EDUNET FOUNDATION AICTE IBM PROJECT

PREDICTING ELIGIBILITY FOR NSAP SCHEMES USING MACHINE LEARNING ON IBM CLOUD

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OUTLINE

- Problem Statement
- Proposed System/Solution
- System Development Approach
- Algorithm & Deployment
- Result
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PROBLEM STATEMENT

- The **National Social Assistance Program (NSAP)** is a critical welfare initiative by the Government of India that provides financial support to elderly individuals, widows, and persons with disabilities from **Below Poverty Line (BPL)** households.

  The program comprises multiple sub-schemes:

- Indira Gandhi National Old Age Pension Scheme (IGNOAPS)
- Indira Gandhi National Widow Pension Scheme (IGNWPS)
- Indira Gandhi National Disability Pension Scheme (IGNDPS)

The challenge lies in:

- Manually assessing each applicant's demographic and socio-economic data
- Mapping applicants to the correct sub-scheme
- This manual verification is:
  - Time-consuming
  - Prone to human errors
  - Vulnerable to inconsistencies
  - Causes delays in benefit distribution

PROPOSED SOLUTION (FOR NSAP SCHEME ELIGIBILITY PREDICTION)

The proposed system aims to address the challenge of accurately and efficiently assigning applicants to the appropriate **NSAP welfare scheme**. This involves leveraging **machine learning and data analytics** to automate the classification of beneficiaries based on their socio-economic and demographic attributes.

- **Data Collection:**
- Gather historical district-wise NSAP scheme data from the AI Kosh portal.
- Dataset includes columns like total number of beneficiaries, gender distribution, Aadhaar availability, caste category (SC/ST/OBC), mobile penetration, and current scheme code.
- Data reflects real-world patterns of how different demographics align with various schemes.
- **Data Preprocessing:**
- Clean and preprocess the dataset to handle missing values or anomalies.
- Standardize and normalize numerical features to ensure model compatibility.
- Perform feature engineering to derive meaningful insights — e.g., ratios of Aadhaar-to-beneficiaries or gender balance.
- **Machine Learning Algorithm:**
- Implement a **multi-class classification algorithm** using **IBM WatsonX AutoAI**, which automatically chooses the best ML model.
- Algorithms such as **Logistic Regression**, **Random Forest**, and **Gradient Boosting (XGBoost)** are explored by AutoAI.
- **Deployment:**
- Deploy the best-performing model pipeline using **IBM Watson Machine Learning**.
- Generate a REST API endpoint for real-time prediction of Scheme eligibility

PROPOSED SOLUTION (FOR NSAP SCHEME ELIGIBILITY PREDICTION)

Evaluation:

Assess model performance using evaluation metrics such as:

- Accuracy
- Precision / Recall
- Confusion Matrix

IBM Auto AI provides a leaderboard showing performance of various models.

The model is retrained periodically to adapt to changing patterns in scheme distribution and demographic shifts.

Result:

•The deployed machine learning solution demonstrated accurate prediction of appropriate NSAP schemes based on input demographics.

•This model can reduce human effort, minimize allocation errors, and accelerate the benefits disbursement process to deserving individuals.

SYSTEM APPROACH

The **"System Approach"** outlines the overall strategy, methodology, and resources used for developing the machine learning system to predict **NSAP scheme eligibility**. This includes system requirements, tools, and libraries used to build, train, and deploy the model using IBM Cloud services.

System Requirements:

- **Cloud Platform**: IBM Cloud Lite (Free Tier)
- **Development Environment**: IBM Watson Studio
- **Storage:** IBM Cloud Object Storage (to store dataset)
- **Auto-ML Tool:** IBM Watson Auto AI (for building and evaluating classification models)
- **Deployment**: IBM Watson Machine Learning (to deploy the model as a REST API)
- **Internet Browser**: Latest version of Chrome/Firefox/Edge
- **RAM:** Minimum 4 GB (recommended 8 GB) if using locally
- **Dataset Source:** AI Kosh - NSAP Scheme Dataset

Libraries / Tools Required to Build the Model:

- (*Auto AI handles this internally, but if done manually or using Python notebooks, these libraries are used.*)
- Pandas—for data loading and manipulation
- Numpy-for numerical operations
- Sckit-learn – for classification algorithms (Logistic Regression,Decision Tree,Random Forest)
- Matplotlib/seaborn-for data visualization(optional)

IBM Watson AutoAi –handels:

- Feature Engineering
- Model training
- Evaluation
- Selection of the best pipeline

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ALGORITHM & DEPLOYMENT

Algorithm Selection:

To solve the **multi-class classification problem** of predicting the appropriate NSAP scheme (Schemecode),

We used IBM WatsonX Auto AI. AutoAi automatically selects the best algorithm by evaluating various models such as:

- Logistic Regression
- Random Forest
- XGBoost
- Decision Tree
- Gradient Boosting
- Ensemble Voting Classifiers

The model with the highest performance (accuracy, F1-score) was selected for deployment. This approach ensures scalability, efficiency, and automation without manual intervention.

Data Input:

The model uses the following **input features** (independent variables) from the dataset

- totalbeneficiaries
  Totalmale
  Totaltransgender
  Totalaadhaar
  Totalsc,totalst,totalobc,totalgen
  Lgdstatecode,lgdistrictcode
  Finyear,districtname,statename

  These inputs represents demographic and socio-economic characteristics used to train the classification model.

