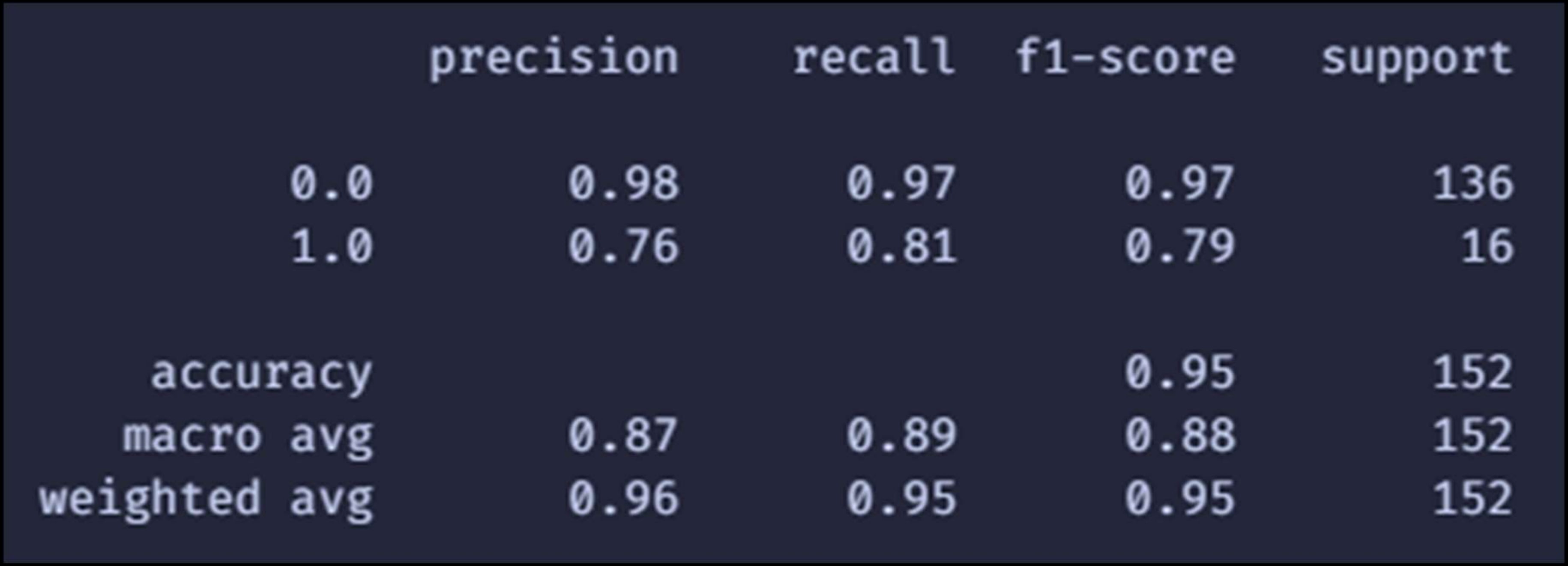
Logistic Regression

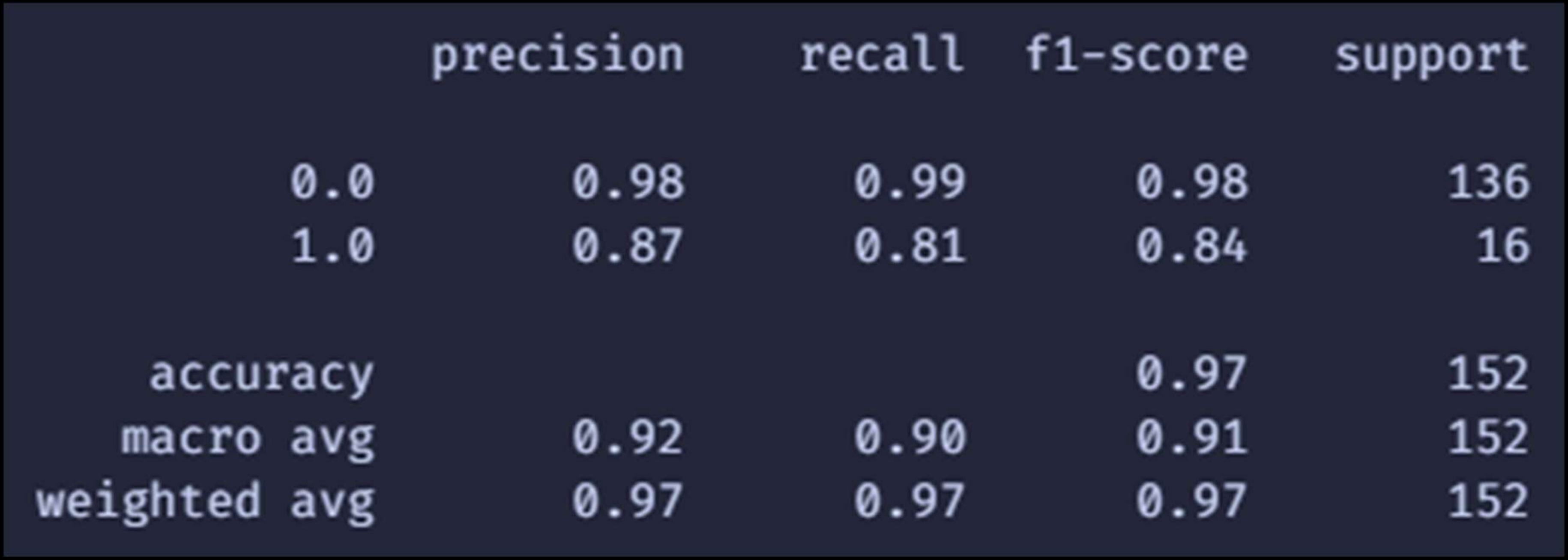


```
              precision    recall  f1-score   support

         0.0       0.98      0.97      0.97       136
         1.0       0.76      0.81      0.79        16

    accuracy                           0.95       152
   macro avg       0.87      0.89      0.88       152
weighted avg       0.96      0.95      0.95       152
