CAPSTONE PROJECT

PREDICTING NSAP SCHEME ELIGIBILITY USING MACHINE LEARNING ON IBM CLOUD

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OUTLINE

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PROBLEM STATEMENT

The National Social Assistance Programme (NSAP) is a critical social welfare initiative by the Government of India that offers financial support to vulnerable sections such as elderly persons, widows, and individuals with disabilities from BPL households.Currently, the process of verifying eligibility and assigning the correct pension scheme is manual and time-consuming.This often results in delays, misallocation of benefits, and reduced accessibility for the intended beneficiaries.

PROPOSED SOLUTION

- **Data Collection:**

    - District-wise NSAP beneficiary data was collected from the AI Kosh portal.

    - It includes demographic details, caste categories, and Aadhaar/mobile linkage counts.

- **Data Preprocessing:**

    - The dataset was cleaned for missing values and categorical fields were encoded.

    - Numerical features were normalized to enhance model performance.

- **Machine Learning Algorithm:**

    - IBM AutoAI selected and trained classification models, mainly using Snap Random Forest.

    - Feature engineering and hyperparameter tuning were applied automatically.

- **Deployment:**

    - The best-performing model was deployed using IBM Watson Machine Learning.

    - A REST API was generated for real-time predictions via UI or CSV uploads.

- **Evaluation:**

    - AutoAI evaluated pipelines using cross-validation accuracy.

    - The final model achieved 98.4% accuracy with optimized features.

- **Result**

    - The deployed model accurately predicts NSAP schemes based on input data.

    - It supports real-time or bulk testing and simplifies benefit allocation.

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SYSTEM APPROACH

- System requirements

  IBM Cloud Account

  WatsonStudio

  IBM AutoAI or Jupyter Notebook

  IBM Watson Machine Learning

  Python Libraries: pandas, scikit-learn, matplotlib

- Library required

  pandas for data loading and preprocessing

  sklearn for model building

  AutoAI for no-code model experimentation

- Steps Followed:

  Download dataset from AI Kosh (NSAP pension data)

  Upload it to IBM Watson Studio

  Launch AutoAI experiment

  Select schemecode as target column

  Evaluate best model and deploy

ALGORITHM & DEPLOYMENT

- Algorithm Selection:

    The Snap Random Forest Classifier was automatically selected and finalized by AutoAI based on **performance metrics**, **model stability**, and **cross-validation accuracy**. It was then deployed for real-time prediction through IBM Watson Machine Learning.

- Data Input:

   - totalmale, totalfemale, totalsc, totalst, totalobc, totalaadhaar etc.

- Training Process:

    - 80-20 train-test split

    - Automatic hyperparameter tuning using AutoAI

    - Model trained to classify one of the NSAP schemes

- Prediction Process:

    - Model deployed using Watson Machine Learning.

    - API endpoint generated for live prediction.

    - Can accept new applicant data and return predicted scheme

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RESULT: AUTOAI PROGRESS MAP AND PIPELINE LEADERBOARD
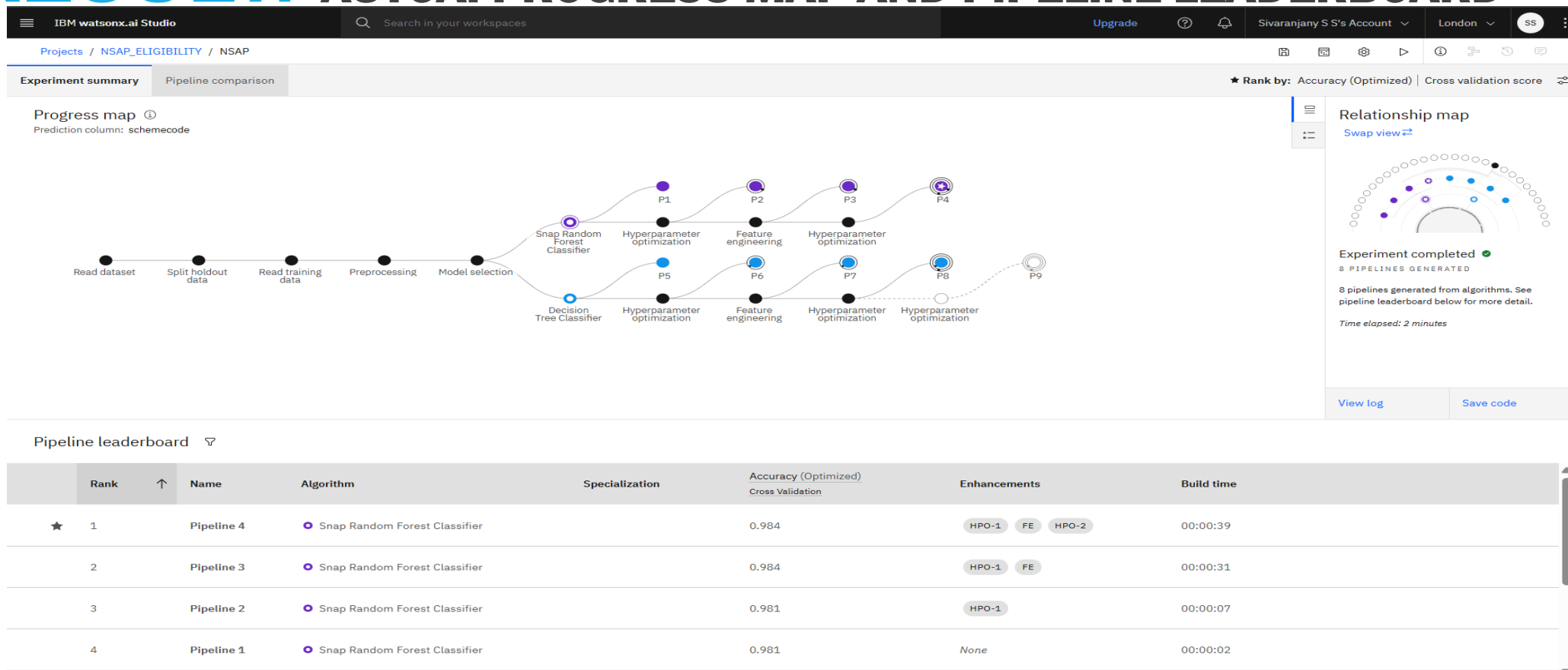
AutoAI generated 8 pipelines using various ML algorithms and enhancements.
The best-performing pipeline (Pipeline 4) used the Snap Random Forest Classifier and achieved an optimized accuracy of 98.4%.
Enhancements like feature engineering (FE) and hyperparameter optimization (HPO) were automatically applied to improve performance.