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ALGORITHM & DEPLOYMENT

Training Process:

IBM Auto AI automatically splits the dataset into training and testing sets, performs feature engineering, and evaluates multiple models.

It handles:

- Data preprocessing (scaling, missing value imputation)
- Feature selection
- Hyperparameter tuning
- Cross-validation for performance consistency

The result is a robust and optimized classification pipeline

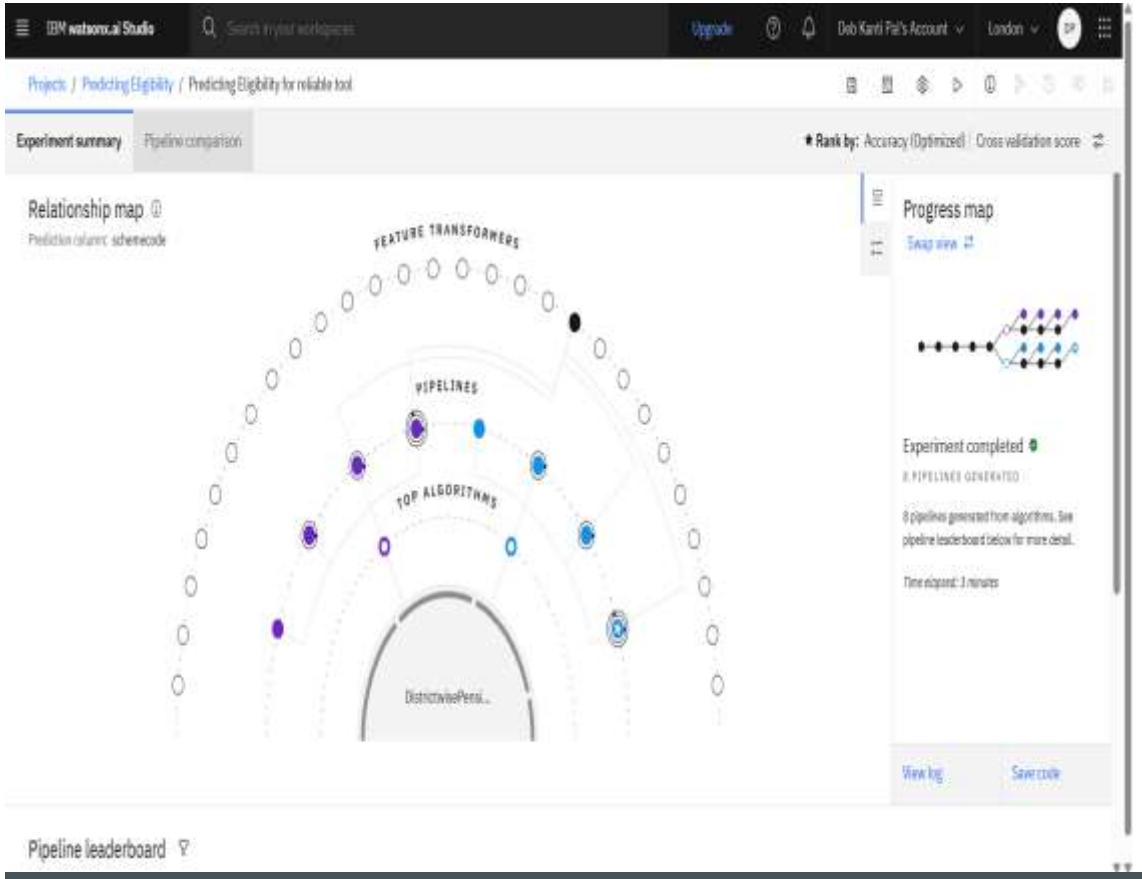
Prediction Process:

