AI for Operations

By the People, For the People

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Andrew (1956) & Erna Viterbi Professor
MIT

Cofounder
CTO
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Massachusetts Institute of Technology

Artificial Intelligence (AI)

Term was coined in 1960s

Goal is to mimic human behavior in an intelligent manner

AI aims to do what humans can do, but really well [automation]

Artificial "creativity"

Drive, Play games, Customer support, ...

machines will be capable, within twenty years, of doing any work a man can do

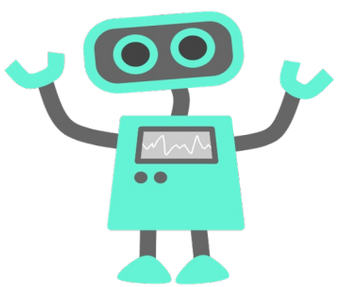
-- Minsky 1960s

AI seeks to create "muscle" and "mind" of humans

Muscle: actuation, mechanics, ... [*Robotics*]

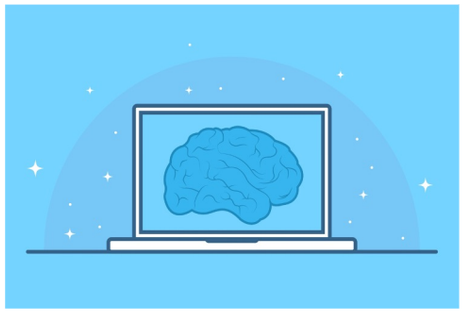
Mind: learning from data, ... [*Machine Learning, Statistics*]

Traditionally using "rules" and "decision trees"



The Challenge

Automation within organizations



Using AI and Data
(+ Computation)

By the *People*, for *People*

That is

Create productive organizations by enabling individuals

Organizations are "(financial) instruments"

Automation of decisions with humans in the loop

with aim of improving the returns on investment (ROI)

using AI and data

Organizations, People

Operations within in an Organization

Front Office:
Marketing, Sales,
Customer Support

Back Office:
Supply Chain, Account,
Human Resources

Typically run by the people:

Skills

Experiences

Collaboration

Instincts

Passion

Data, People in Orgs: pre Computers

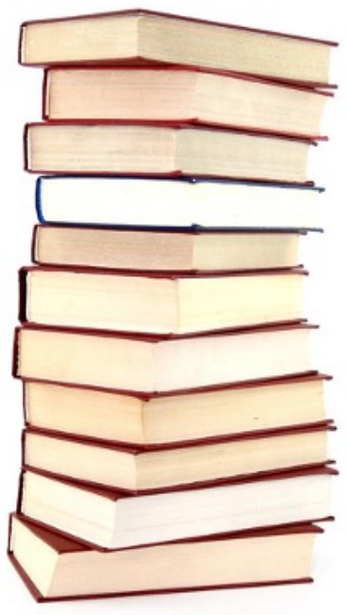
Example: Inventory Ops in Retail
Primary Goal: Achieve the best "return on investments"

Status of Inventory

When + How Much to Replenish

Store Managers:

- *Talk* to customers
- *Look* at shelves
- *Understand* what is selling and what is not



Generally managed through **paper ledgers**

- Manual, laborious, error-prone, and incomplete

Data, People in Orgs: enter Computers

Example: Inventory Ops in Retail

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- *Talk* to customers
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Generally managed through **information systems**

- Easy to keep track of operational information

Data, People in Orgs: enter Business Intelligence

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Status of Inventory

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Store Managers:

- *Talk* to customers
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- *Understand* what is selling and what is not

Generally managed through **information systems**

- Easy to keep track of operational information
- Understand trends, profit margins, & turn easily

Data, People in Orgs: enter e-Commerce

Example: Inventory Ops in Retail
Primary Goal: Achieve the best "return on investments"

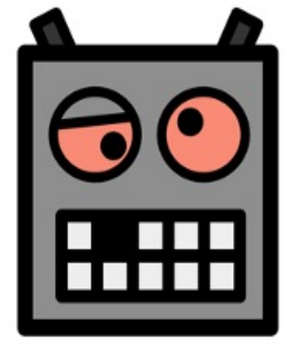
Status of Inventory

When + How Much to Replenish

Store Managers:

- No customers to talk to, no shelves to look at, only data

Data is not present in a "common" information system



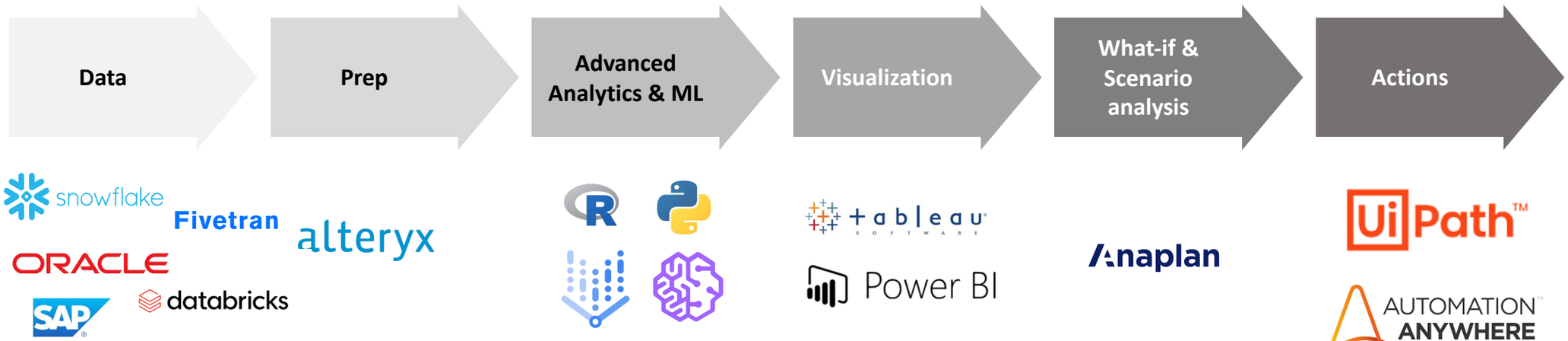
Creating source of truth

- Manual, laborious, error-prone, and incomplete (think spreadsheets)
- **Cannot** do trends, profit margins, & turn easily

A Day in the Life of a *Data Operator*

make decisions to achieve best *ROI*

how much *new* inventory to order *every* day



Q1. What is the ground truth?

6+ systems of record

Q2. What action should we take?

4+ teammates

Email collaboration

Q3. What strategic changes to make?

5+ tools

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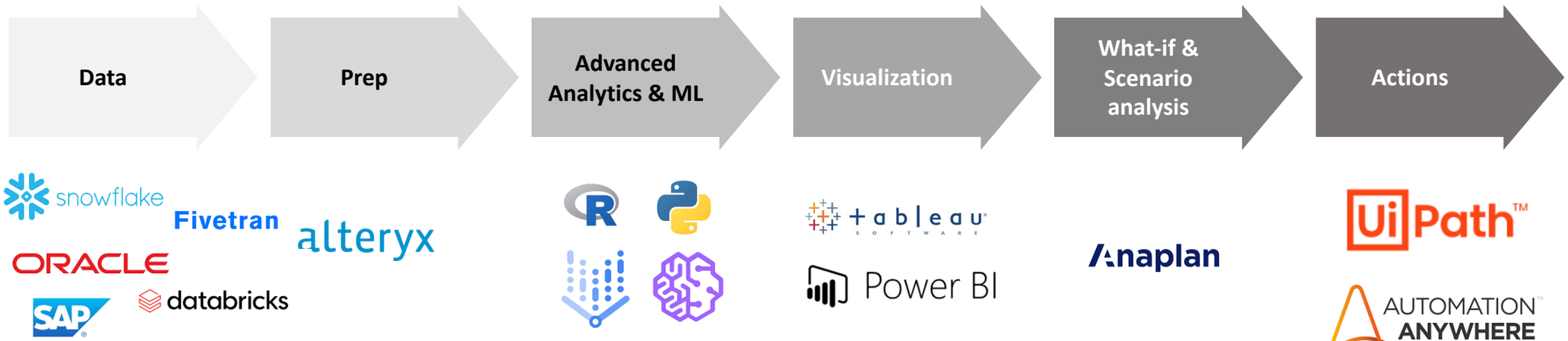


Q1. What is the ground truth?

Can't Figure Ground Truth!

Multiple Sources

Schemas Don't Match

Q2. What action should we take?

Can't Make Good Forecasts!

