# Applications of Bayesian Machine Leaning in Marketing and advertising

Bayesian Machine Learning combines Machine Learning with Bayesian Statistics. The goal of Bayesian Machine Learning is to estimate the posterior distribution of one or more target variables based on some prior knowledge or belief about them and some evidence.

One of the domains that Bayesian Machine Learning has been applied to is Marketing and advertising . Some applications are :

## Personalized Recommendations:

The task of item recommendation is to create a user-specific ranking for a set of items. Preferences of users about items are learned from the user's buying history.

In 2009 Rendle ET AL proposed an optimization criterion **BPR-Opt** that is the maximum posterior estimator derived from a Bayesian analysis of the problem for optimal personalized ranking which is similar to the ranking statistic AUC ,the area under the ROC curve.

## Customer Retention.

Literature reports show that:

1)acquiring a new client is five to six times more costly than retaining an existing customer.

2) long-term customers generate higher profits

3) losing customers leads to opportunity costs because of reduced sales.

Therefore even a small improvement in customer retention can prove valuable for a company.

In 2014 Verbraken et al investigates the predictive power of a number of Bayesian Network algorithms, ranging from the Naive Bayes classifier to **General Bayesian Network classifiers** in customer churn prediction for telecom operators customers.

## A/B testing to Optimise Marketing campaigns

**Media mix models** (MMM) are used to understand how media spend affects sales aiming to optimize the allocation of spend across media.

In 2017 Yuxue Jin et al proposed a Bayesian update in Media mix models to measure the effectiveness of advertising in a retail setting.

The **multi-armed bandit** is a problem in which a decision maker iteratively selects one of multiple fixed choices (i.e., arms or actions) when the properties of each choice are only partially known at the time of allocation, and may become better understood as time passes. Multi arm bandit has been applied in a/b testing ,recommendation systems and many more marketing related fields.

In 2010 Steven L. Scott proposed a Bayesian approach in the Multi armed bandit problem and presenting a simulation study that investigates the performance of the Bayesian approach in the unstructured binomial bandit compared to the traditional.

References :

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