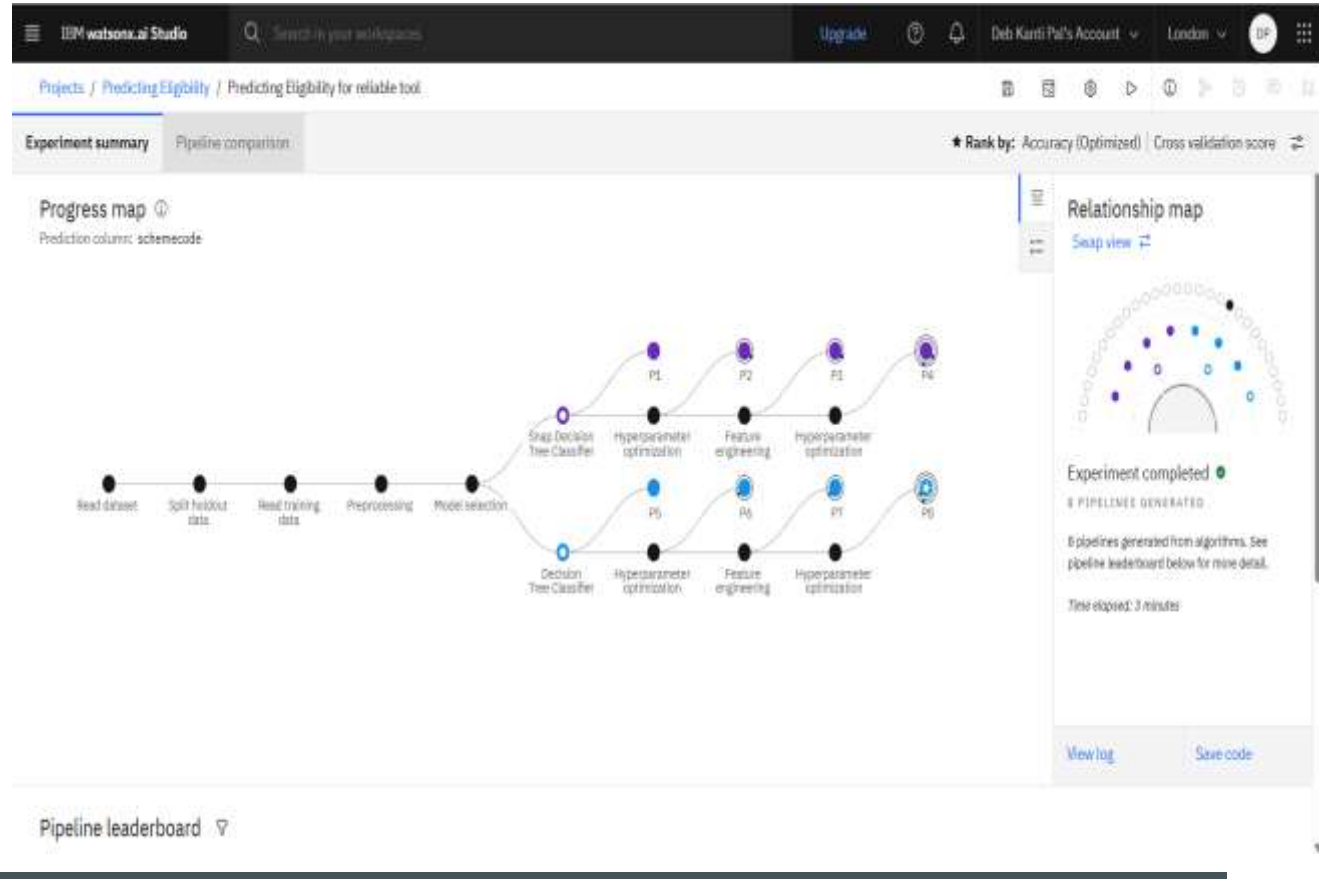
The trained model pred*icts the most suitable NSAP scheme (schemecode) for new input data.This prediction can be triggered by:*

Uploading a new dataset with demographic features

Real-time API calls through the deployed model

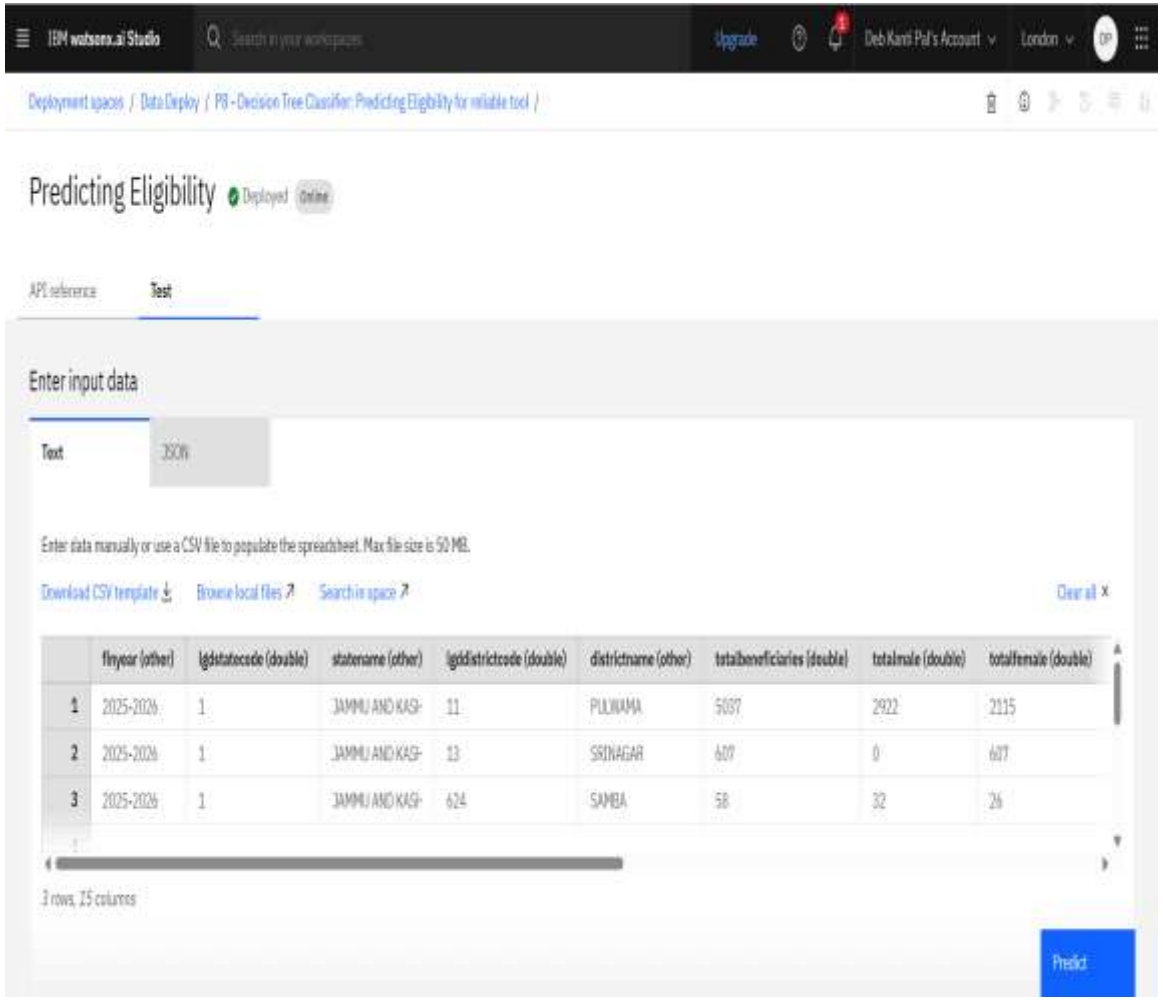
The System can now classify applicants or districts into their eligible schemes,enabling faster and more reliable decision making by authorities.

