Approach Machinehack analytics olympiad 2022

Create a machine learning model to help an insurance company understand which claims are worth rejecting and the claims which should be accepted for reimbursement.

- Basic exploratory data analysis using pandas, matplotlib, seaborn packages.
- Data pre-processing
  - Column name lower casr
  - Feature Engineering
    - Create a binary feature if a person having child without a marriage.
    - get a categorical columns percentage
    - numerical groupby numerical summary
- The final features for the model
  - 1_age
  - 2_gender
  - 3_driving_experience
  - 4_education
  - 5_income
  - 6_credit_score
  - 7_vehicle_ownership
  - 8_vehicle_year
  - 9_married
  - 10_children

- 11_postal_code
- 12_annual_mileage
- 13_speeding_violations
- 14_duis
- 15_past_accidents
- 16_outcome
- 17_type_of_vehicle
- 18_data
- 19_not_married_hv_child
- 20_id_age_percentage
- 21_id_gender_percentage
- 22_id_driving_experience_percentage
- 23_id_education_percentage
- 24_id_income_percentage
- 25_id_vehicle_ownership_percentage
- 26_id_vehicle_year_percentage
- 27_id_married_percentage
- 28_id_children_percentage
- 29_id_type_of_vehicle_percentage
- 30_id_not_married_hv_child_percentage
- 31_id_annual_mileage_percentage
- 32_id_speeding_violations_percentage
- 33_id_duis_percentage
- 34_id_past_accidents_percentage
- 35_age_credit_score_median

- 36_age_credit_score_mean
- 37_age_credit_score_max
- 38_age_credit_score_min
- 39_age_annual_mileage_median
- 40_age_annual_mileage_mean
- 41_age_annual_mileage_max
- 42_age_annual_mileage_min
- 43_age_speeding_violations_median
- 44_age_speeding_violations_mean
- 45_age_speeding_violations_max
- 46_age_speeding_violations_min
- 47_age_duis_median
- 48_age_duis_mean
- 49_age_duis_max
- 50_age_duis_min
- 51_age_past_accidents_median
- 52_age_past_accidents_mean
- 53_age_past_accidents_max
- 54_age_past_accidents_min
- 55_gender_credit_score_median
- 56_gender_credit_score_mean
- 57_gender_credit_score_max
- 58_gender_credit_score_min
- 59_gender_annual_mileage_median
- 60_gender_annual_mileage_mean

- 61_gender_annual_mileage_max
- 62_gender_annual_mileage_min
- 63_gender_speeding_violations_median
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- 65_gender_speeding_violations_max
- 66_gender_speeding_violations_min
- 67_gender_duis_median
- 68_gender_duis_mean
- 69_gender_duis_max
- 70_gender_duis_min
- 71_gender_past_accidents_median
- 72_gender_past_accidents_mean
- 73_gender_past_accidents_max
- 74_gender_past_accidents_min
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- 77_driving_experience_credit_score_max
- 78_driving_experience_credit_score_min
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- 81_driving_experience_annual_mileage_max
- 82_driving_experience_annual_mileage_min
- 83_driving_experience_speeding_violations_median
- 84_driving_experience_speeding_violations_mean
- 85_driving_experience_speeding_violations_max

- 86_driving_experience_speeding_violations_min
- 87_driving_experience_duis_median
- 88_driving_experience_duis_mean
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- 90_driving_experience_duis_min
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- 128_income_duis_mean
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- 130_income_duis_min
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- 133_income_past_accidents_max
- 134_income_past_accidents_min
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- 136_vehicle_ownership_credit_score_mean
- 137_vehicle_ownership_credit_score_max
- 138_vehicle_ownership_credit_score_min
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- 140_vehicle_ownership_annual_mileage_mean
- 141_vehicle_ownership_annual_mileage_max
- 142_vehicle_ownership_annual_mileage_min
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- 146_vehicle_ownership_speeding_violations_min
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- 153_vehicle_ownership_past_accidents_max
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- 160_vehicle_year_annual_mileage_mean

