CAPSTONE PROJECT

PROJECT TITLE

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OUTLINE

- Problem Statement
- Proposed System/Solution
- System Development Approach
- Algorithm & Deployment
- Result (Output Image)
- Conclusion
- Future Scope
- References

PROBLEM STATEMENT

Create a robust network intrusion detection system (NIDS) using machine learning. The system should be capable of analyzing network traffic data to identify and classify various types of cyber-attacks (e.g., DoS, Probe, R2L, U2R) and distinguish them from normal network activity. The goal is to build a model that can effectively secure communication networks by providing an early warning of malicious activities.

PROPOSED SOLUTION

Develop a machine learning model for analysing network traffic data to identify and classify various types of cyber-attacks and distinguish them from normal network activity .The model can effectively secure communication networks by providing an early warning of malicious activities.

- Key components:
  - Data collection: Data set collection from Kaggle
  - Preprocessing: Clean and normalise the dataset
  - Model training: Train a classification model(e.g, Decision Tree, Random Forest, svm)
  - Evaluation: validate the model using accuracy, precession, recall and F-1 score

SYSTEM APPROACH

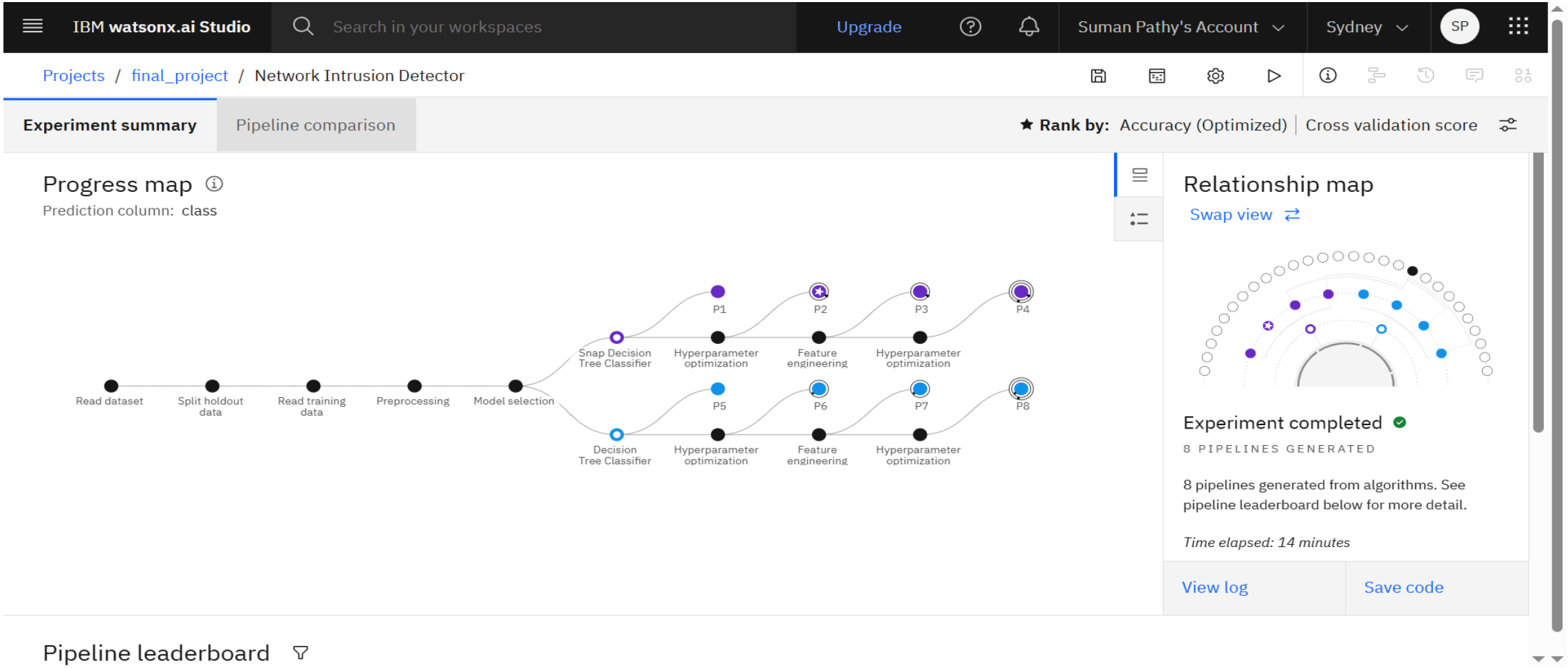
The "System Approach" section outlines the overall strategy and methodology for developing and implementing the Network Intrusion Detection system. Here's a suggested structure for this section:

- **System requirements**
  - IBM Cloud (mandotory)
  - IBM Watson studio for model development and deployment
  - IBM Cloud object storage for dataset handiling

ALGORITHM & DEPLOYMENT

- **Algorithm Selection:**
  - Snap Decision Tree Classifier
- **Data Input:**
  - Specify the input features used by the algorithm, such as protocol_type , flag , src_bytes , dst_bytes , count , dst_host_srv_rerror_rate
- **Training Process:**
  - Supervised learingi using labeled fauly tpes
- **Prediction Process:**
  - Model deployed on ibm watson api studio with api endpoint for real time predictions.

RESULT



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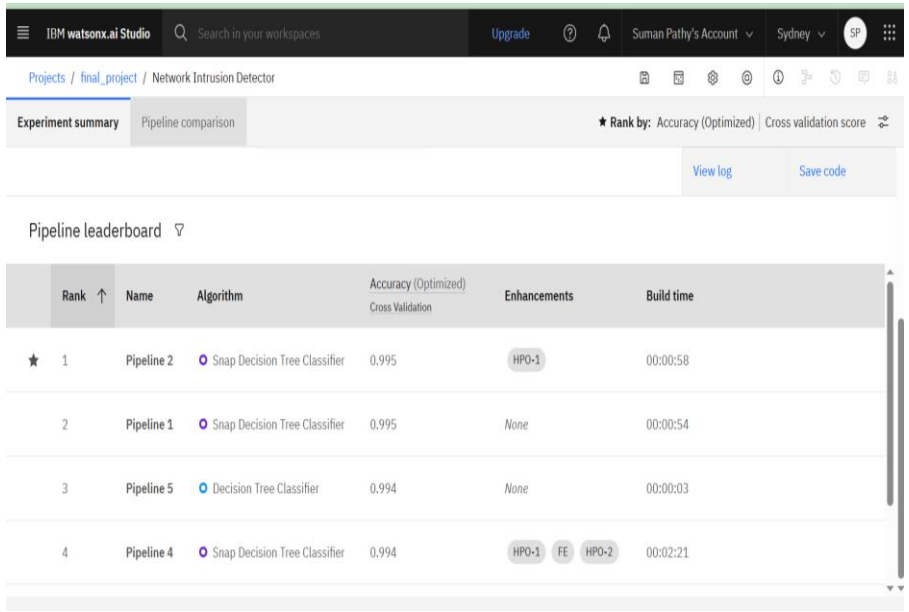
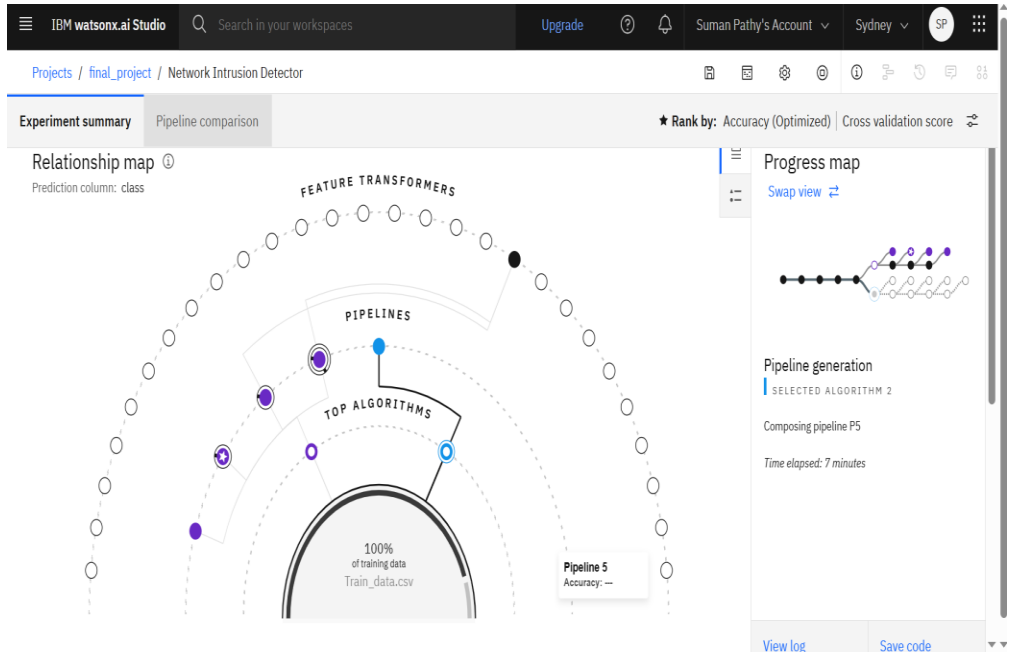
RESULT