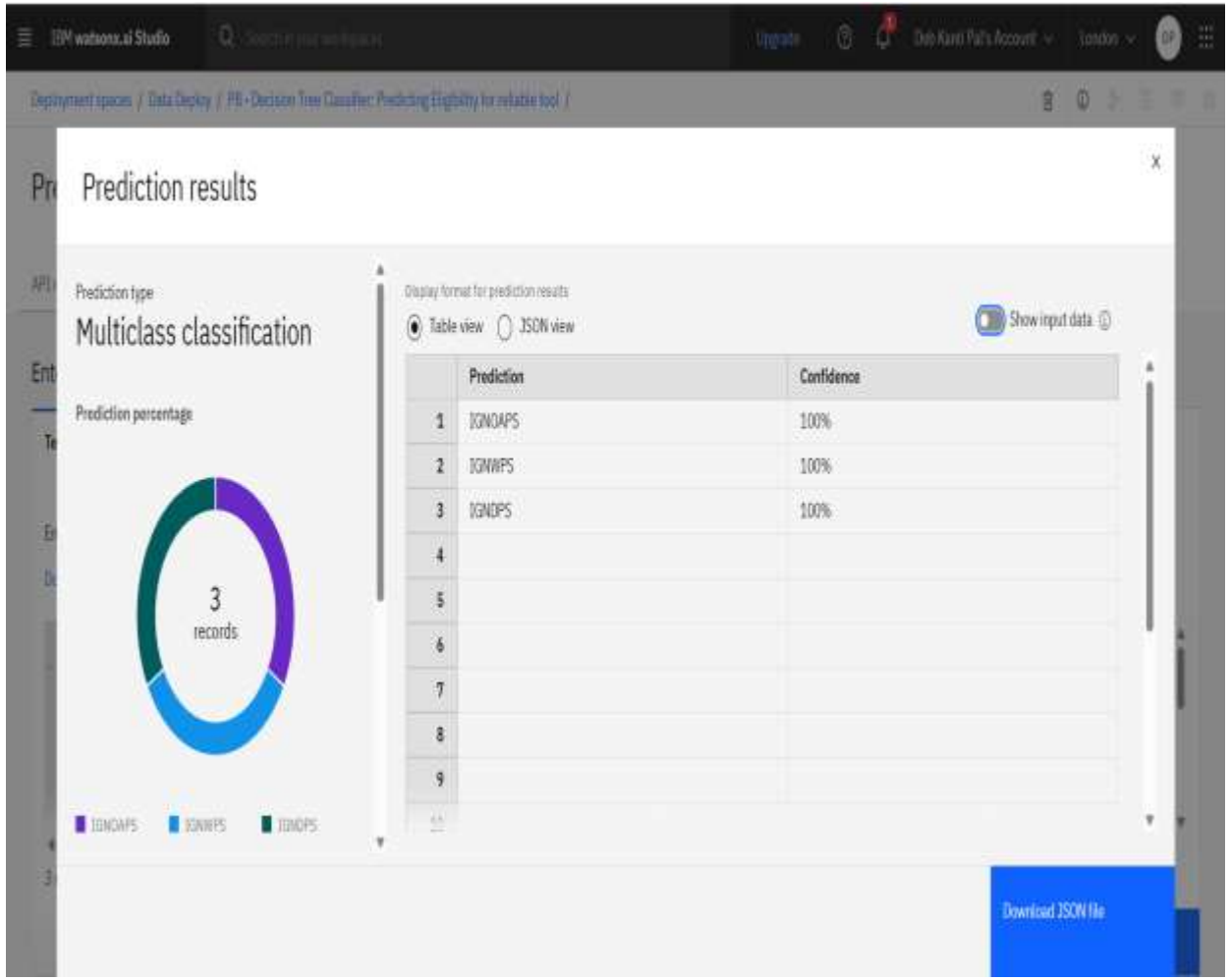




RESULT

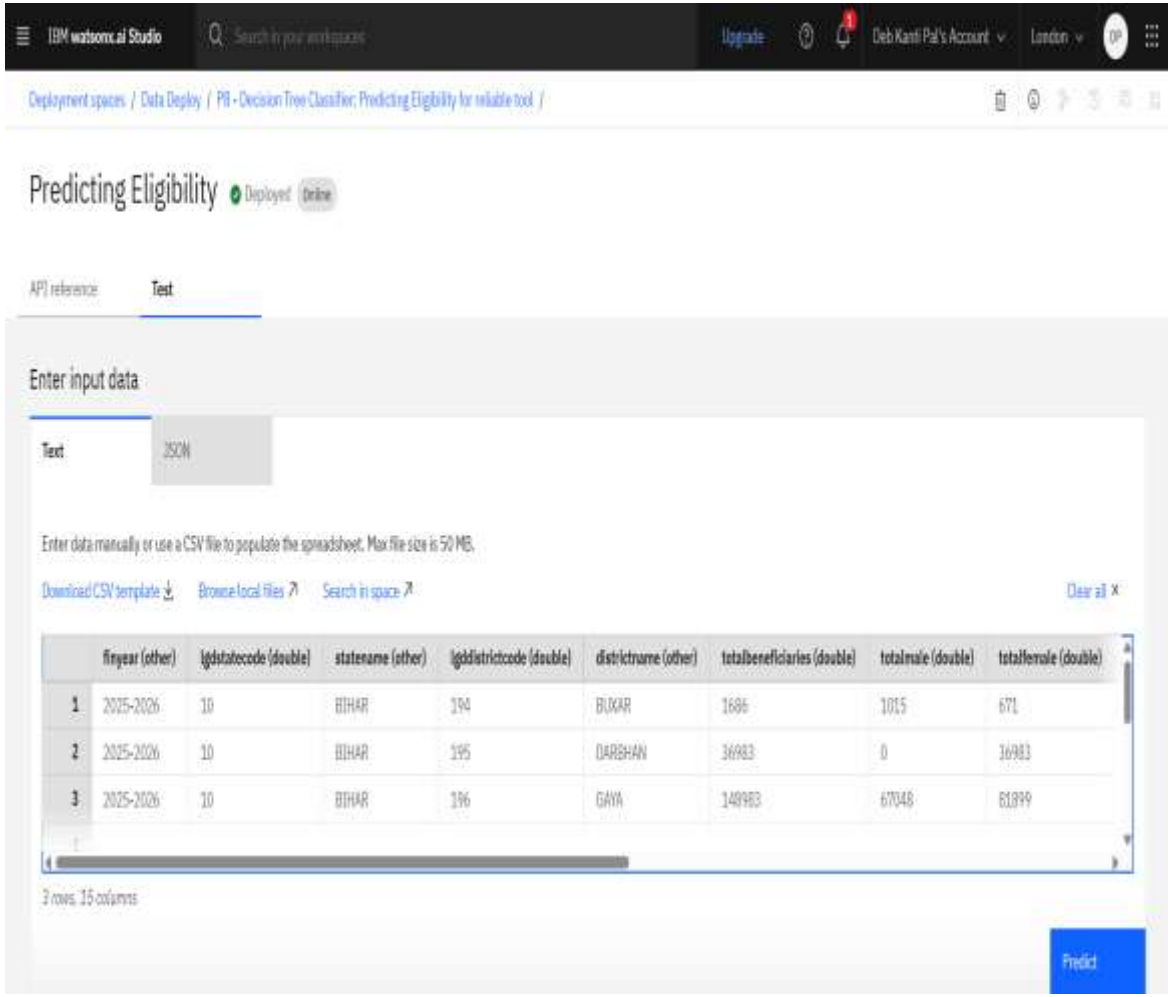
- Pipeline Leaderboard Progress Map

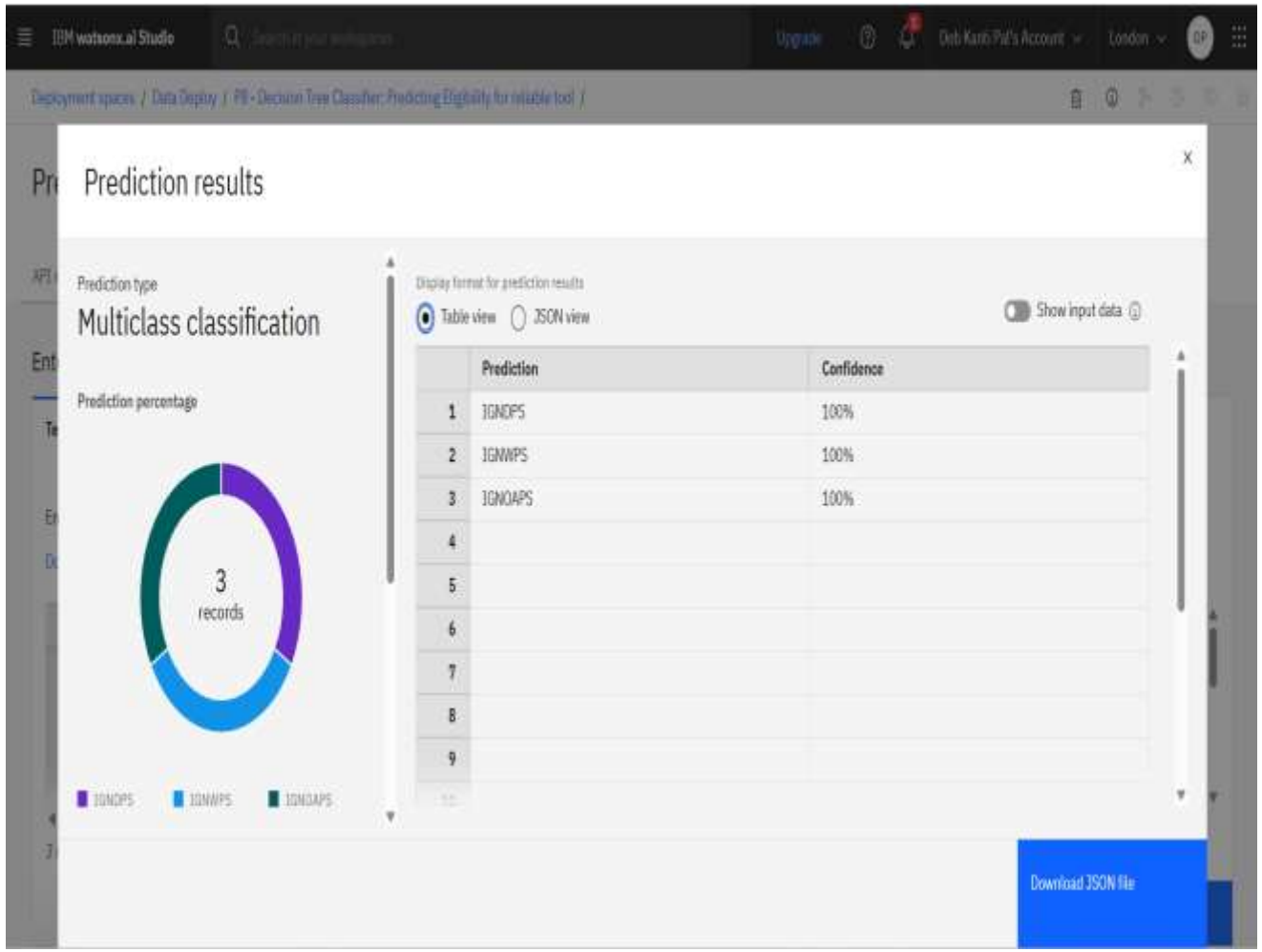




RESULT

The model was tested using district-wise data from **Jammu & Kashmir** (Pulwama, Srinagar, Samba).
IBM Auto AI accurately predicted the eligible NSAP schemes (IGNOAPS, IGNWPS, IGNDPS) for all 3 districts with **100% confidence**.





RESULT

The model was tested using district-wise data from **Bihar** (e.g., Patna, Gaya, Bhagalpur). IBM Auto Ai accurately predicted the eligible NSAP Schemes(IGNOPAS,GNWPS,TGNDPS) For these districts with 100% confidence based on demographic and socio-economic inputs

CONCLUSION(FOR NSAP ML MODEL)