- 161_vehicle_year_annual_mileage_max
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- 167_vehicle_year_duis_median
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- 169_vehicle_year_duis_max
- 170_vehicle_year_duis_min
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- 193_married_past_accidents_max
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- 197_not_married_hv_child_credit_score_max
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- 201_not_married_hv_child_annual_mileage_max
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- 209_not_married_hv_child_duis_max
- 210_not_married_hv_child_duis_min

- 211_not_married_hv_child_past_accidents_median
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- 252_type_of_vehicle_past_accidents_mean
- 253_type_of_vehicle_past_accidents_max
- 254_type_of_vehicle_past_accidents_min

- Created catboost classifier model and tuned hyperparameters by using optuna framework.Model evaluated with Logloss.After 100 trials,
    - The best score is 0.68106
    - The best hyperparemeters are,

      {'reg_lambda': 160,

      'learning_rate': 0.04010653349368823,

      'n_estimators': 221,

      'max_depth': 6,

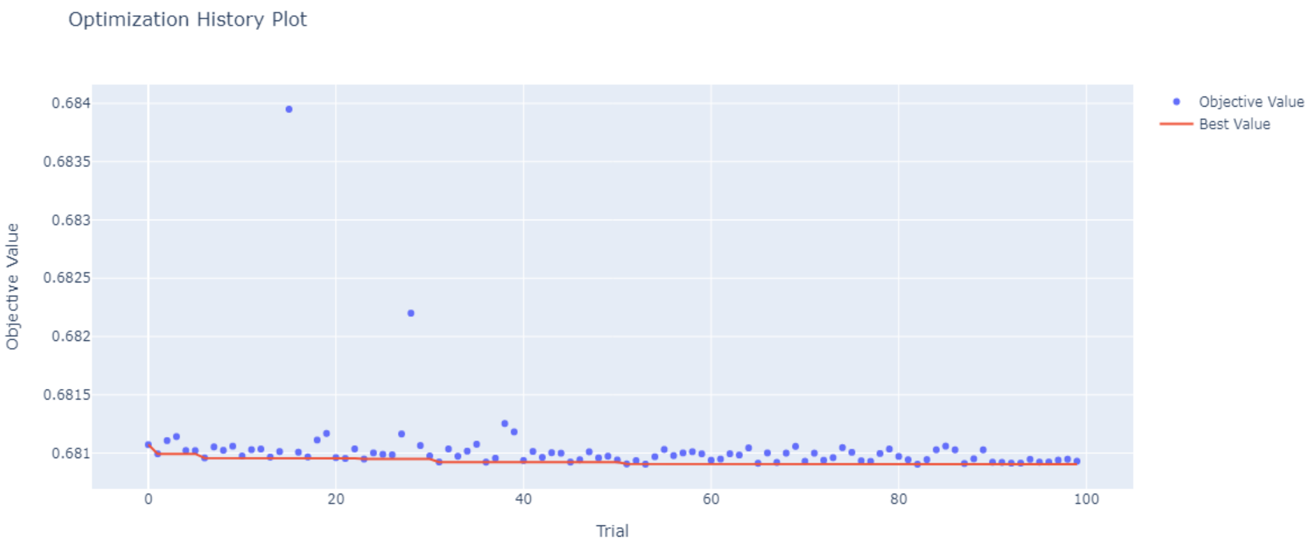
      'od_type': 'IncToDec',

      'random_state': 1024,

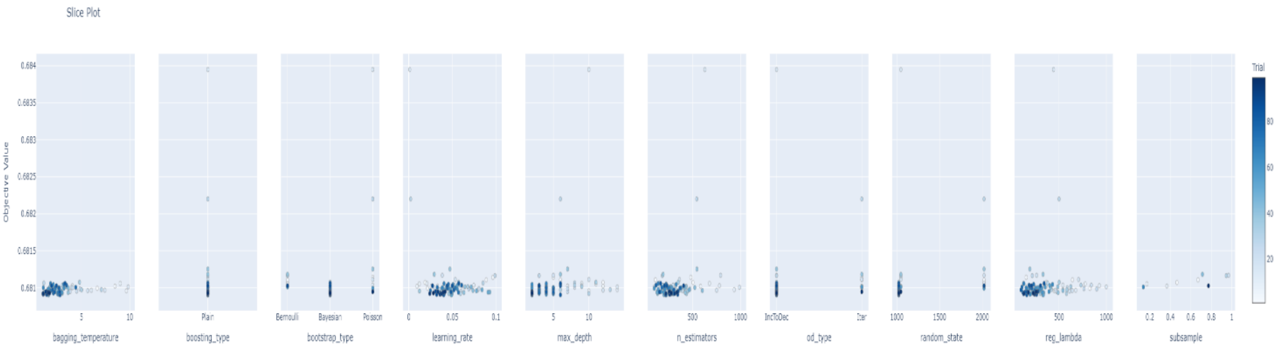
      'boosting_type': 'Plain',

      'bootstrap_type': 'Bayesian',

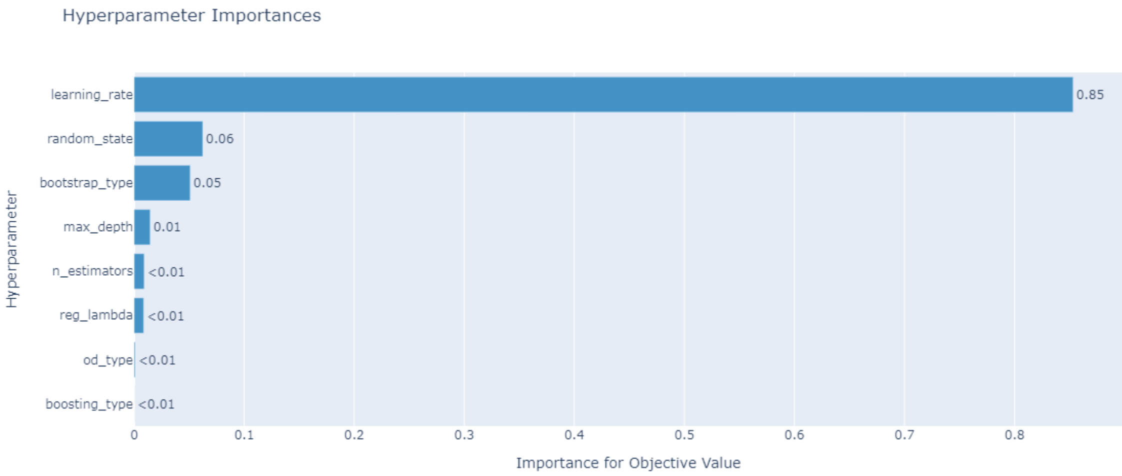
      'bagging_temperature': 2.7779687356027973}
- Visualizing the Optimization History - Explains the best score at each trials.



