Kaggle Seasons #02

QUEEN MARY MACHINE
LEARNING SOCIETY

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Loan Approval Prediction

Playground Series - Season 4, Episode 10

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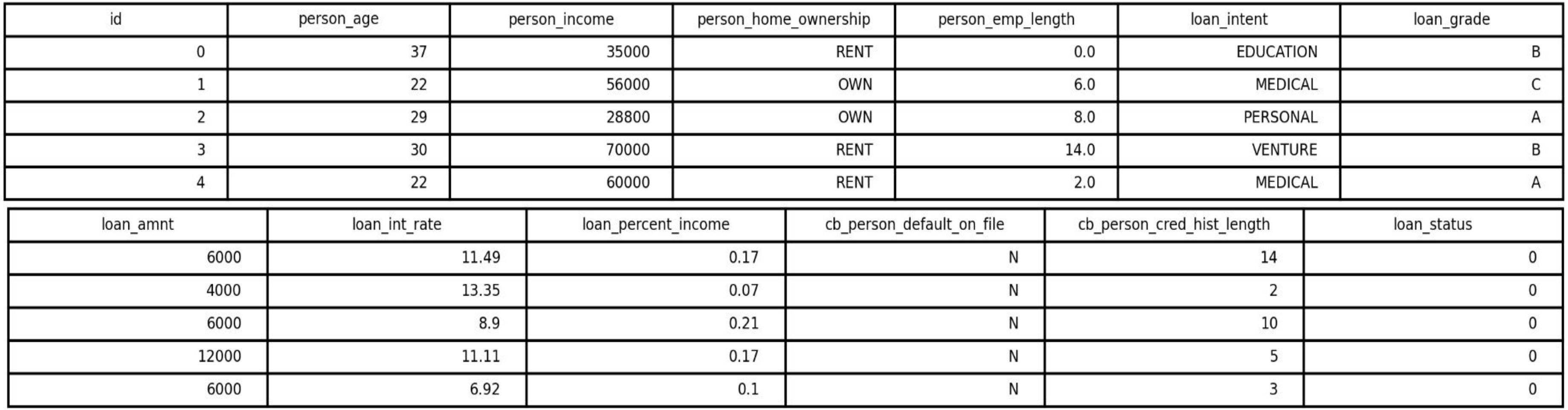
The data (first 5 rows)



id	person_age	person_income	person_home_ownership	person_emp_length	loan_intent	loan_grade	loan_amnt	loan_int_rate	loan_percent_income	cb_person_default_on_file	cb_person_cred_hist_length	loan_status
0	37	35000	RENT	0.0	EDUCATION	B	6000	11.49	0.17	N	14	0
1	22	56000	OWN	6.0	MEDICAL	C	4000	13.35	0.07	N	2	0
2	29	28800	OWN	8.0	PERSONAL	A	6000	8.9	0.21	N	10	0
3	30	70000	RENT	14.0	VENTURE	B	12000	11.11	0.17	N	5	0
4	22	60000	RENT	2.0	MEDICAL	A	6000	6.92	0.1	N	3	0

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The task

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The task

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The task

Predict loan status from the first 12 columns (for individuals not present in the dataset)

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General approaches

- *Data cleaning* (handle missing values and/or incorrect data)
- *Data enhancement* (find or construct similar datasets to increase data volume and/or help with data cleaning)
- *Encoding* (convert categorical variables into continuous variables so that they are parsable, or more well-interpretable, by our ML algorithm)
- *Normalisation* (standardise the scales of all of our variables so that arbitrary scale differences between variables don’t bias the learning process)
- *Model selection* (select the appropriate ML algorithm(s))
- *Hyperparameter tuning* (choose the best values for the parameters of our algorithm(s))

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General approaches (continued)

- *Feature engineering* (construct new variables, whether from the existing variables or from scratch, to feed into our ML algorithm(s))
- *Ensemble learning* (combine the knowledge gleaned by each of our ML algorithms)
- *Exploratory data analysis (EDA)* (understand the data intuitively with the help of statistics, tables, graphs, and other data visualisation techniques)
- *Evaluation* (determine how good our models are so we can track progress)
- *Subject-matter research* (gain information about the subject to contextualise our data)
- *Technical research* (research data science approaches relevant to our subject)

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Specific approaches (examples)

- *Data cleaning*: Mean imputation, column dropping, row dropping, predictive modelling, duplicate removal, outlier removal
- *Data enhancement*: Data augmentation, synthetic data generation, oversampling
- *Encoding*: Label encoding, one-hot encoding, target encoding, binary encoding
- *Normalisation*: Z-score, L1, L2, min-max, robust (median-IQR) scaling
- *Model selection*: Logistic regression, Catboost, XGBoost, Random Forest
- *Hyperparameter tuning*: Manual search, grid search, random search, Optuna

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General approaches (continued)

