CAPSTONE PROJECT

NSAP ELIGIBILITY PREDICTION USING IBM WATSONX.AI

Presented By:
1. Shubham Kumar Sharma-Engineering College, Ajmer
   Computer Science Department

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OUTLINE

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

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PROBLEM STATEMENT

- The National Social Assistance Program (NSAP) is a flagship social security and welfare program by the Government of India. It aims to provide financial assistance to the elderly, widows, and persons with disabilities belonging to below-poverty-line (BPL) households. The program consists of several sub-schemes, each with specific eligibility criteria.
- Manually verifying applications and assigning the correct scheme can be a time-consuming and error-prone process. Delays or incorrect allocation can prevent deserving individuals from receiving timely financial aid.
- Your task is to design, build, and evaluate a multi-class classification model that can accurately predict the most appropriate NSAP scheme for an applicant based on their demographic and socio-economic data. The goal is to create a reliable tool that could assist government agencies in quickly and accurately categorizing applicants, ensuring that benefits are delivered to the right people efficiently.

PROPOSED SOLUTION

- **To automate the classification of applicants into the correct NSAP sub-scheme using a machine learning model trained on demographic and socio-economic data, thereby reducing manual errors and accelerating benefit delivery**
- **Data Collection:**
  - Gathered synthetic or real applicant data with features such as:
  - Age , Gender, Maritial State, Disability Status etc.
- **Data Preprocessing:**
  - Clean and preprocess the collected data to handle missing values, outliers, and inconsistencies.
  - Feature engineering to extract relevant features from the data that might impact relevant schems.
- **Machine Learning Algorithm:**
  - **Explored multiple machine learning algorithm :**
    - Snap Random Forest Classifier
    - Random Forest Classifier

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PROPOSED SOLUTION

- **Deployment:**
- Algorithm Chosen:
  - Decision Tree Classifier (with HPO and FE)
  - Achieved highest accuracy of 0.967
  - Snap Decision Tree Classifier also performed well
- Model deployed in Watsonx.ai
- Input interface supports table & JSON
- Predictions exported in table and JSON format
- **Training Process:**
  - Used supervised learning on labeled scheme data
  - Hyperparameter optimization (HPO-1 & HPO-2) and Feature Engineering (FE) applied

SYSTEM APPROACH

- System Requirements:
  - IBM Cloud (Lite – Mandatory)
  - IBM Watsonx.ai Studio
  - IBM Cloud Object Storage
- Steps Followed:
  - Data preprocessing and labeling
  - AutoAI experiment to train multiple pipelines
  - Model selection based on cross-validated accuracy
  - Real-time prediction using Watson UI

ALGORITHM & DEPLOYMENT

- Algorithm Selection:
  - Decision Tree Classifier (with HPO and FE)
  - Achieved highest accuracy of 0.967
  - Snap Decision Tree Classifier also performed well
- Data Input:
  - Age , Gender, Marital status, Aadhar number (optional), Mobile number , Category (obc, gen , sc and at).
  - These features were selected because they directly correlate with eligibility conditions across various NSAP sub-schemes like:
    - IGNOAPS (Old Age Pension)
    - IGNWPS (Widow Pension)
    - IGNDPS (Disability Pension)