RESULT : RELATIONSHIP MAP AND PIPELINE ACCURACY
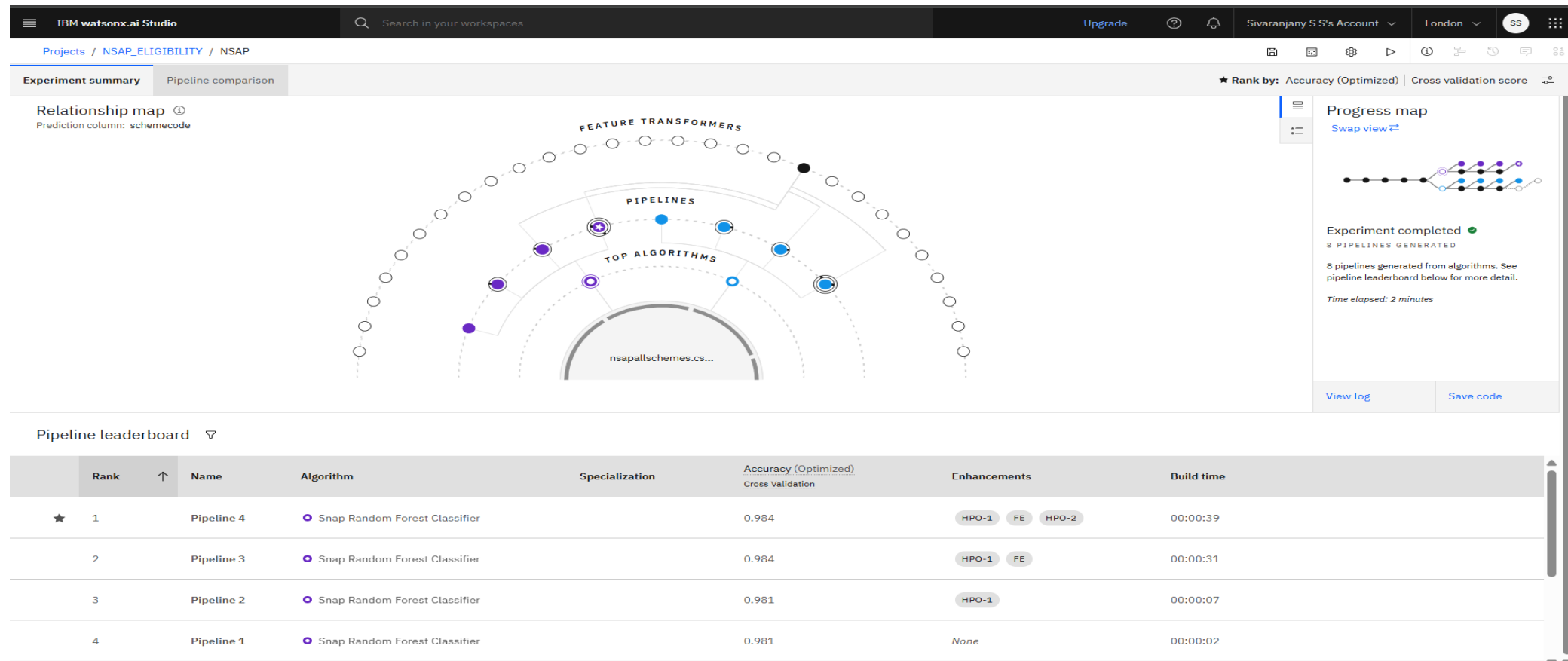
The Relationship Map shows how AutoAI explored various combinations of algorithms, feature transformers, and tuning strategies.

