Connecting Open Source Machine Learning Libraries with Data Visualization Tools

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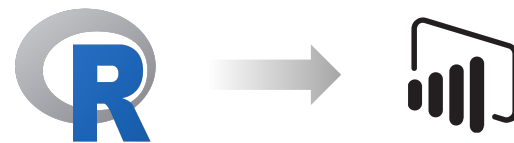
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Agenda
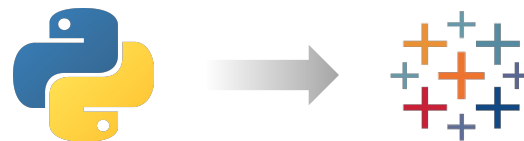
Dining Experience Use-Case

Value of pairing ML with Viz
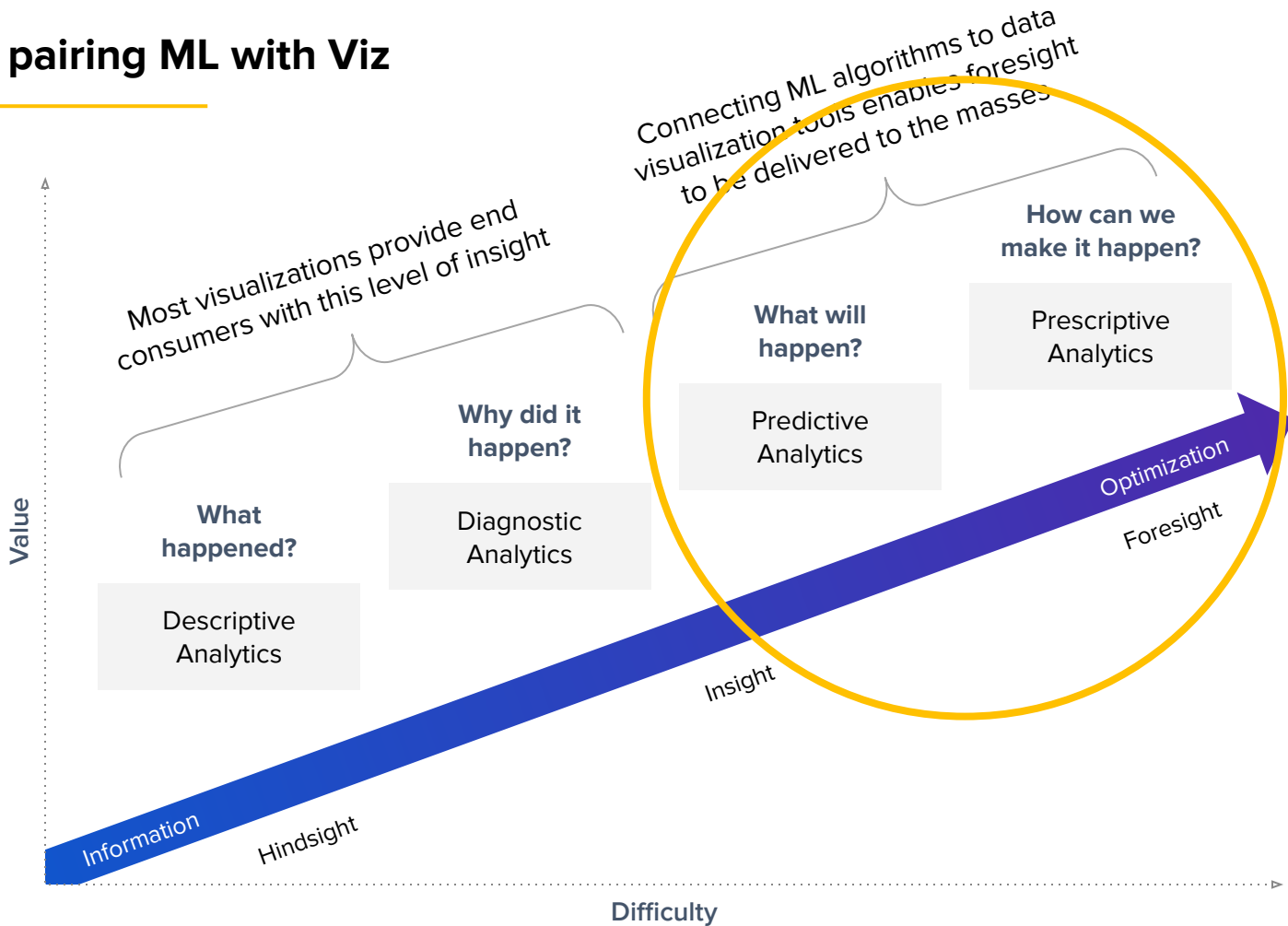
Value of pairing ML with Viz