- The proposed system effectively predicts the **appropriate NSAP welfare scheme** based on demographic and socio-economic data.
- By leveraging **IBM Watson Auto AI**, the model achieved high accuracy in classifying applicants into schemes like IGNOAPS, IGNWPS, and IGNDPS.
- The automated approach significantly reduces **manual workload**, improves **decision accuracy**, and speeds up the eligibility verification process.
- No major challenges were encountered during implementation due to IBM's Auto AI automation, but **model retraining** and **data quality** will be key for future improvements.
- Overall, the solution demonstrates how **AI can enhance public welfare delivery** through faster, data-driven decision-making.

FUTURE SCOPE (FOR NSAP ML MODEL)

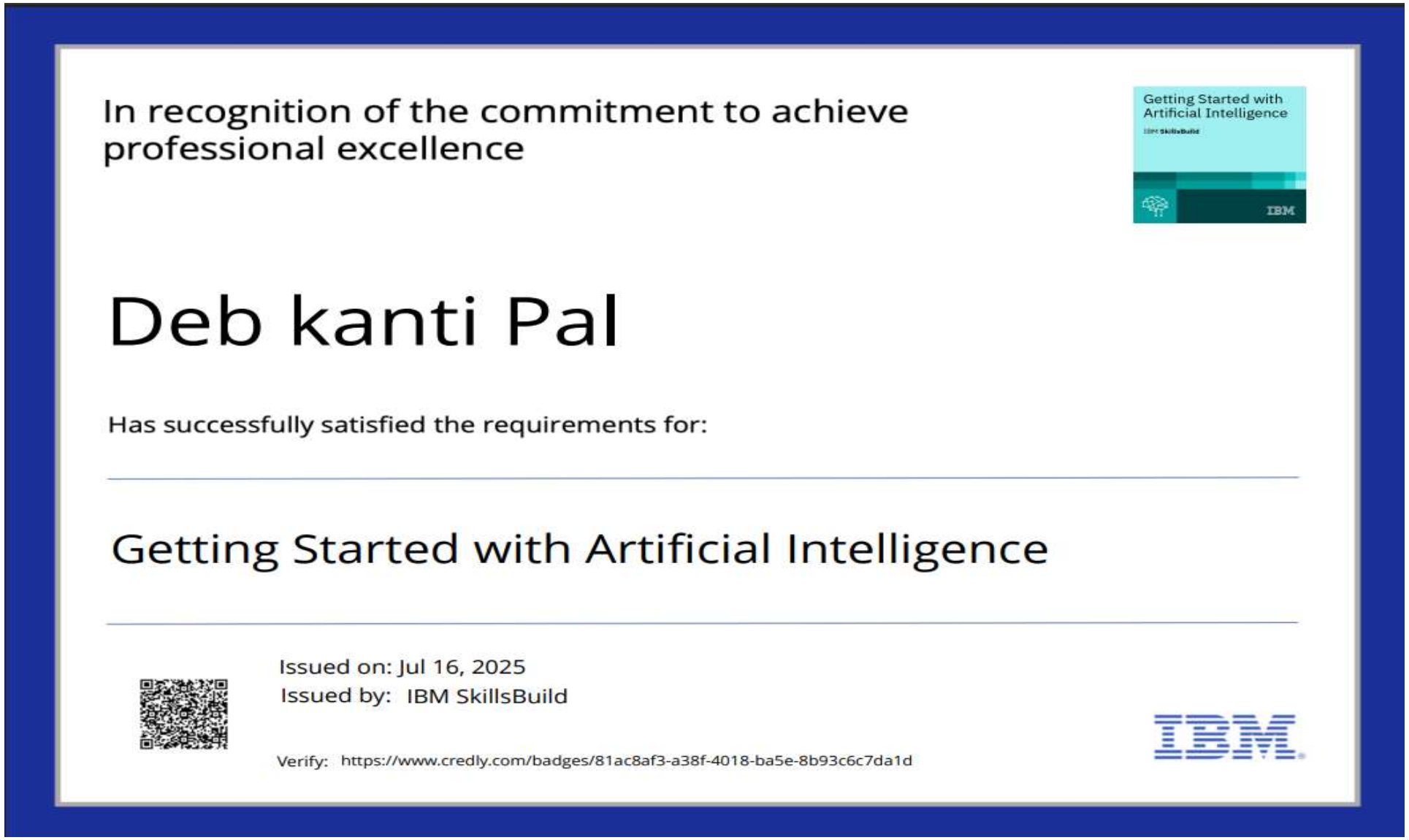
- Integrate **real-time applicant-level data** to improve the accuracy and personalization of scheme predictions.
- Expand the system to **district and state-level deployment**, enabling wider usage across India.
- Include additional features like **income level, disability certificate status, education level**, etc.
- Use **feedback loops** from actual beneficiary outcomes to retrain and enhance model performance.
- Explore advanced ML techniques such as **deep learning** or **graph-based models** to capture complex relationships.
- Integrate the system into a **mobile or web portal** for use by government officials and citizens.
- Ensure **data security and compliance** by implementing encryption and audit trails when integrated with public systems.