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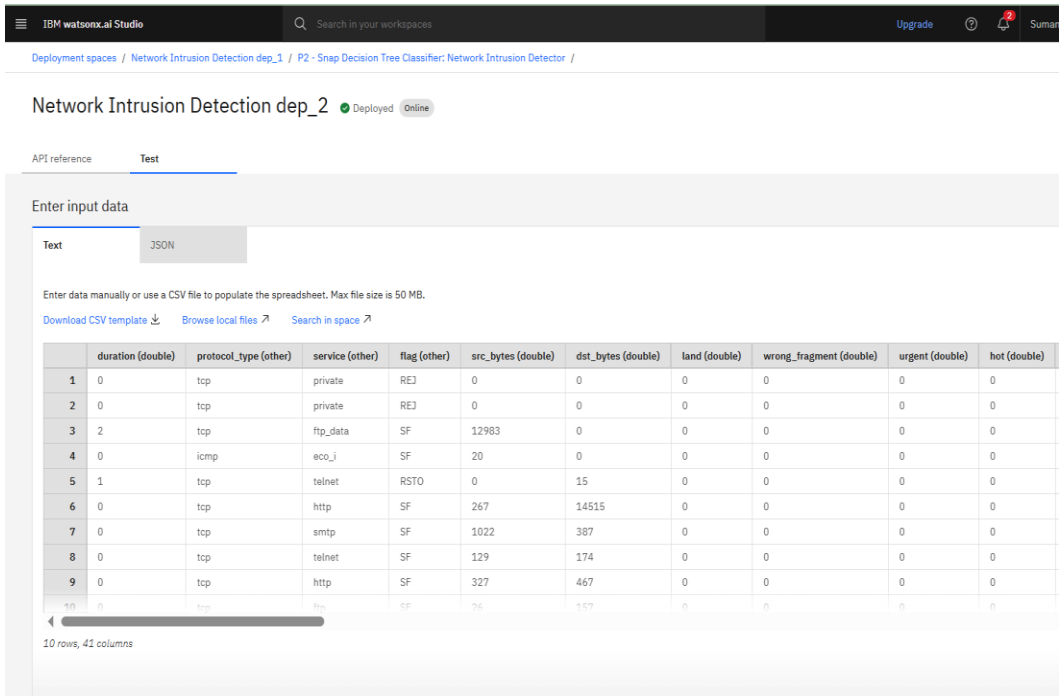
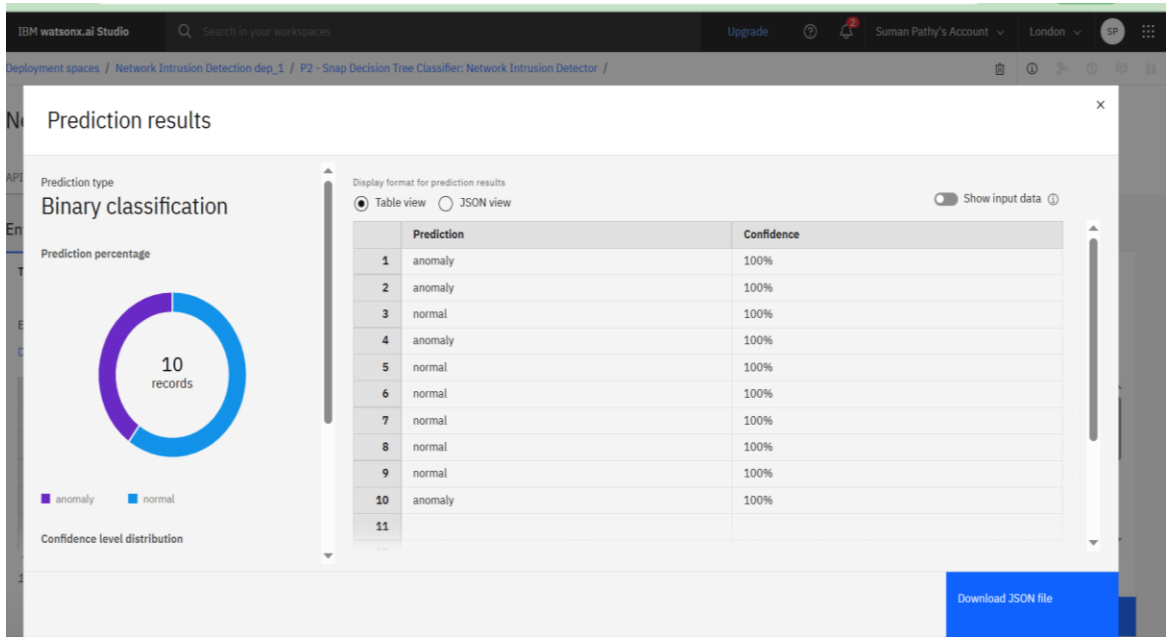
RESULT