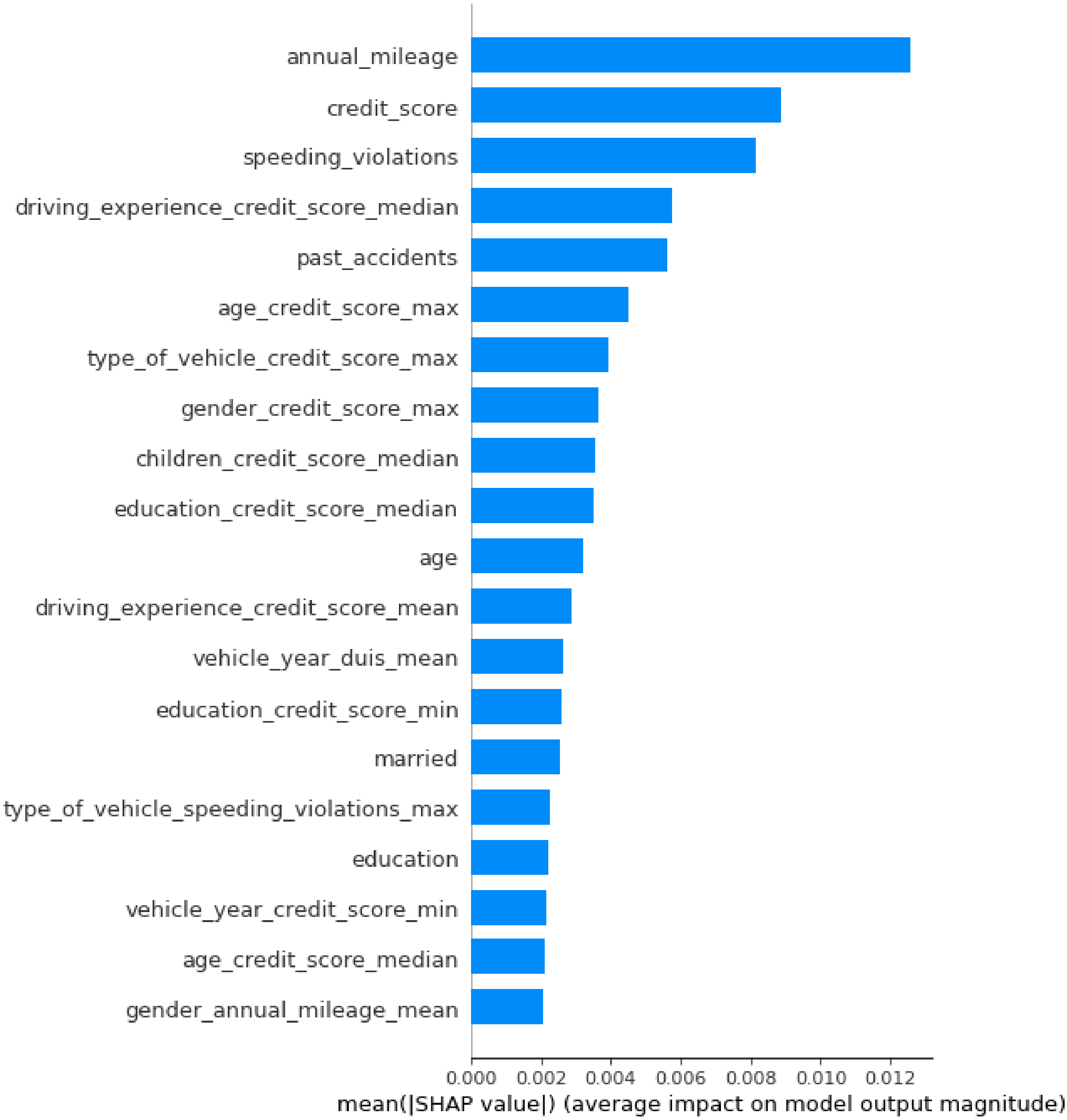
- Visualizing High-dimensional Parameter Relationships