```

Random Forest

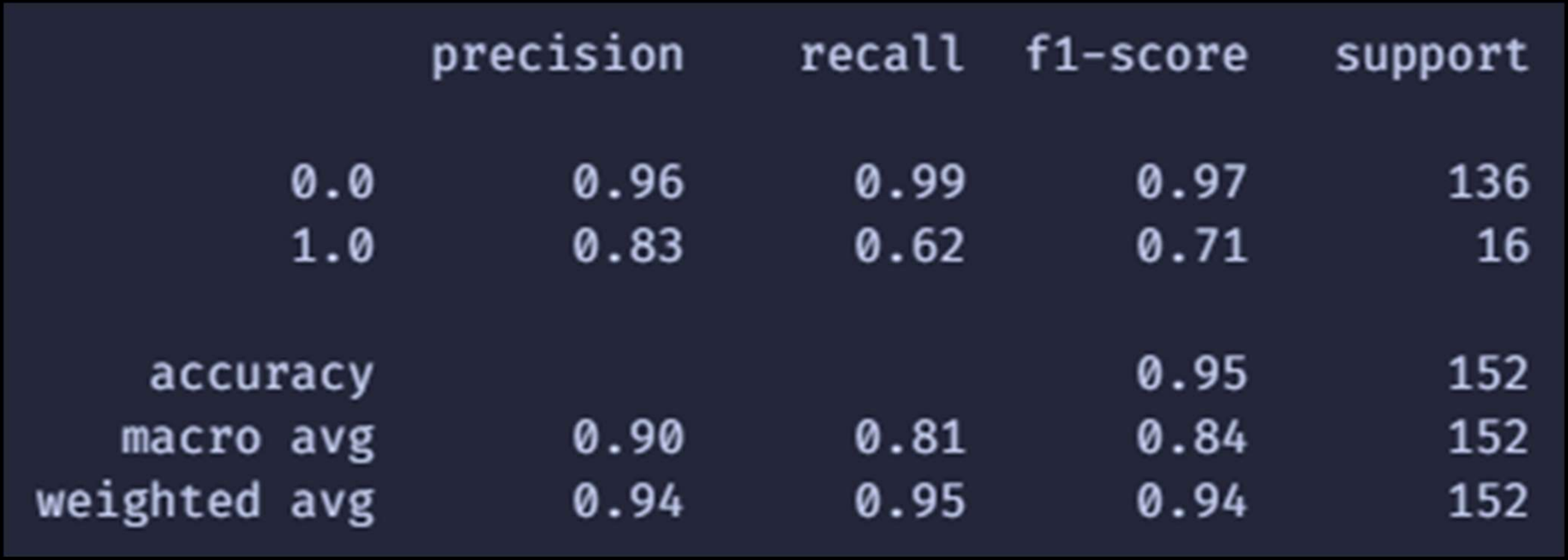


```
              precision    recall  f1-score   support

         0.0       0.98      0.99      0.98       136
         1.0       0.87      0.81      0.84        16

    accuracy                           0.97       152
   macro avg       0.92      0.90      0.91       152
weighted avg       0.97      0.97      0.97       152
```