The system automatically selected and ranked the pipelines based on cross-validation accuracy.

The top 4 pipelines used Random Forest as the base algorithm with different levels of enhancement.

RESULT : MODEL DEPLOYMENT AND TESTING

The deployed model is tested with 8 real-world input records using IBM Watson Machine Learning's web UI. The prediction can be triggered with a single click, and results are returned instantly.

RESULT : DEPLOYED MODEL – TEST INPUT INTERFACE
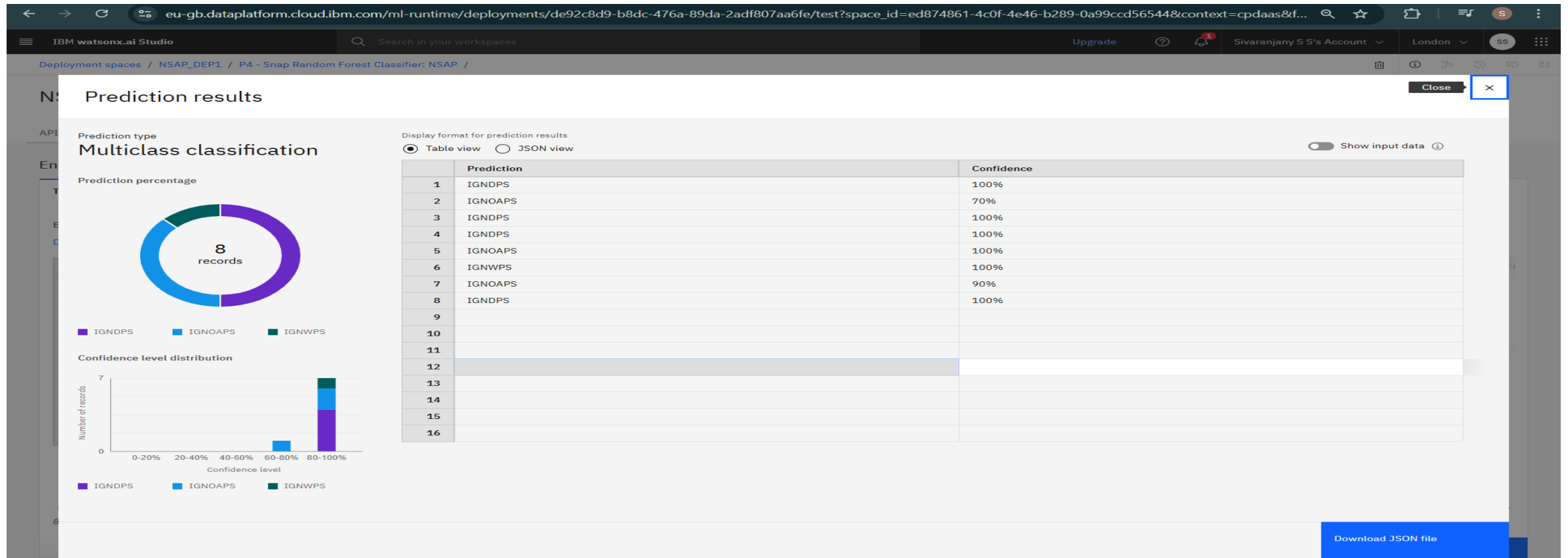
After training, the model was successfully deployed using Watson ML with an online endpoint.
The interface allows uploading or pasting new applicant data to get real-time predictions.
The system supports CSV uploads (max 50MB) and displays the prediction results upon clicking "Predict."

CONCLUSION

- The machine learning model built using IBM Watson Studio successfully predicts the appropriate NSAP scheme based on applicant data.
  It demonstrates strong performance, simplifies the verification process, and supports the automation of social scheme allocation.
  This AI-based approach can help the government make the delivery of social benefits more efficient and equitable.

FUTURE SCOPE

- Integrate with government databases for real-time eligibility checking. Extend the model with additional data like disability percentage, income levels, etc. Build a chatbot interface for beneficiaries to check their scheme eligibility. Enhance model explainability using SHAP or LIME for transparency.

REFERENCES

- **AI Kosh Dataset: https://aikosh.indiaai.gov.in**
- **IBM Watson Studio: https://cloud.ibm.com**
- **Scikit-learn Documentation: https://scikit-learn.org**

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