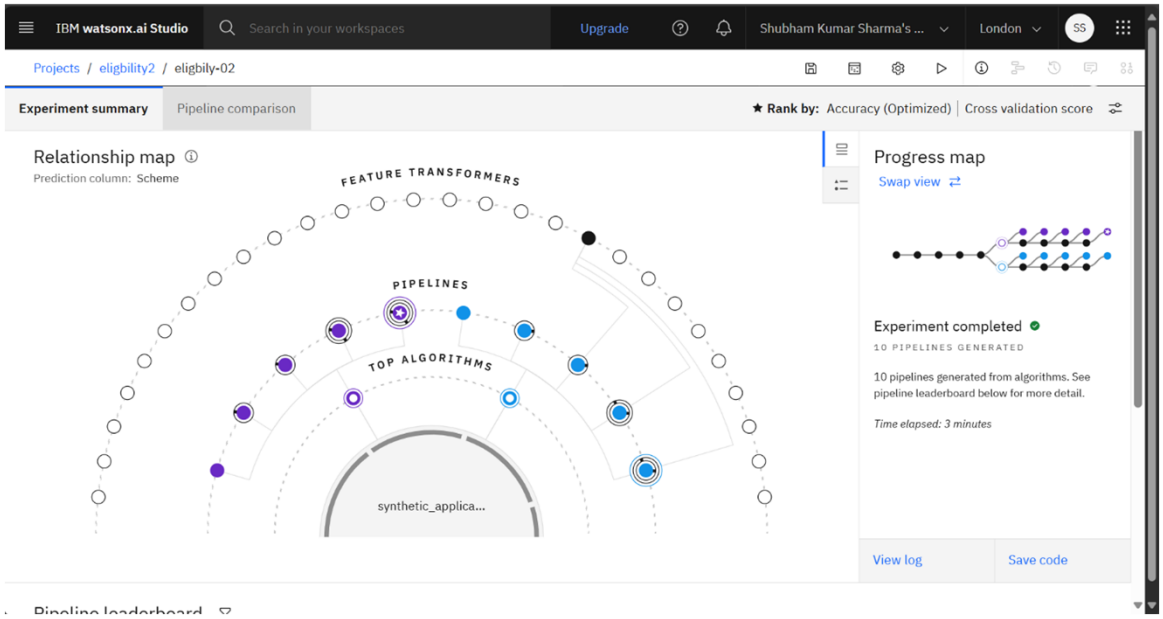
ALGORITHM & DEPLOYMENT

- Training Process :
  - **Platform Used:** IBM Watsonx.ai AutoAI
  - **Dataset Split:** AutoAI handled training/validation split internally (typically 80:20 or with K-fold cross-validation)
  - Preprocessing:
    - Categorical encoding (e.g., gender, pension type)
    - Handling of missing values
    - Automatic feature transformation by AutoAI

Model Selection: The pipeline with highest **accuracy** (96.7%) using **Decision Tree Classifier** was selected

RESULT

- 8 ML Pipelines trained using AutoAI in 3 minutes.
- Best Model: Batched Tree Ensemble Classifier (Snap Random Forest Classifier)
- Example Prediction: IGNDPS with probability [1.0, 0.0, 0.0]



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Prediction results

Prediction type

Multiclass classification

Prediction percentage

IGNDPS IGNWPS

Display format for prediction results

Table view JSON view

Show input data

	Prediction	Confidence	Age
1	IGNDPS	100%	24
2	IGNDPS	70%	65
3	IGNDPS	100%	37
4	IGNDPS	100%	23
5	IGNDPS	50%	85
6	IGNDPS	100%	52
7	IGNWPS	77%	55
8	IGNDPS	100%	44