Problem

Insights are hard to come by and they are even harder to **disseminate** to the right folks

Data Scientists and ML Engineers are great at creating models that can deliver foresight, but people don't know how to use them

Solution

Viz tools like Tableau and Microsoft Power BI are pervasive within the enterprise and could serve as a solution for disseminating ML generated insights to the right people.

Additionally, these tools have made it easy for DS / ML engineers to pair the capability of open source ML libraries to viz dashboards, making it easy for people to use their models

ML Technologies, Frameworks, & Libraries
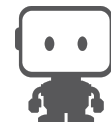
Building a Model

ML Technologies, Frameworks, & Libraries

1

Research

What are you trying to solve/build?

2

Data Gathering

What Data is needed in order to solve/build this?

3

Data Cleanup

What data needs to be cleaned up or restructured?

4

Exploratory Data Analysis

What is the data telling us; What are the main characteristics of the data?

7

Scoring & Assessing Results

How do we deploy this model on a test set of data? Are the results as anticipated?

6

Model Selection & Tuning

Which model produced the best results? What's the best way of measuring the success of a model?

5

Feature Engineering

Which input features are the most important towards constructing an accurate model?

Using a Model in a Visualization Tool

Visualization tools that will be used in our demo

For the analytical artist, data is your paint, the visualization studio is your palette

Tableau	Shared	Microsoft Power BI
Founded in 2003	Integrate well with third party data sources	Founded in 2013
Strong Data Exploration Capabilities	Excellent Product Support Communities	Strong Focus on Predictive Analytics and Reporting
~$35/month Professional LIcense	Connect to scripting Languages	~$10/month Professional License
Available on Windows and Mac OS	Both run on Windows	Available only on Windows
	Present Exceptional Illustration of patterns, cost savings opportunities, ***	

Truly understand
the "experience"

Dining Experience Use-Case

How to enable the right people within the restaurant to optimize Staffing, Inventory and Menu based on Predictive insights:
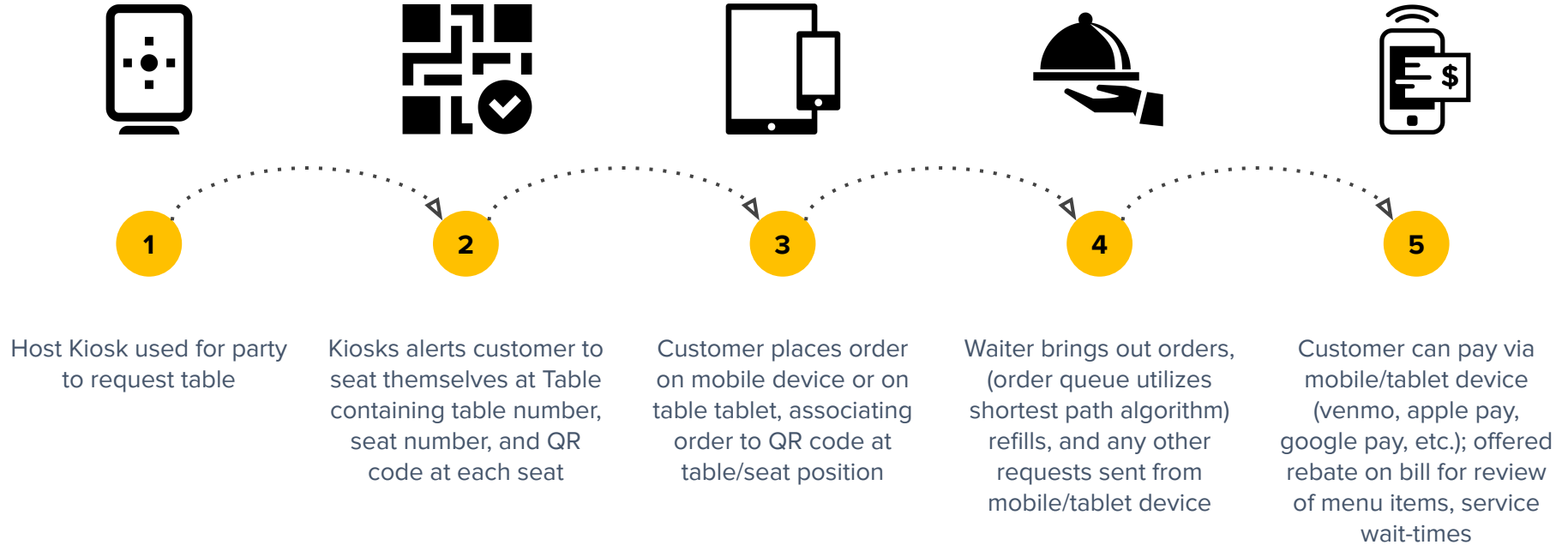
- → Nearly autonomous and fully digitalized data collection process
- → Collect relevant experience data at different points in the process
- → Compile collected data into visual insights, and use it to forecast future process states
- → Incentivize customers to leave reviews on menu items/dining experience

