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To predict a customer subscribes to a term deposit, we trained a GradientBoostingClassifier on the Bank dataset.

We used Permutation Importance (PI) to rank global features, SHAP to provide both global and local explanations, and LIME to provide local case-specific explanations.

Lastly, we compared the three methods to seek similarities and differences on their explanations.

Consistencies & Differences

1. PermutationImportance(PI)describesthemostpredictiveglobal features but fails to tell whether their effect is positive or negative.
2. SHAPsummaryplotconfirmstherankingofPland,inaddition, indicates whether the effect is positive or negative (e.g., longer call duration makes it more likely to subscribe).
3. SHAPlocalforceplotaddspersonalizedlogictoindicatehowspecific characteristics attracted a customer to, or turned them off to, subscribing.
4. LIMEexplanationsofferhuman-readable,intuitiverulesastowhy certain predictions were made to individual customers.
5. PlandSHAPagreeontheimportantfeatures,suchaslengthoftime, age, and prior results.
6. TherearesomeslightdifferencesinSHAPandLIMEatthelocallevel, in the methods of their approximation.
7. PlisconstantandinternationalwhereasLIMEmaychangeamong runs because it uses sampling.
8. SHAPismoremathematicallysoundbutacostlyprocess;LIMEis neither computationally cheap nor difficult to interpret in practice.

9. Collectively these approaches are complementary: PI provides global ranking, SHAP provides global + local balance, LIME a simple local reasoning.

10. This multi means approach guarantees reliable and clear explanations of both the world trends and personal forecasts.