Download JSON file

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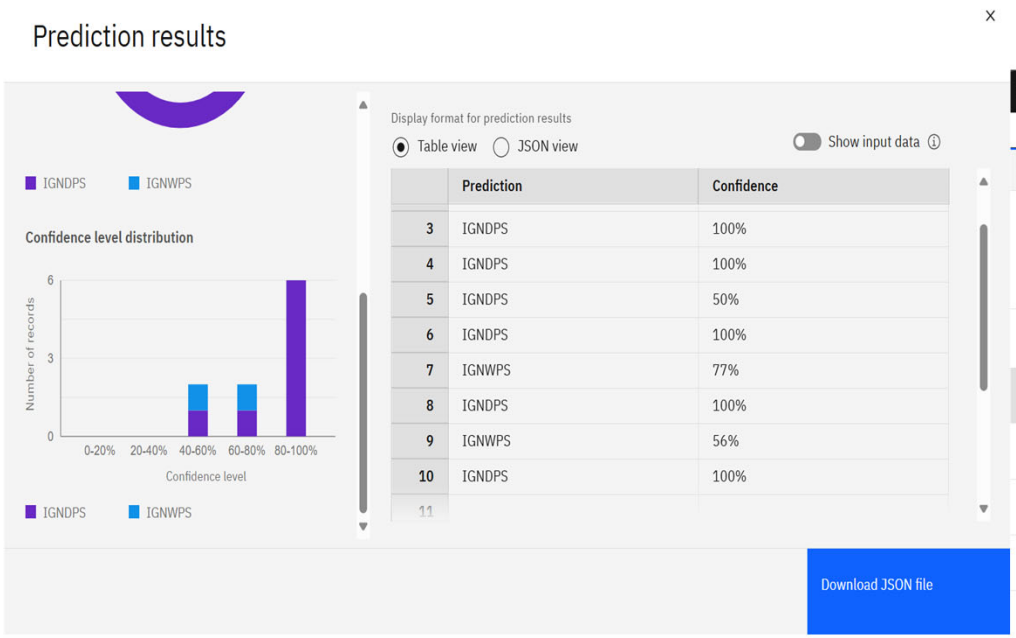
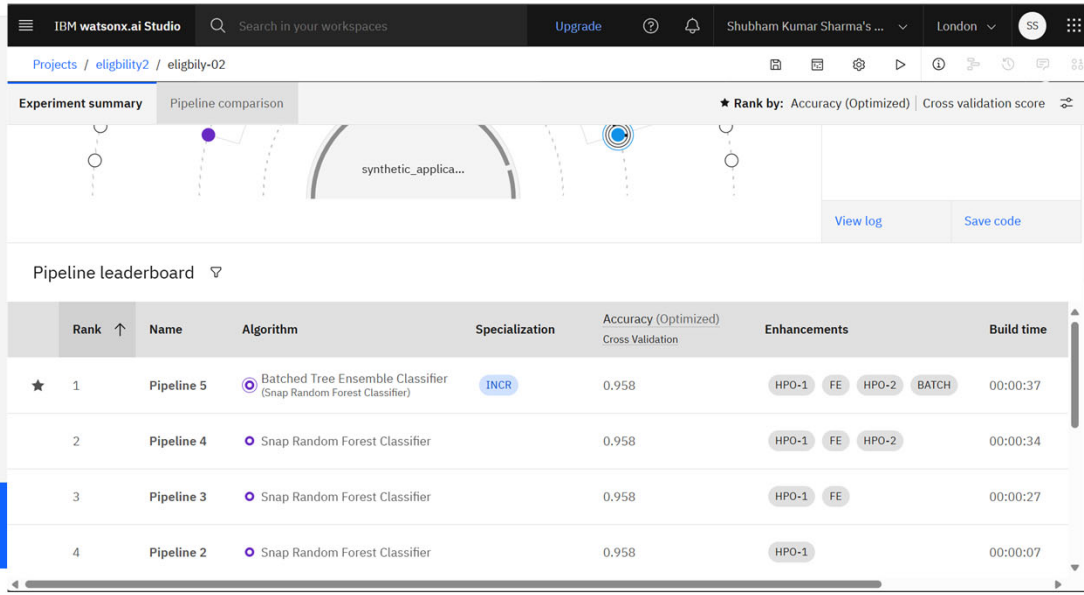
RESULT





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CONCLUSION

- Automated prediction improves efficiency and reduces manual errors.
- Watsonx.ai supports scalable deployment and real-time predictions.
- Model helps ensure timely scheme allocation to eligible citizens.