Constantly Changing Trends

Data is Sparse

Q3. What strategic changes to make?

Can't Do Scenario Analysis!

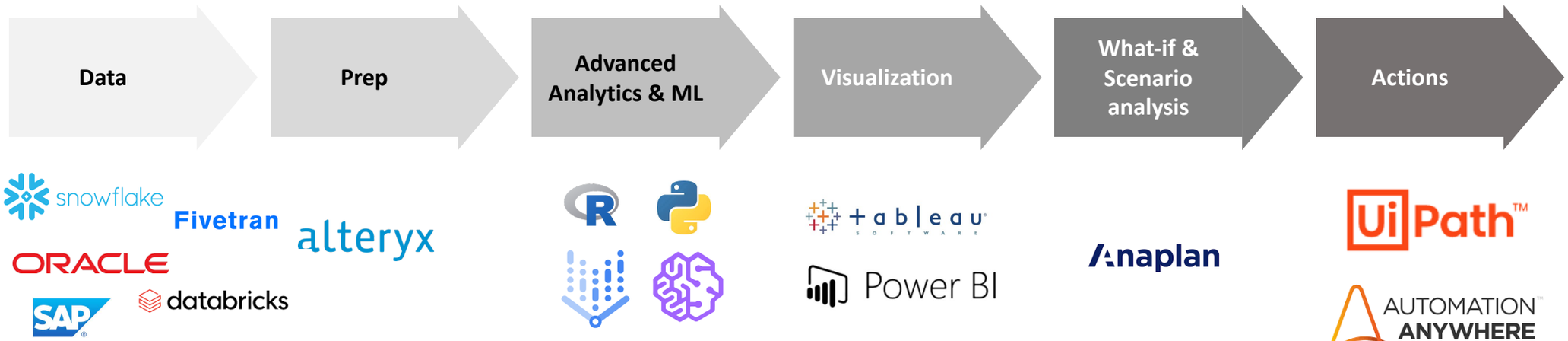
Multiple Objectives

Too Many Scenarios

A Day in the Life of a *Data Operator*

make decisions to achieve best *ROI*

how much *new* inventory to order *every* day



Q1. What is the ground truth?

Q2. What action should we take?

Q3. What strategic changes to make?