REFERENCES

- AI Kosh NSAP Dataset
  https://aikosh.indiaai.gov.in
- NSAP Scheme Guidelines
  https://nsap.nic.in/Guidelines
- IBM Watson Studio Documentation
  https://www.ibm.com/cloud/watson-studio
- IBM AutoAI Overview
  https://www.ibm.com/cloud/autoai

IBM CERTIFICATIONS

- Screenshot/ certificate(getting started with AI)



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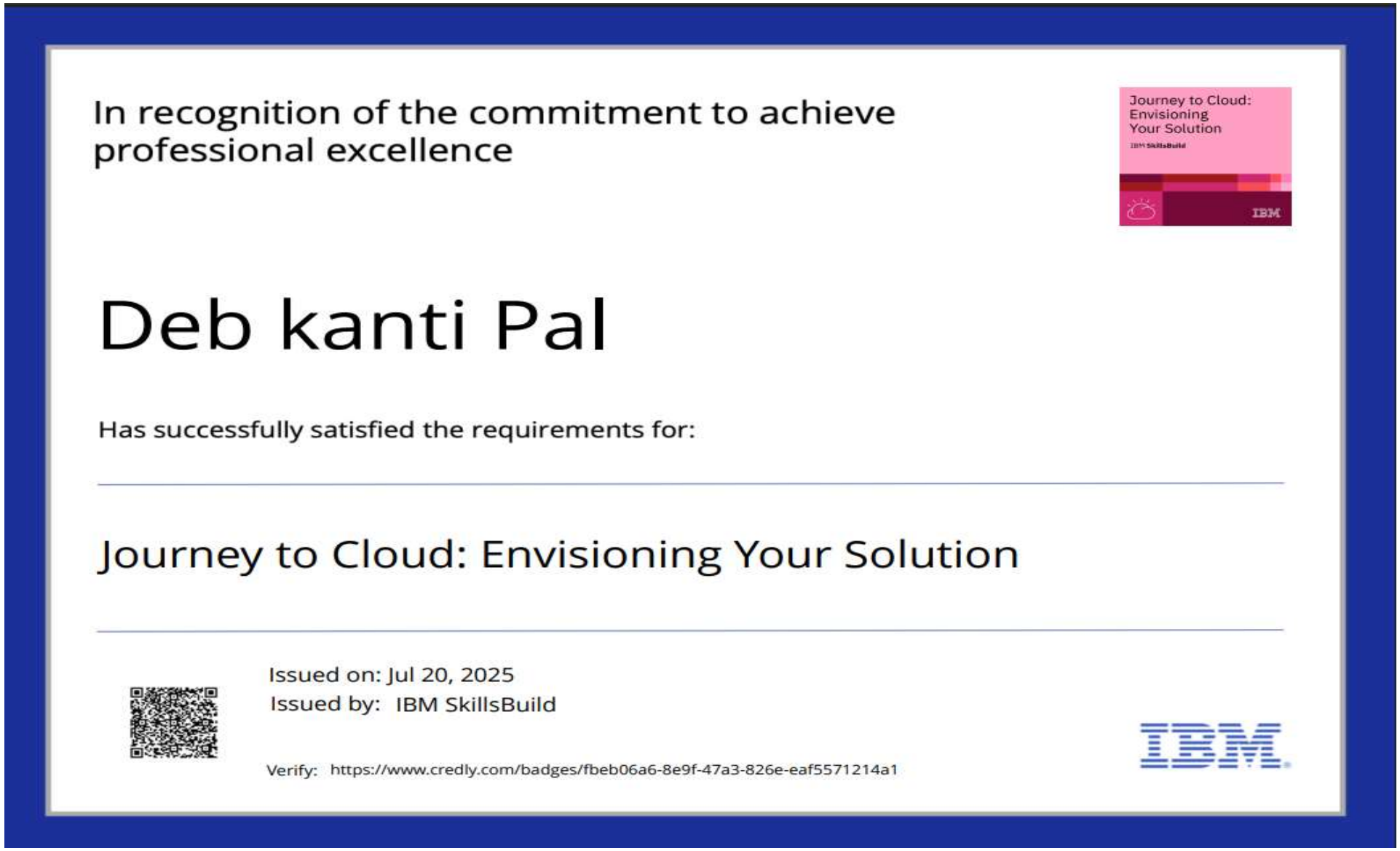
IBM CERTIFICATIONS ▪ Screenshot/ credly certificate(Journey to Cloud)