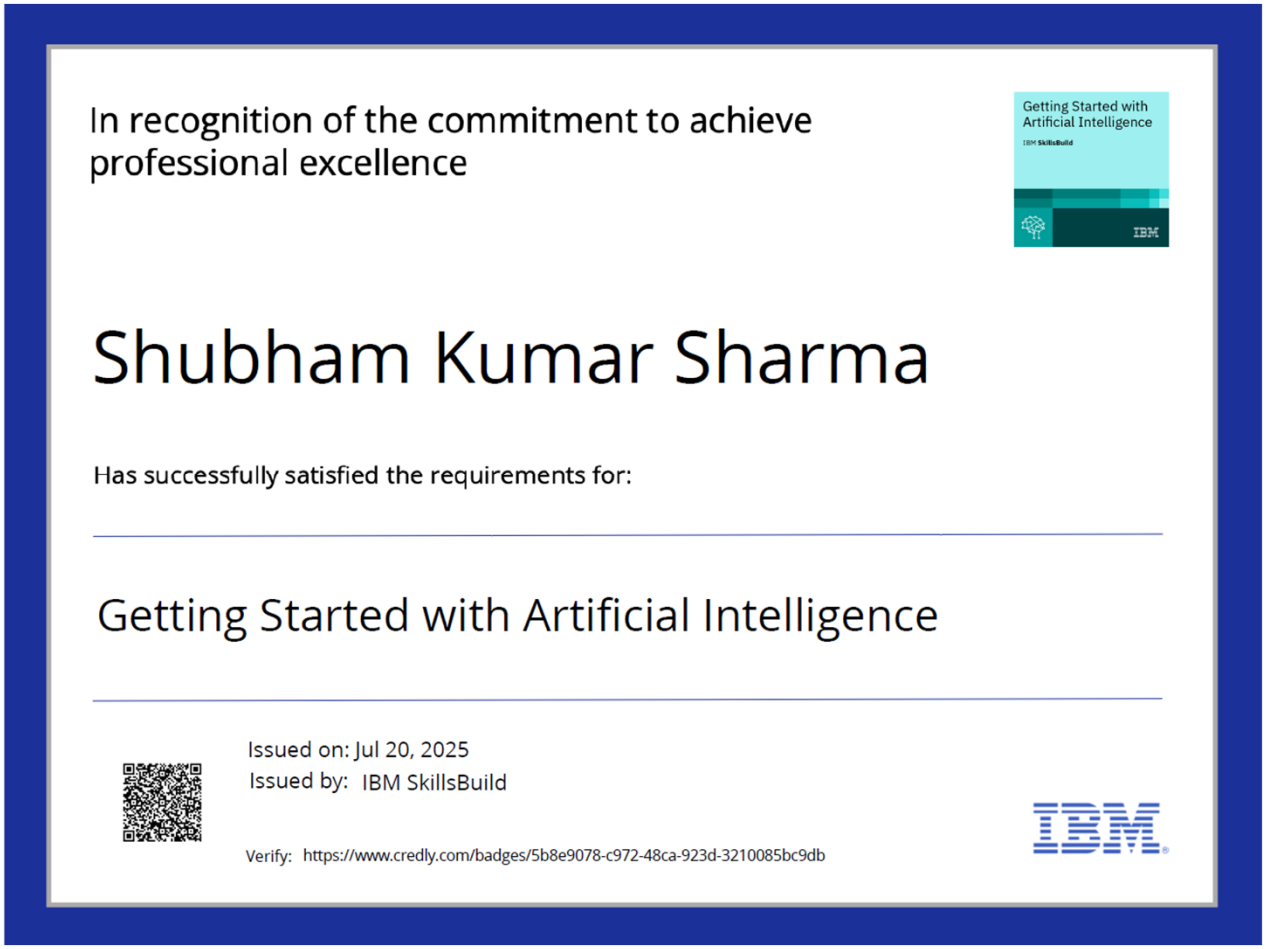
FUTURE SCOPE

- Expand to cover more NSAP schemes and complex eligibility rules.
- Hybrid ML + Rule-based logic integration.
- Aadhaar and real-time ID verification integration.
- API-based bulk processing and feedback loop for retraining.