DeepMatch

AI driven data prep for disparate sources

DeepCast

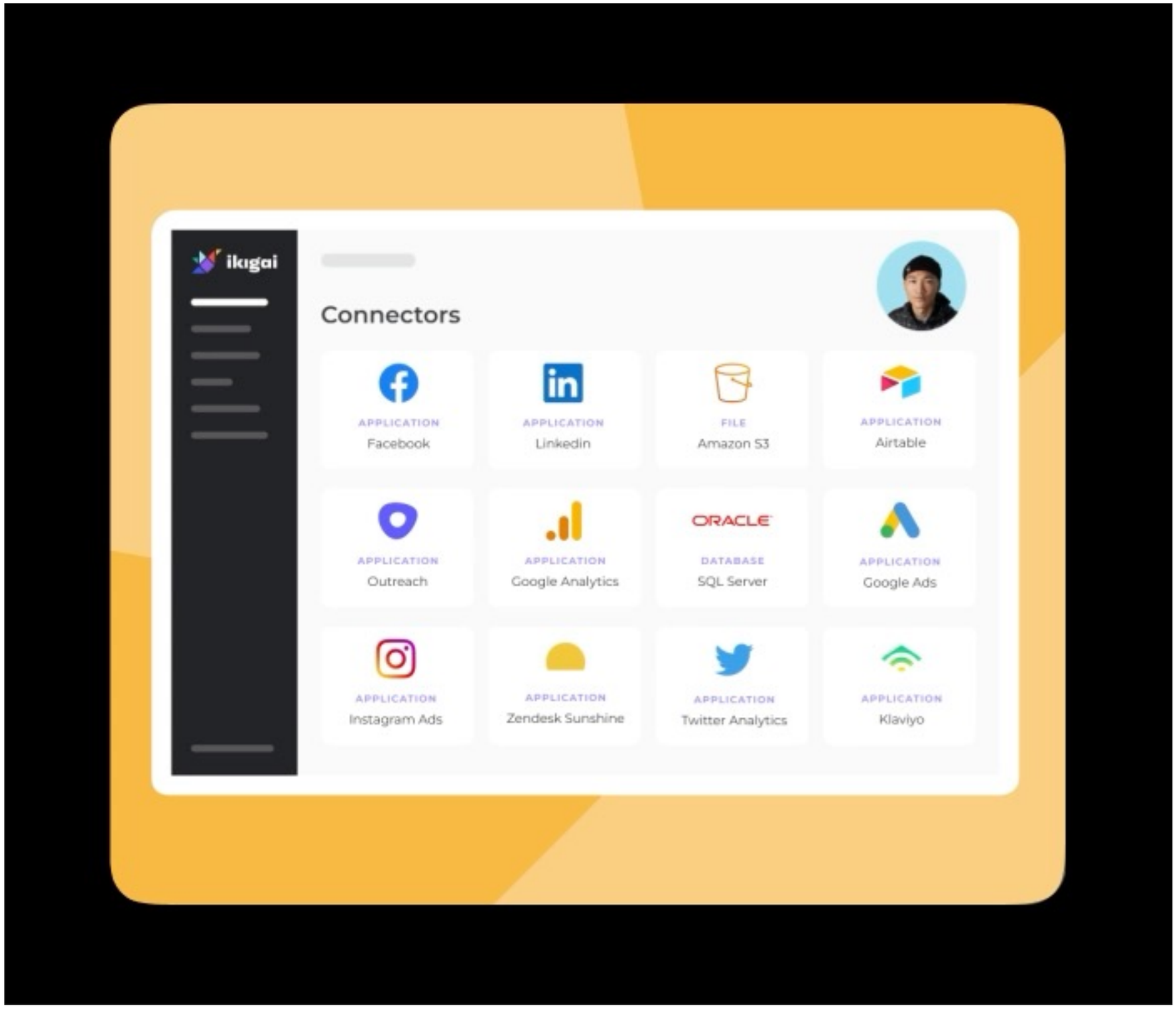
predictions w extremely limited data

DeepRL

Interpretable RL w upto 10^{19} scenario analysis

Three AI Nuggets

DeepMatch

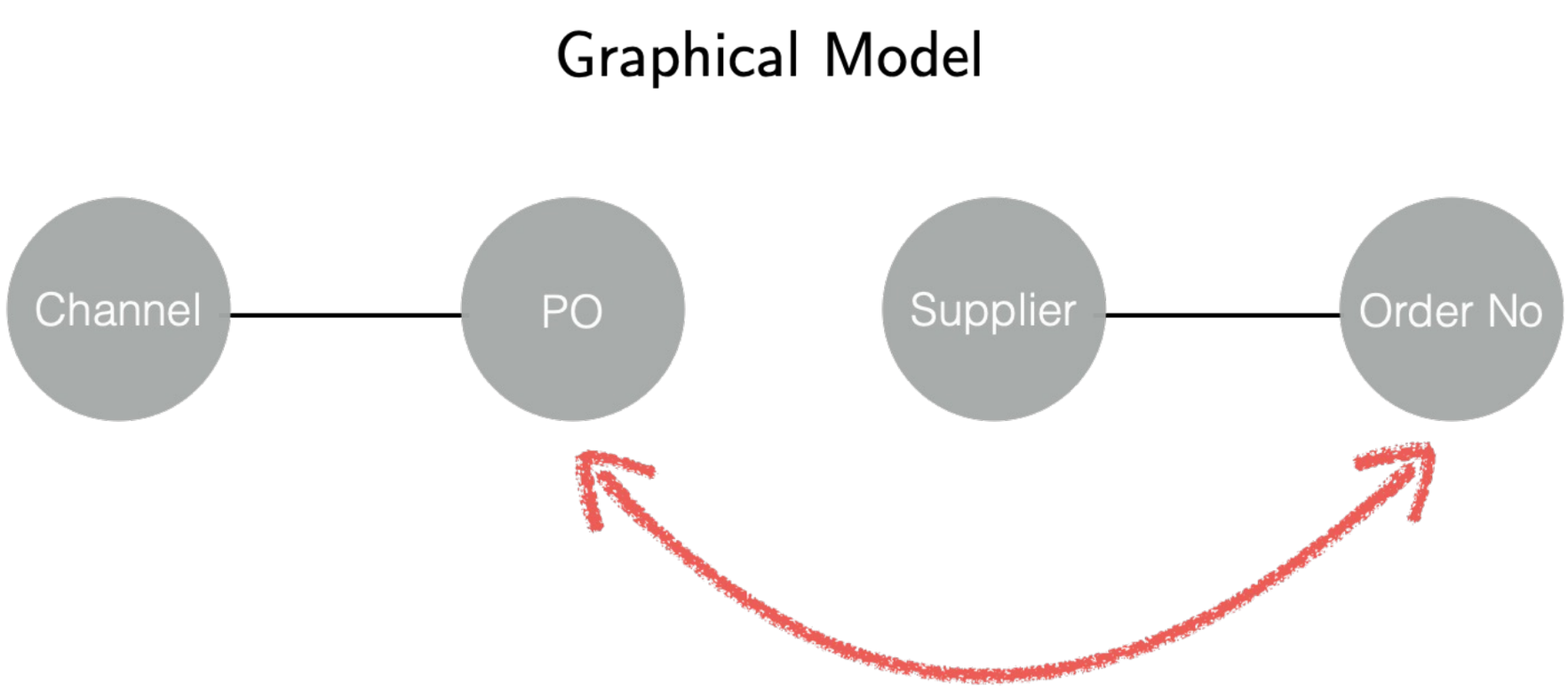

ikigai
Connectors
APPLICATION
Facebook
APPLICATION
Linkedin
FILE
Amazon S3
APPLICATION
Airtable
APPLICATION
Outreach
APPLICATION
Google Analytics
DATABASE
SQL Server
APPLICATION
Google Ads
APPLICATION
Instagram Ads
APPLICATION
Zendesk Sunshine
APPLICATION
Twitter Analytics
APPLICATION
Klaviyo

DeepMatch

Stitching data

Channel	PO
Shopify	Cherry Blue

Supplier	Order No.
Fusion	XL Cherry

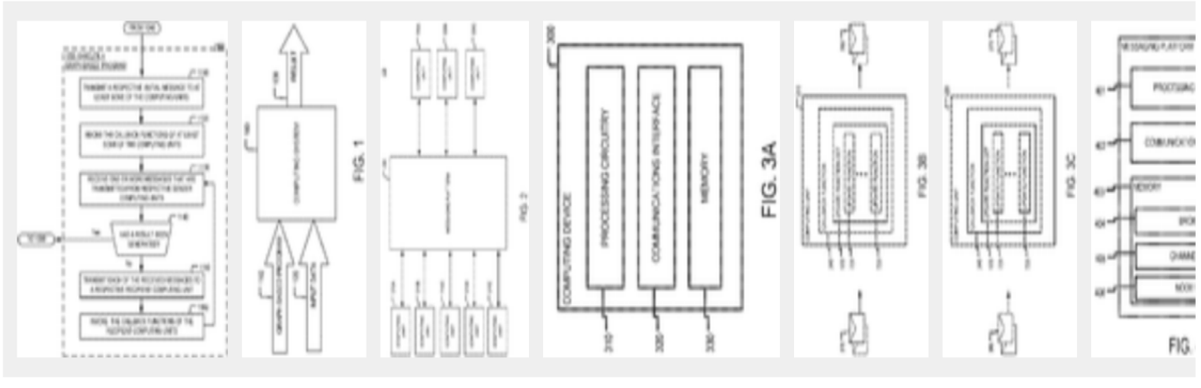


Method and apparatus for graph-based computing

Abstract

A method is disclosed including: receiving a graph-based program that identifies a bipartite graph and one or more update function sets, the bipartite graph including a plurality of graph nodes and a plurality of edges, such that each graph node corresponds to one of the update function sets; associating each of a plurality of computing units with a different respective one of the graph nodes; instantiating, by a Publisher Subscriber platform, a plurality of channels, the plurality of channels defining a topology that matches a topology of the bipartite graph; and executing the graph-based program based on the plurality of channels to produce a result.