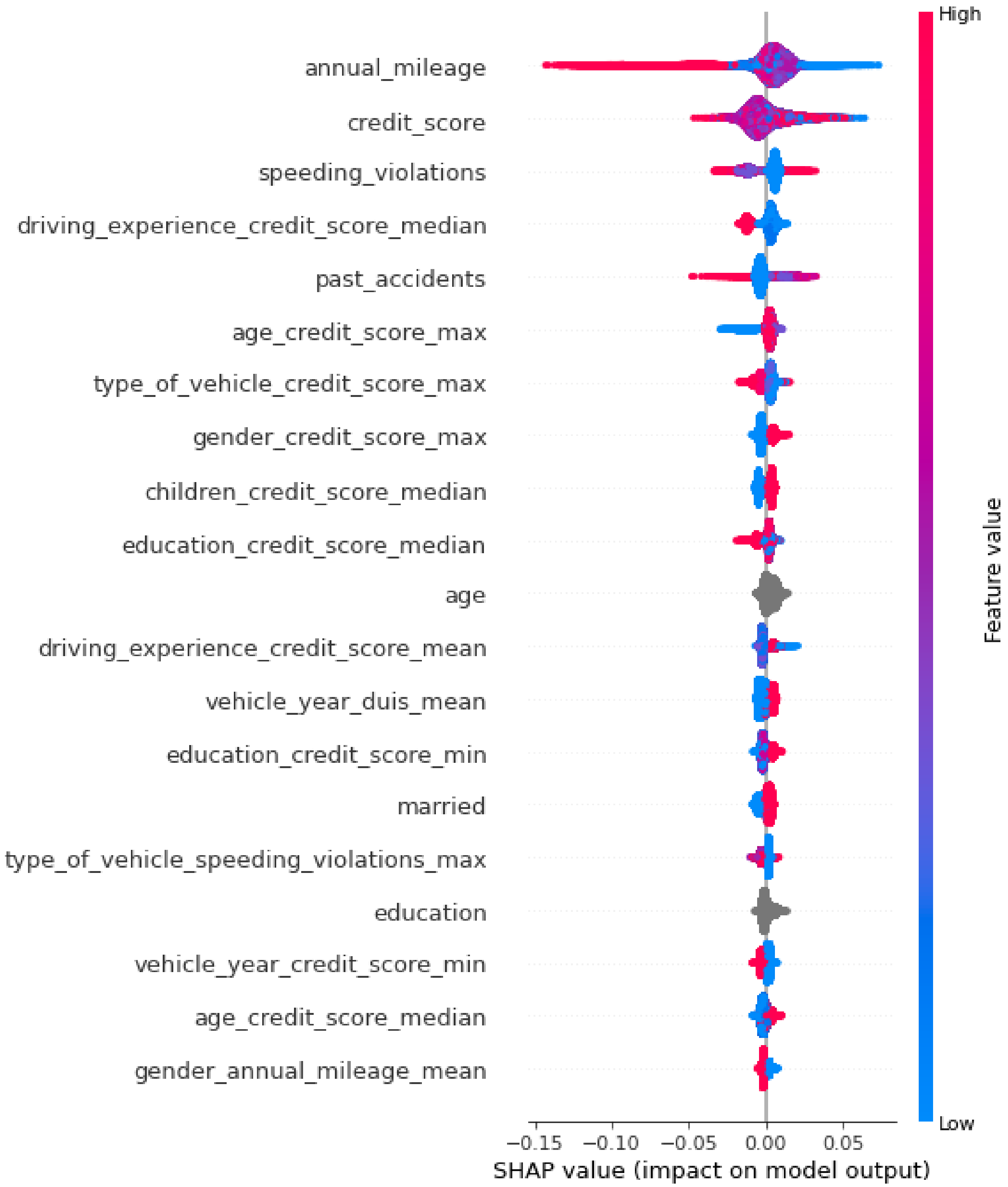
- Visualizing Parameter Importances



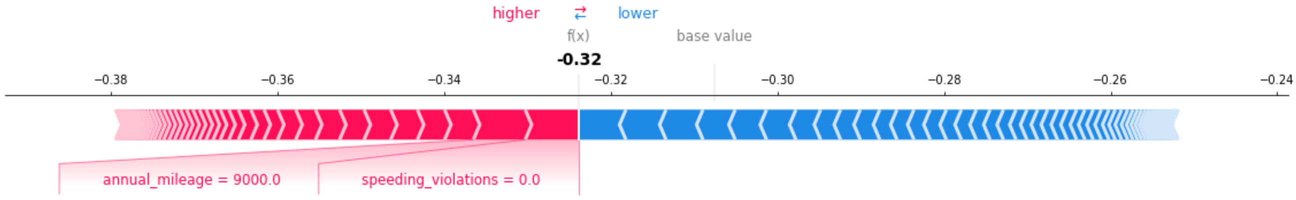
- Catboost SHAP feature importances plot



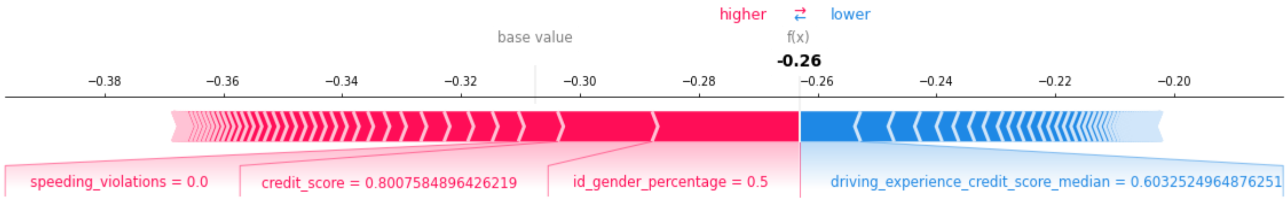
- Catboost SHAP top features impact the model