REFERENCES

- AI Kosh Dataset: https://aikosh.indiaai.gov.in
- IBM Watson Studio & Cloud Documentation
- NSAP Guidelines – Ministry of Rural Development
- IBM AutoAI Technical Docs

IBM CERTIFICATIONS



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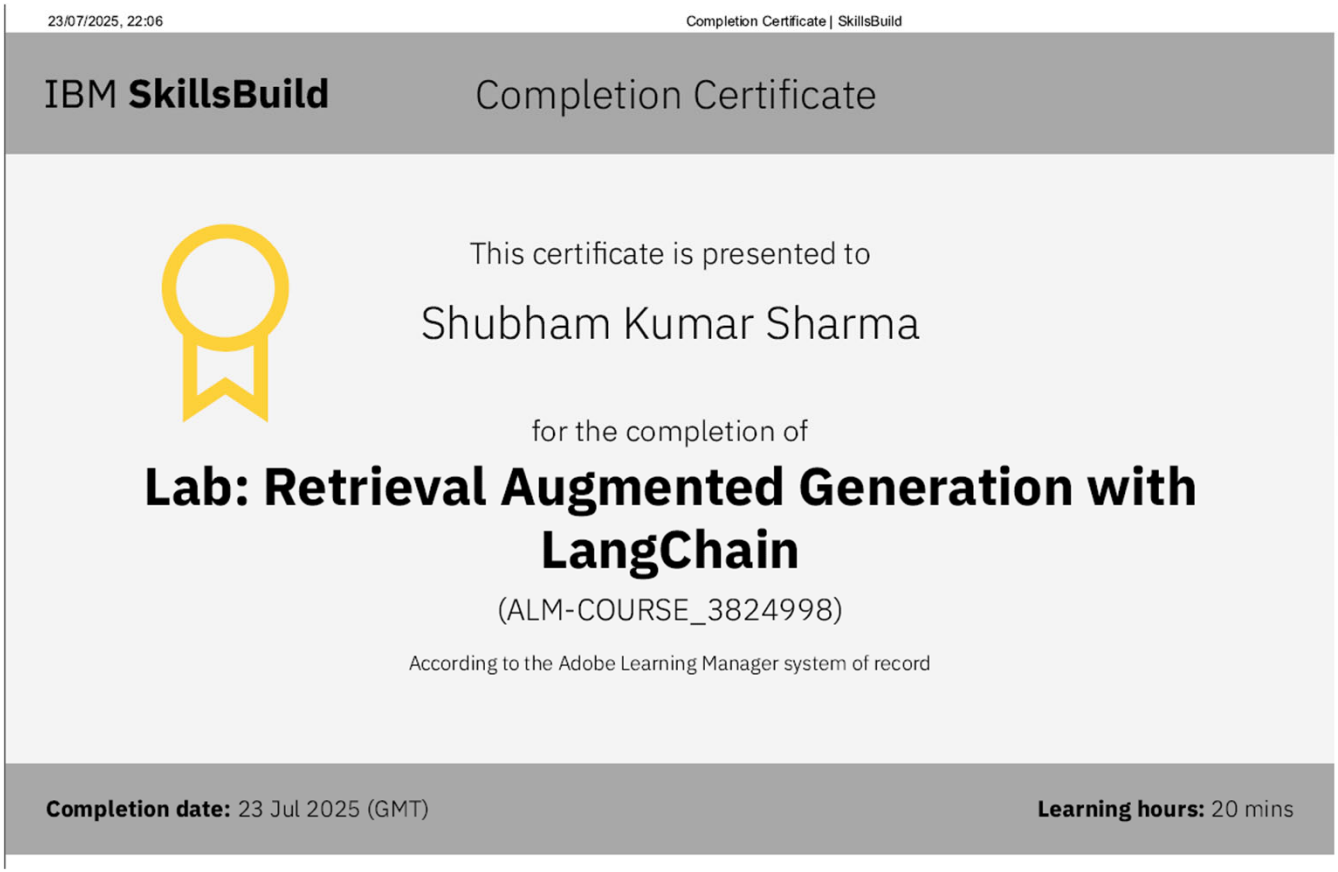

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