	duration (double)	protocol_type (other)	service (other)	flag (other)	src_bytes (double)	dst_bytes (double)	land (double)	wrong_fragment (double)	urgent (double)	hot (double)
1	0	tcp	private	REJ	0	0	0	0	0	0
2	0	tcp	private	REJ	0	0	0	0	0	0
3	2	tcp	ftp_data	SF	12983	0	0	0	0	0
4	0	icmp	eco_i	SF	20	0	0	0	0	0
5	1	tcp	telnet	RSTO	0	15	0	0	0	0
6	0	tcp	http	SF	267	14515	0	0	0	0
7	0	tcp	smtp	SF	1022	387	0	0	0	0
8	0	tcp	telnet	SF	129	174	0	0	0	0
9	0	tcp	http	SF	327	467	0	0	0	0
10	0	tcp	ftp	SF	26	157	0	0	0	0



	Prediction	Confidence
1	anomaly	100%
2	anomaly	100%
3	normal	100%
4	anomaly	100%
5	normal	100%
6	normal	100%
7	normal	100%
8	normal	100%
9	normal	100%
10	anomaly	100%
11		

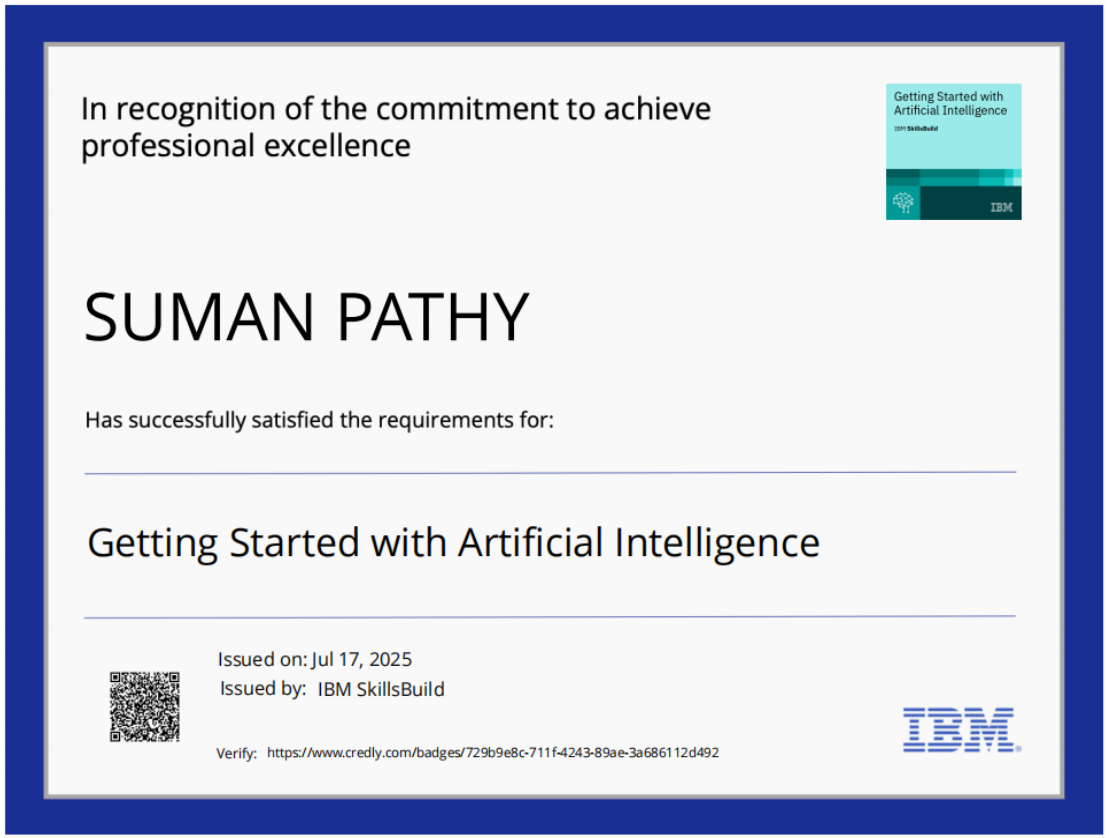
CONCLUSION

- In this project, i successfully developed a Machine Learning-based **Network Intrusion Detection System (NIDS)** capable of analyzing network traffic data to detect and classify malicious activities. Using a labeled dataset containing various network features and class labels (normal vs anomaly), the system learned to differentiate between legitimate traffic and potential cyber-attacks.

FUTURE SCOPE

- **Multi-Class Attack Classification**
  Upgrade the system to not only detect anomalies but also classify them into specific attack types like DoS, Probe, R2L, and U2R, improving threat identification and response.
- **Real-Time Intrusion Detection**
  Integrate with live network monitoring tools and IBM Event Streams to detect and respond to threats in real time, enhancing the system's practical applicability.
- **Explainable AI Integration**
  Use explainability tools such as SHAP or LIME to make the model's decisions transparent, enabling better trust and understanding by security analysts.