SVM



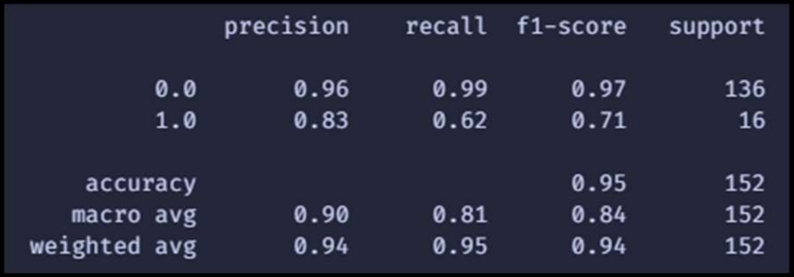
```
              precision    recall  f1-score   support

         0.0       0.96      0.99      0.97       136
         1.0       0.83      0.62      0.71        16

    accuracy                           0.95       152
   macro avg       0.90      0.81      0.84       152
weighted avg       0.94      0.95      0.94       152
```

Results

- Without Hinselmann test as a feature:

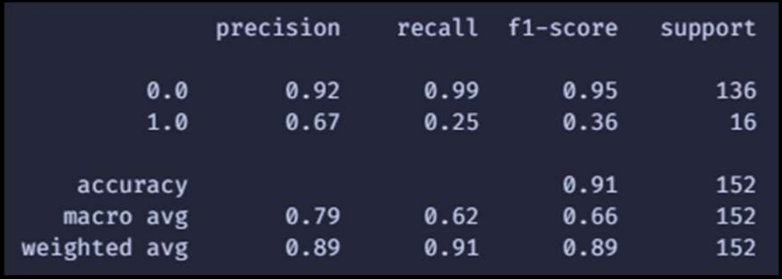


```
              precision    recall  f1-score   support

         0.0       0.96      0.99      0.97       136
         1.0       0.83      0.62      0.71        16

    accuracy                           0.95       152
   macro avg       0.90      0.81      0.84       152
weighted avg       0.94      0.95      0.94       152
```

- Without Hinselmann or Biopsy tests as features:



```
              precision    recall  f1-score   support

         0.0       0.92      0.99      0.95       136
         1.0       0.67      0.25      0.36        16

    accuracy                           0.91       152
   macro avg       0.79      0.62      0.66       152
weighted avg       0.89      0.91      0.89       152
```

Future Improvements

- Improved Feature Engineering
- Predict diagnosis instead

Conclusions

- SVM model the most ideal
- All models were inaccurate if no test results used as data features
- Options:
  - Work to improve AI models
  - Focus efforts elsewhere