

Appendix I

Metadata Extractor Method Accuracy Report

Extraction Method	Precision	Recall	F1-Score	Processing Speed (docs/sec)
Multi-Modal (Full)	0.923	0.897	0.910	2.1
Rule-based Pattern	0.941	0.762	0.842	8.3
NER	0.835	0.819	0.827	3.7
LLM	0.889	0.912	0.900	1.2

Appendix 2

Government Win-Rate Classification Model Report

Model	Accuracy	F1-Score	Precision	Recall
Gradient Boosting	0.9753	0.9752	0.9752	0.9753
XGBoost	0.9738	0.9735	0.9734	0.9738
Random Forest	0.9553	0.9539	0.9539	0.9553
Neural Network	0.8980	0.8907	0.8898	0.8980
SVM	0.8839	0.8746	0.8733	0.8839
Logistic Regression	0.8342	0.8042	0.8158	0.8342

Best Classification Model: Gradient Boosting**

- F1-Score: 0.9752
- Accuracy: 0.9753
- Cross-validation: 0.9222 ± 0.0072

Appendix 3

Resolution Time (Year) Regression Model Report

Model	RMSE	MAE	R2 Score	CV RMSE
Gradient Boosting	0.6389	0.3062	0.9294	1.2186
XGBoost	0.6984	0.3639	0.9156	1.1820
Random Forest	0.9537	0.5220	0.8427	1.3180
SVR	1.6370	0.9639	0.5364	1.7011
Linear Regression	1.9246	1.3579	0.3592	1.9271
Ridge Regression	1.9246	1.3577	0.3592	1.9271

Best Regression Model: Gradient Boosting

- R² Score: 0.9294
- RMSE: 0.6389
- Cross-validation RMSE: 1.2186 ± 0.0435

Appendix 4

The Impact of Judges on Government Win-Rate Classification Model Performance

Model	Accuracy		Significancy	F1-Score		Significancy
	Without Judge	With Judge		Without Judge	With Judge	
Gradient Boosting	0.8668	0.9753	10.85%	0.867	0.9752	10.82%
XGBoost	0.8608	0.9738	11.30%	0.8601	0.9735	11.34%
Random Forest	0.8341	0.9553	12.12%	0.831	0.9539	12.29%
Neural Network	0.7313	0.898	16.67%	0.7111	0.8907	17.96%
SVM	0.7253	0.8839	15.86%	0.6952	0.8746	17.94%
Logistic Regression	0.6911	0.8342	14.31%	0.6673	0.8042	13.69%

Appendix 5

The Impact of Judges on Resolution Time (Year) Regression Model Performance

Model	R ²		Significancy	RMSE		Significancy
	Without Judge	With Judge		Without Judge	With Judge	
Gradient Boosting	0.8706	0.9294	5.88%	0.7261	0.6389	8.72%
XGBoost	0.8551	0.9156	6.05%	0.7685	0.6984	7.01%
Random Forest	0.7726	0.8427	7.01%	0.9625	0.9537	0.88%
SVR	0.5683	0.5364	-3.19%	1.3264	1.637	-31.06%
Linear Regression	0.4495	0.3592	-9.03%	1.4979	1.9246	-42.67%
Ridge Regression	0.4495	0.3592	-9.03%	1.4979	1.9246	-42.67%

Appendix 6

Comparative Feature Importance (Chi² and Random Forest)