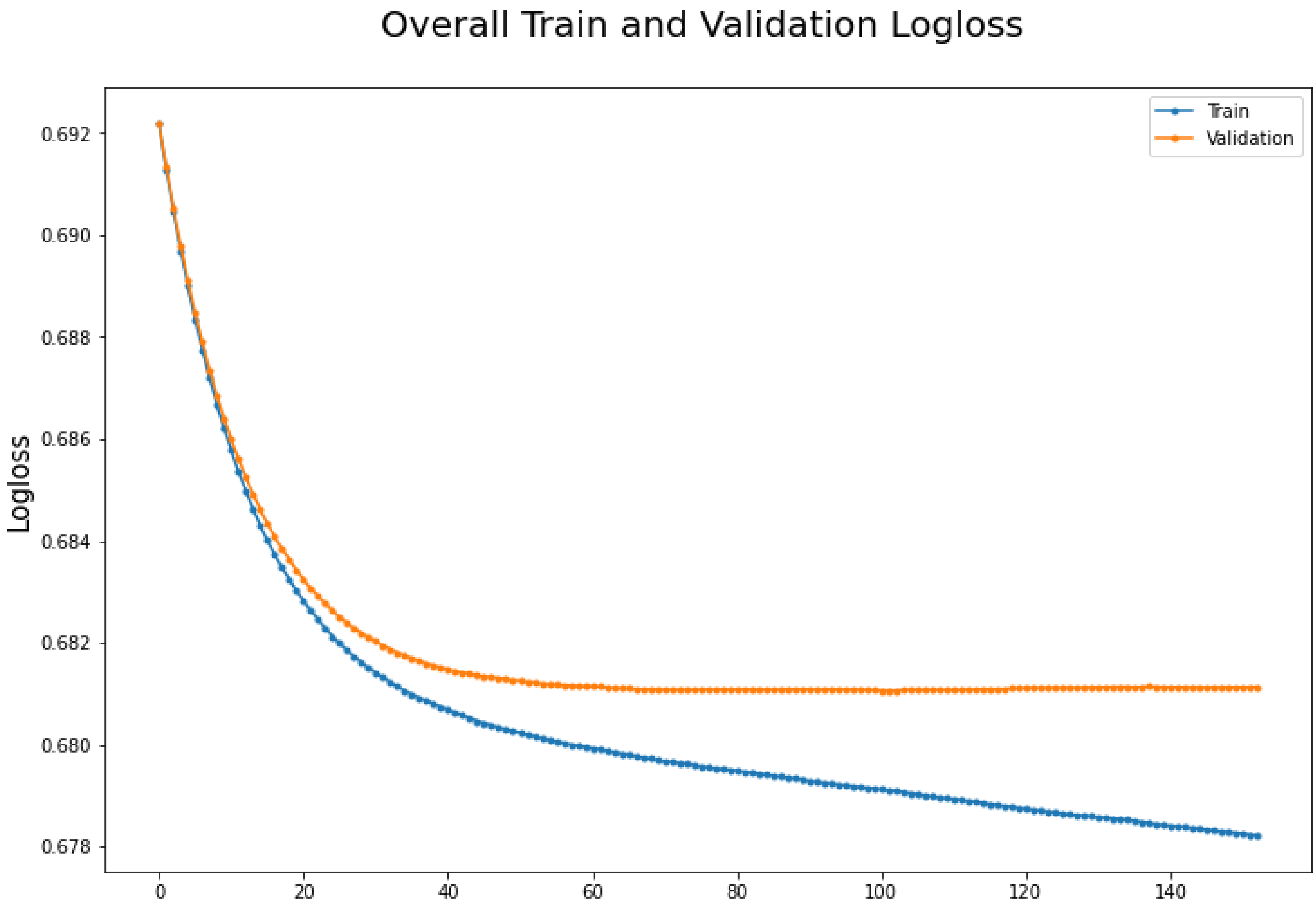
- Top feature influences for class 1



- Top feature influences for class 0



- Overall Train and Validation Logloss



- Train logloss: 0.67936 , Validation logloss: 0.68106
- Final competition score is 0.68081