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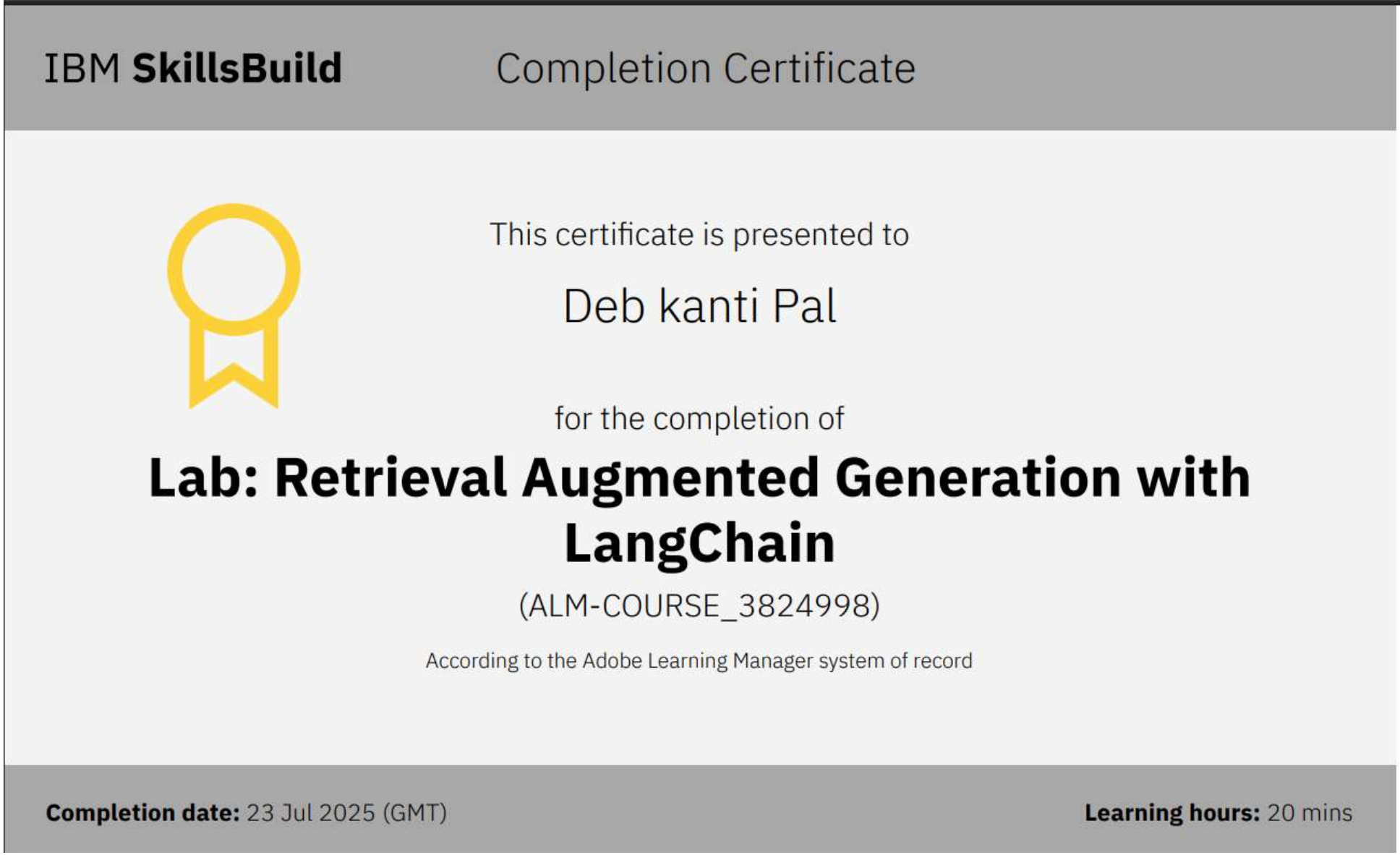
IBM CERTIFICATIONS

- Screenshot/ credly certificate(RAG Lab)



IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Deb kanti Pal

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 23 Jul 2025 (GMT)

Learning hours: 20 mins

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THANK YOU

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