IBM CERTIFICATIONS



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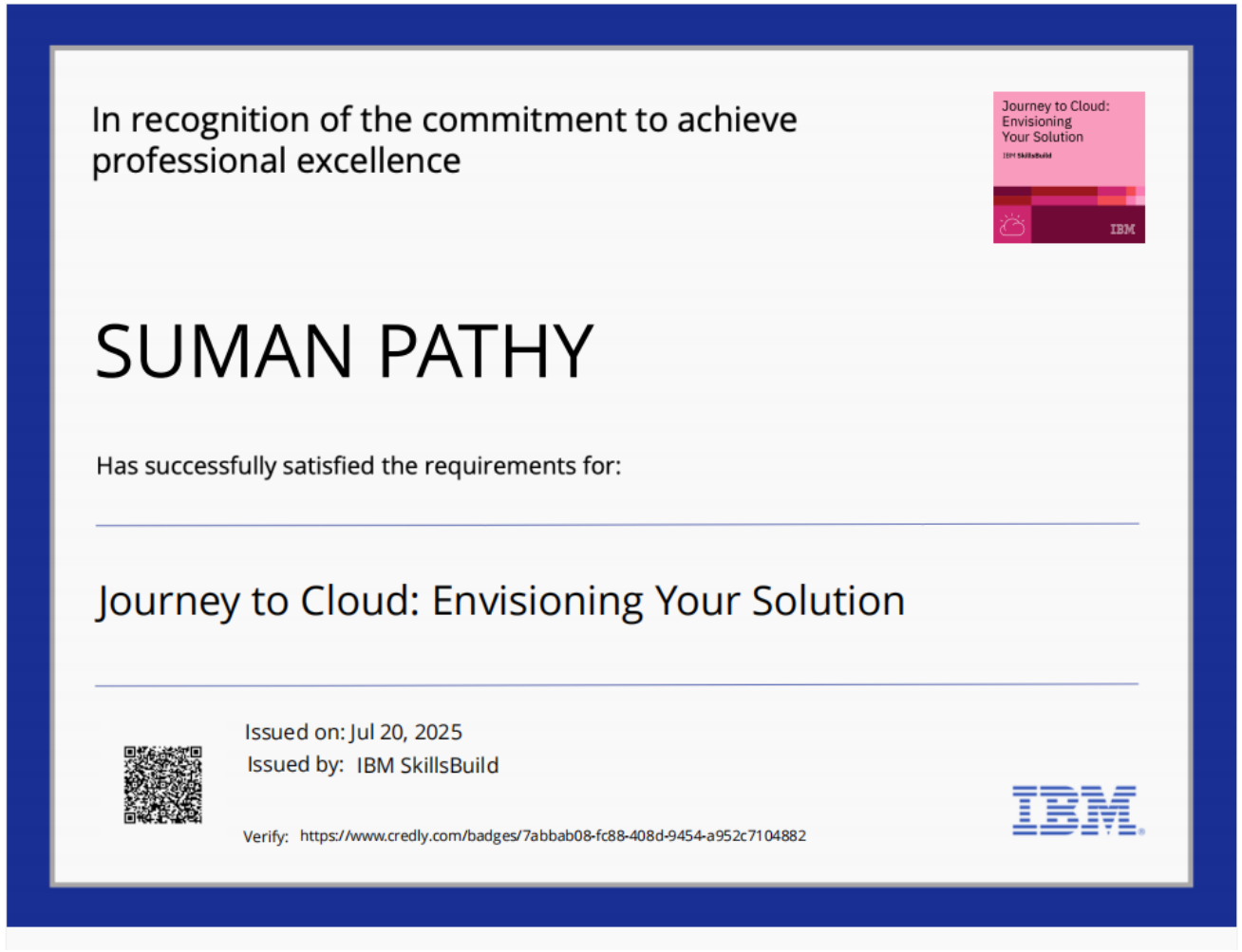

