Project Goals
- Identify Internet of Things (IoT) use cases for customized banking services
- Identify sources of IoT data, find methods to synthesize IoT unstructured data with existing structured databases

Resources Used
- TD Bank brand and product attributes
- Epsilon dataset

Major Challenge
- Lack of relevant available IoT data

Market Research
- Most IoT databases are privatized, but monetized IoT business solutions and platforms are available
- In personal finance and retail banking, IoT can be used to monitor usage of financial products, personalize customer experience, and enhance fraud prevention

Epsilon Dataset
- 5 million households and 645 attributes on household demographics, interests, lifestyles, life events, consumer behavior
- 34% attributes have more than 80% missing values
- High marginal correlation among many variables

Project Framework

Approach 1
- Internet of Things
- Epsilon Predictors
- Epsilon Responses
- TD Bank Products

Approach 2
- IoT & TD Bank
- TD Bank Customer Database
- Services Utilizing Geolocation Data
- TD Bank Customer Database
IoT Use Case: Amazon Alexa with Debit Card User Example

- Use term frequency (tf-idf) and latent semantic analysis on an Alexa user history to identify if a person is likely to have a certain lifestyle
- Substitute Alexa history for “Personal Finance for Dummies”
- “Credit” has a very high frequency and should pass a cut-off set to identify if the frequency is high enough to suggest something about the user
- Develop Alexa Skill for TD to deliver basic financial services and collect information on lifestyles and interests

TD Product Response Selection

- Identify Epsilon variables relevant to major TD banking products (checking, savings, credit card, mortgage, home equity loan, unsecured loan)

<table>
<thead>
<tr>
<th>Response Variable</th>
<th>TD Bank Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debit Card User</td>
<td>Checking Account</td>
</tr>
<tr>
<td>In the Market to Purchase a Home</td>
<td>Mortgage</td>
</tr>
<tr>
<td>Student Loan Customer</td>
<td>Unsecured Loan</td>
</tr>
<tr>
<td>Online Savings User</td>
<td>Savings Account</td>
</tr>
</tbody>
</table>

Connecting IoT to Epsilon Predictors

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Predictor Selection and Modeling

- Approach 1: use Bayesian Additive Regression Trees (BART) for variable selection and construct small models with predictors given
- Approach 2: conduct full regression and prediction with BART, evaluate predictions by household niche
- Sample response: Debit Card User