Images (20)



Classifications

- G06F9/5038 Allocation of resources, e.g. of the central processing unit [CPU] to service a request the resource being a machine, e.g. CPUs, Servers, Terminals considering the execution order of a plurality of tasks, e.g. taking priority or time dependency constraints into consideration

US11055157B2

United States

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Inventor: Devavrat D. Shah, Vinayak Ramesh

Current Assignee : Massachusetts Institute of Technology

Worldwide applications

2018 • US 2019 • US

Application US16/683,918 events

2018-11-27 • Priority to US16/201,492

2019-11-14 • Application filed by Massachusetts Institute of Technology

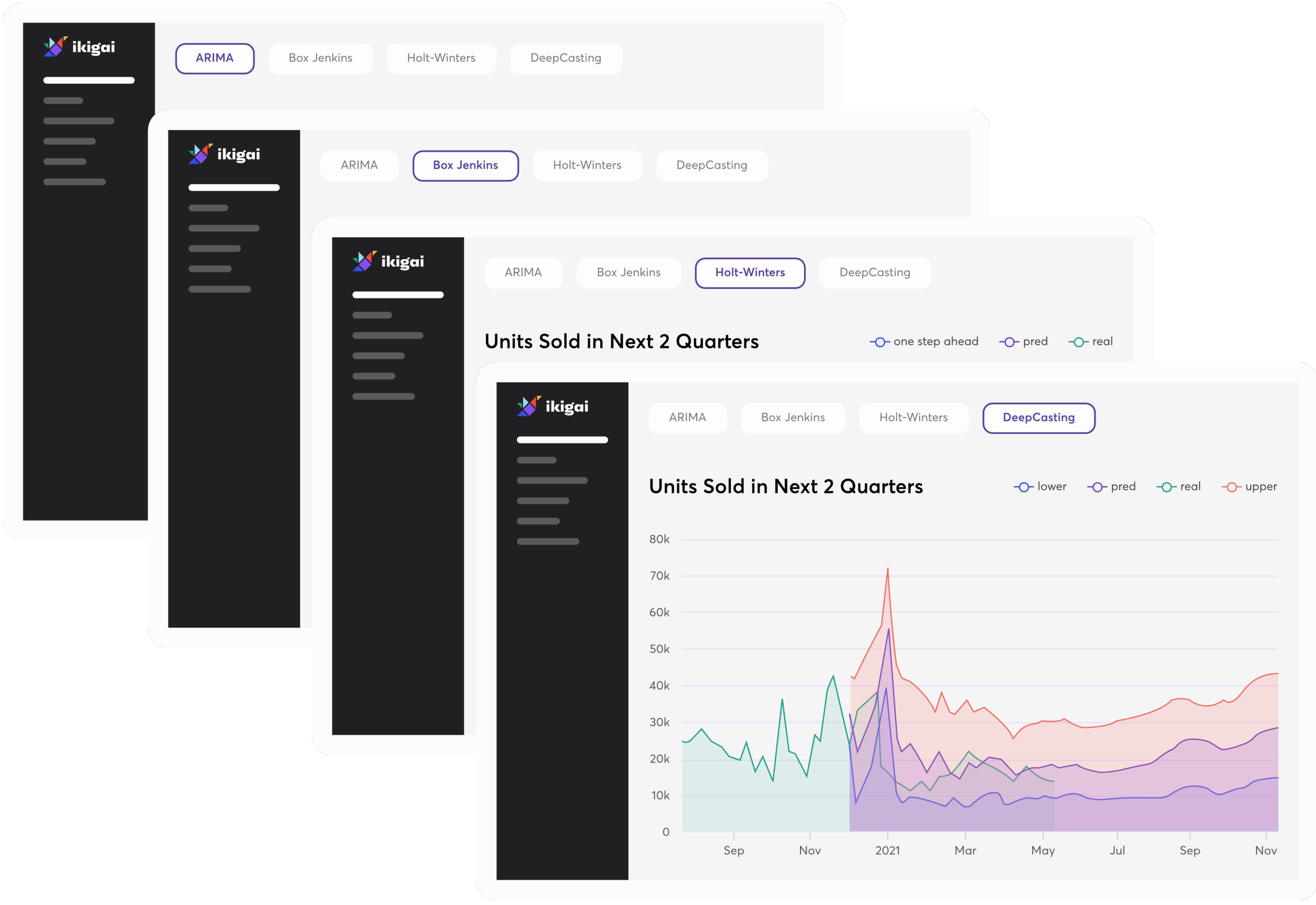
2020-05-28 • Publication of US20200167214A1