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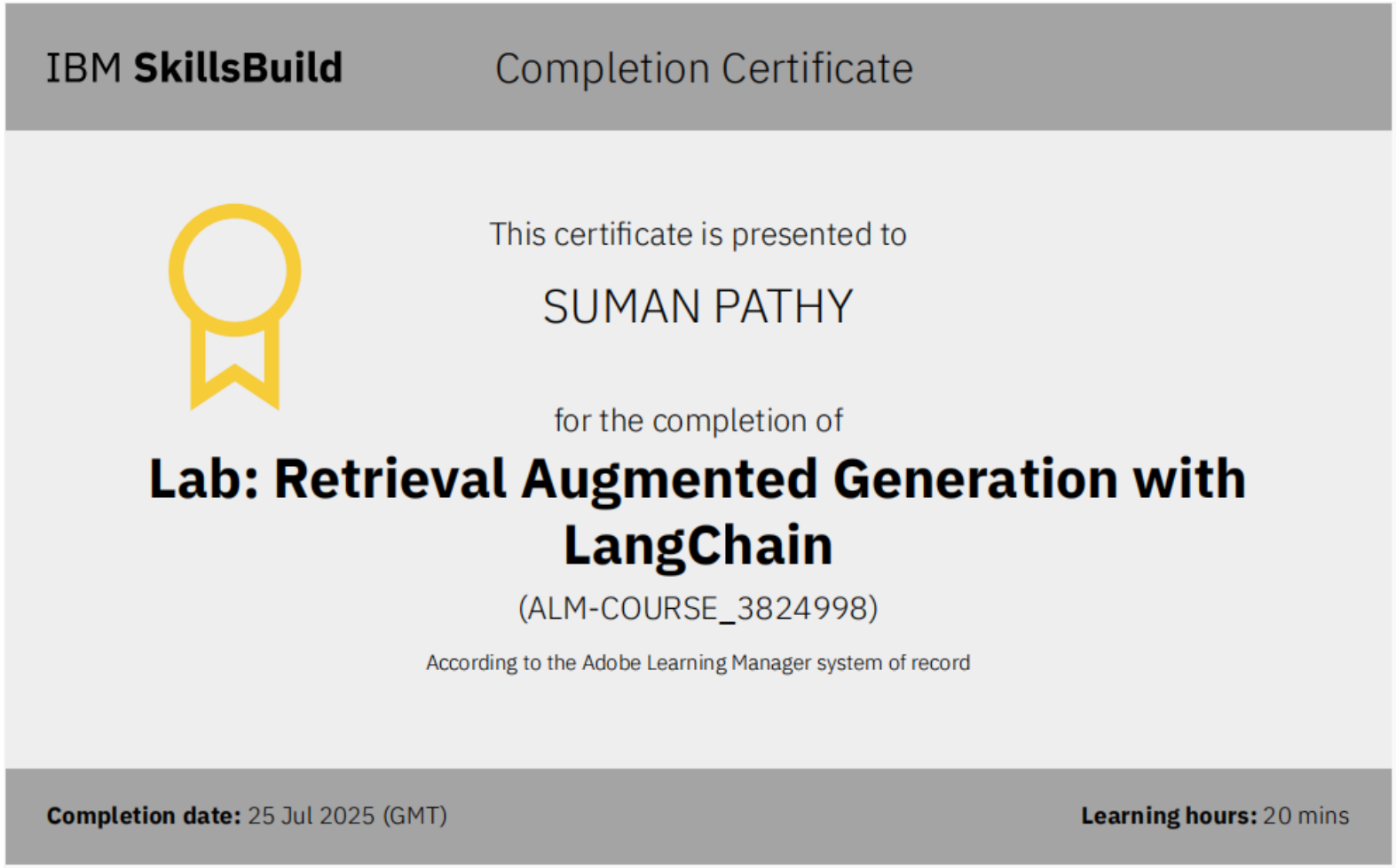

IBM **SkillsBuild** Completion Certificate

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According to the Adobe Learning Manager system of record

Completion date: 25 Jul 2025 (GMT)

Learning hours: 20 mins

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THANK YOU

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