- *Feature engineering*: Principal component analysis (PCA), feature grouping
- *Ensemble learning*: Stacking, blending, hill climbing blending, bagging, voting ensemble
- *Exploratory data analysis (EDA)*: Summary statistics, box plots, histograms, correlation heatmap, missing value heatmap
- *Evaluation*: Train-test split, cross-validation, evaluation metrics: accuracy, recall, precision, AUC, (note: evaluation metric will be provided by Kaggle)
- *Subject-matter research*: Wikipedia, ArXiv, expert consultation
- *Technical research*: Kaggle competition discussion, Kaggle public notebooks

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My approach

- *Data cleaning*: Mean imputation – replace missing values with the mean value of the corresponding variable
- *Data enhancement*: Append the original dataset, from which the competition dataset was synthesised, to the competition dataset
- *Encoding*: Label encoding – simple one-to-one mapping to integers
- *Normalisation*: Z-score normalisation: assume each variable is normally distribution and rescale the distribution to standard normal
- *Model selection*: Catboost, XGBoost, LGBM were my top-performing models
- *Hyperparameter tuning*: Manual search with reference to Kaggle public notebooks

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My approach

- *Feature engineering*: For CatBoost, use both the categorical and encoded versions of the categorical data
- *Ensemble learning*: Hill climbing blending: use simple linear regression with the hill climbing solver to combine predictions from my 3 models
- *Exploratory data analysis (EDA)*: Correlation heatmap, summary statistics
- *Evaluation*: Train-test split, stratified 5-fold cross-validation, evaluation metrics: AUC (required by the competition)
- *Subject-matter research*: Consultation with friend who works in finance
- *Technical research*: Kaggle competition discussion, Kaggle public notebooks

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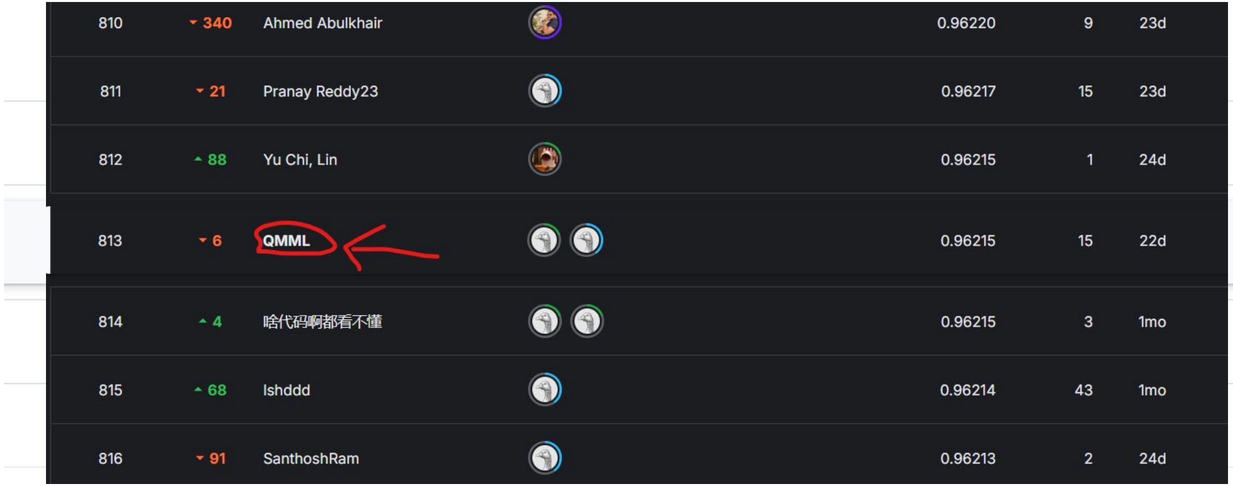
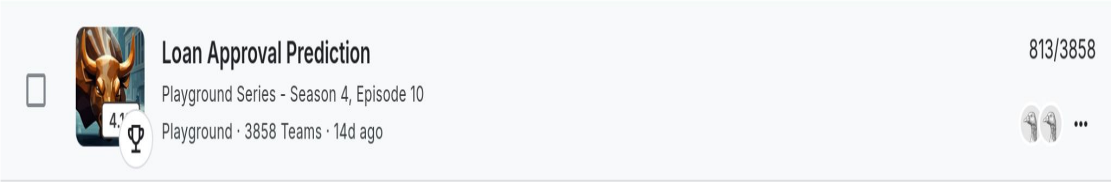
Results



810	▾ 340	Ahmed Abulkhair	0.96220	9	23d
811	▾ 21	Pranay Reddy23	0.96217	15	23d
812	▴ 88	Yu Chi, Lin	0.96215	1	24d
813	▾ 6	QMML	0.96215	15	22d
814	▴ 4	啥代码啊都看不懂	0.96215	3	1mo
815	▴ 68	lshddd	0.96214	43	1mo
816	▾ 91	SanthoshRam	0.96213	2	24d



☐ Loan Approval Prediction

Playground Series - Season 4, Episode 10

Playground · 3858 Teams · 14d ago

813/3858

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Results

Top 21%! Can you do better?

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GOOD LUCK!

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