Dining Experience Use-Case / ML Implementation/Desired Visualization App

ML Models

Forecast Restaurant Revenue

Forecast Average Customer Duration

Predict Overall Experience Review Score

Visualization Dashboards

Restaurant Sales Performance Dashboard

Experience Durations Dashboard

Menu Item and Experience Review Dashboard

Desired Insights

→ How, when, and which items to market

→ How to optimize price points of menu items

→ Menu item product placement

→ Forecasting number of customers for a given day (and determining required number of staff needed)

Dining Experience Use-Case / Process Workflow [For Experience Dashboards]

1 — Host Kiosk used for party to request table

2 — Kiosks alerts customer to seat themselves at Table containing table number, seat number, and QR code at each seat

3 — Customer places order on mobile device or on table tablet, associating order to QR code at table/seat position

4 — Waiter brings out orders, (order queue utilizes shortest path algorithm) refills, and any other requests sent from mobile/tablet device

5 — Customer can pay via mobile/tablet device (venmo, apple pay, google pay, etc.); offered rebate on bill for review of menu items, service wait-times

Dining Experience Use-Case / Data Collected

|	**1** Party Arrival	**2** Party Seated	**3** Party Orders	**4** Party Receives Orders / Additional Requests	**5** Party Submits Payment and Exits Facility
Data Collected (from customer)	→ Table Party Size → *Contact Number → *Email address	→ Party Seated Date / Time → Customer Name	→ Menu Items Selected → Modifications and Customization to Items Selected → Order Submission Date/Time	→ Order Delivered Date/Time → Refills → Additional Order Requests	→ Review (1:5 ranking) of one or more menu items (optional/gamified) → Age → Payment Amount → Payment Type
Data Generated	→ Est. Wait time → Party Arrival Date/Time	→ Actual Wait time → Party Arrival to Party Seated Duration → Table Number	→ Dining Start to Order Submitted Duration	→ Order Submission to Delivery Wait Duration	→ Final Order Delivered to Payment Received Duration

Let's dive into a demo

Run R Script in Power BI Desktop

Walk through connection process

Go through ML models in RStudio

Demonstration of connecting ML algorithm in R script to visualization dashboards in Power BI
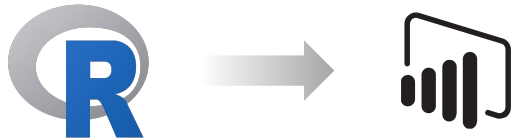
Python to Tableau via PyTab

Walk through running PyTab Server instance from command terminal

Show how to connect python script to visualization dashboards in Tableau