RUSH! delivers personalized, time-limited discount coupons via continuous-time forecasts of consumer purchases.

Why digital coupons? $4.2B in consumer spending 0.6% of all coupons are digital 30x more likely to be redeemed

Challenges
- Continuous-time temporal forecasts
- Joint purchase category prediction
- Non-stationary consumer behavior
- Sparse consumption timelines
- Evaluation from a financial perspective

Data
- Prepaid accounts from partner bank
- Near-complete transaction logs
- Fine-grained transaction times
- VISA MCC category mapping

Data Statistics
- February 2014 — 2015 time-frame
- 7,719 bank customer accounts
- 2,808,360 timestamped transactions
- 10 merchant categories

Modeling Purchase Behavior
$\lambda^*(t) = \lambda_0 + \mu(t) + \sum_{t' \in H_t} e^{-\alpha(t-t')} \beta c_{t,t'}$

Exogenous time-variation
$\mu(t) = \sum_{j \in F} \mu_j f_j(t)$

Intensity leads to loglikelihood that is concave

Evaluation
- Predictive loglikelihood
- Absolute error CDF
- Total profit
- Total profit, p% most confident coupons

Scalability
- Total profit, p% most confident coupons
- Runtime (s)
- Precomputation
- Source Category
- Target Category

Future
- Prediction intervals for duration
- Coupon amount estimation
- A/B testing & randomized experiments

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