2021-07-06 • Application granted

2021-07-06 • Publication of US11055157B2

Status • Active

DeepCast


ikigai
ARIMA
Box Jenkins
Holt-Winters
DeepCasting
ikigai
ARIMA
Box Jenkins
Holt-Winters
DeepCasting
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ARIMA
Box Jenkins
Holt-Winters
DeepCasting
Units Sold in Next 2 Quarters
one step ahead
pred
real
ikigai
ARIMA
Box Jenkins
Holt-Winters
DeepCasting
Units Sold in Next 2 Quarters
lower
pred
real
upper
80k
70k
60k
50k
40k
30k
20k
10k
0
Sep
Nov
2021
Mar
May
Jul
Sep
Nov

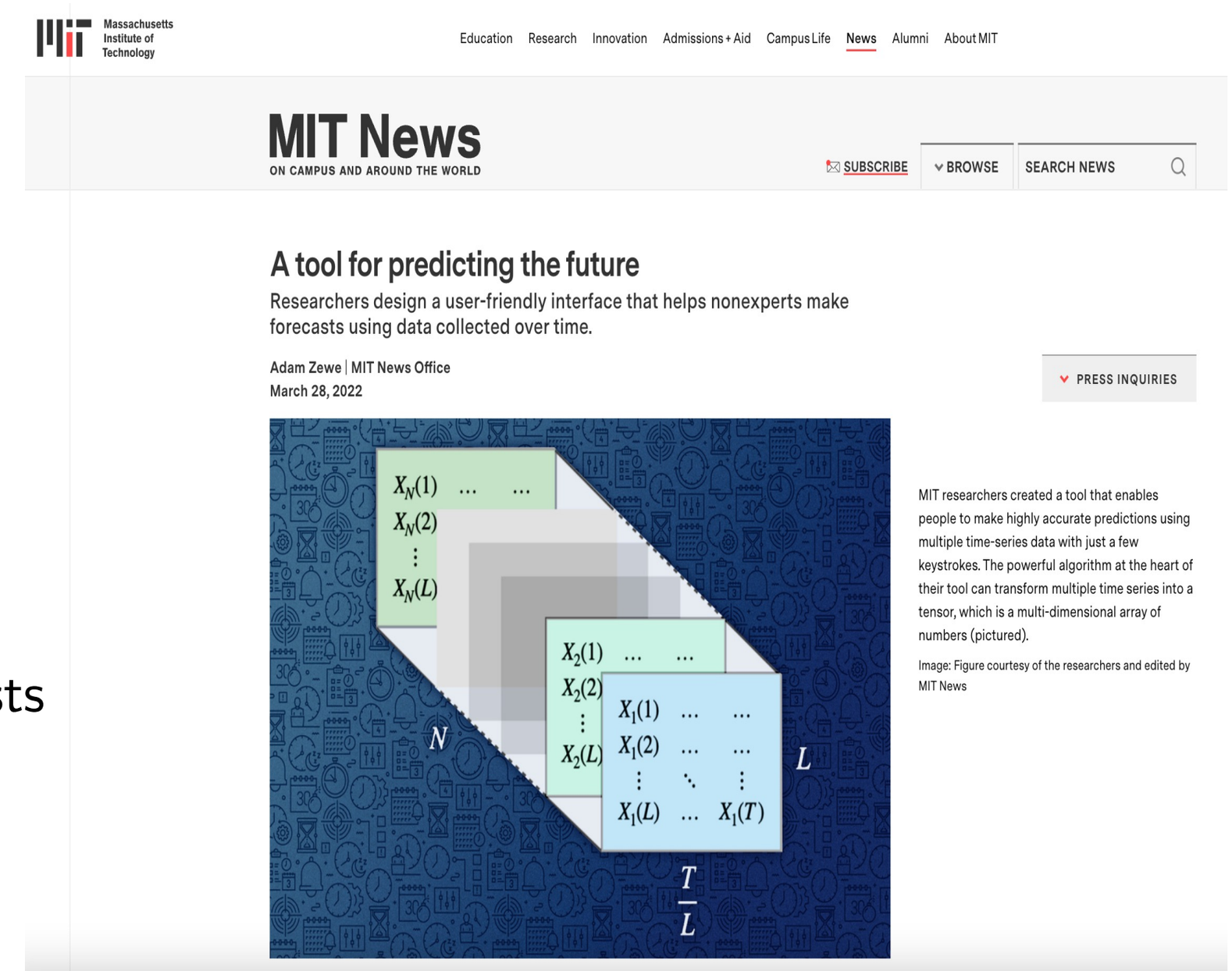
DeepCast

Key insights:

Little data across time

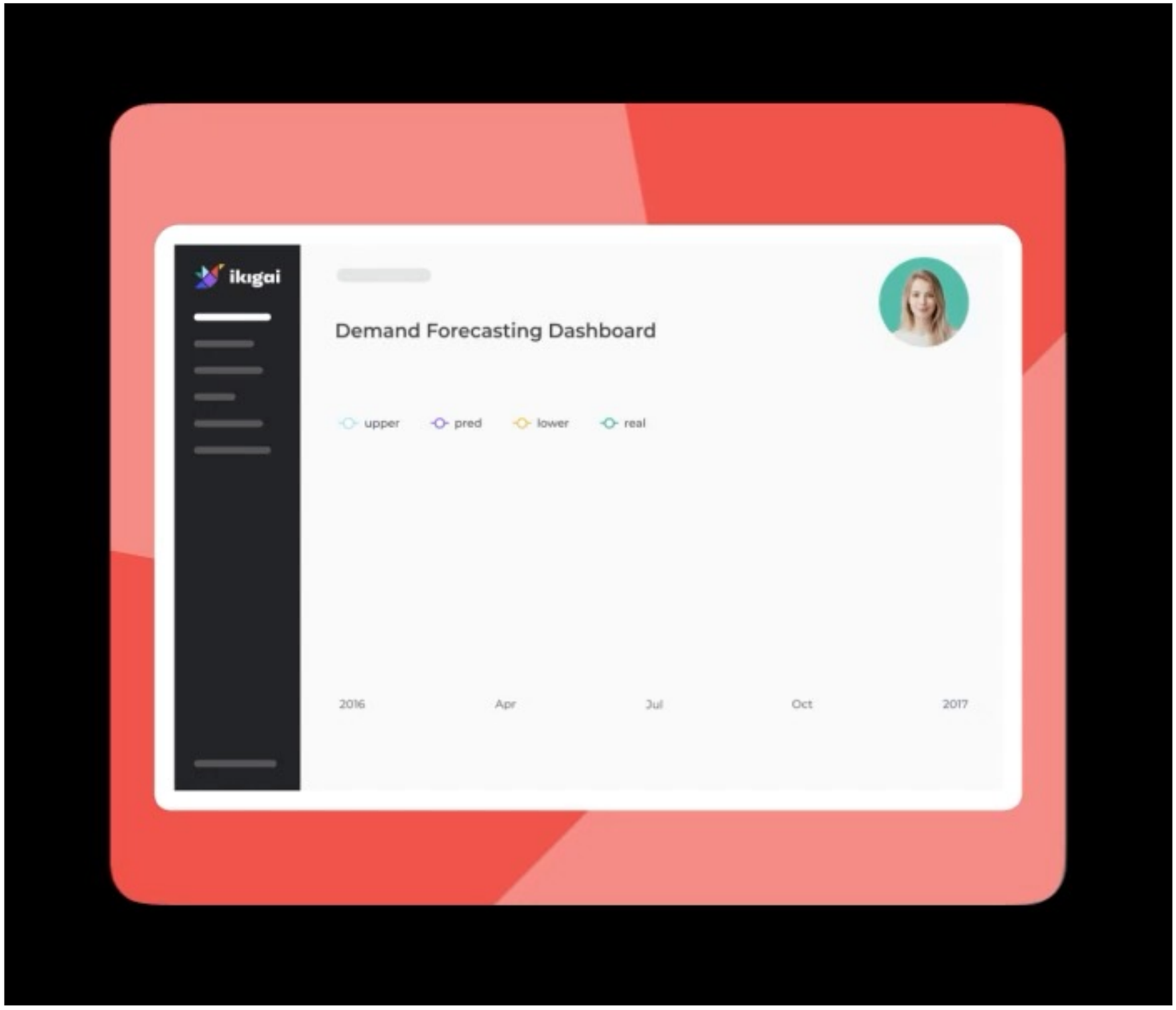
but, across many items

enables *accurate* forecasts



tspdb.mit.edu

DeepRL


ikigai
Demand Forecasting Dashboard
upper
pred
lower
real
2016
Apr
Jul
Oct
2017

DeepRL

Key insights:

Interpretable policies

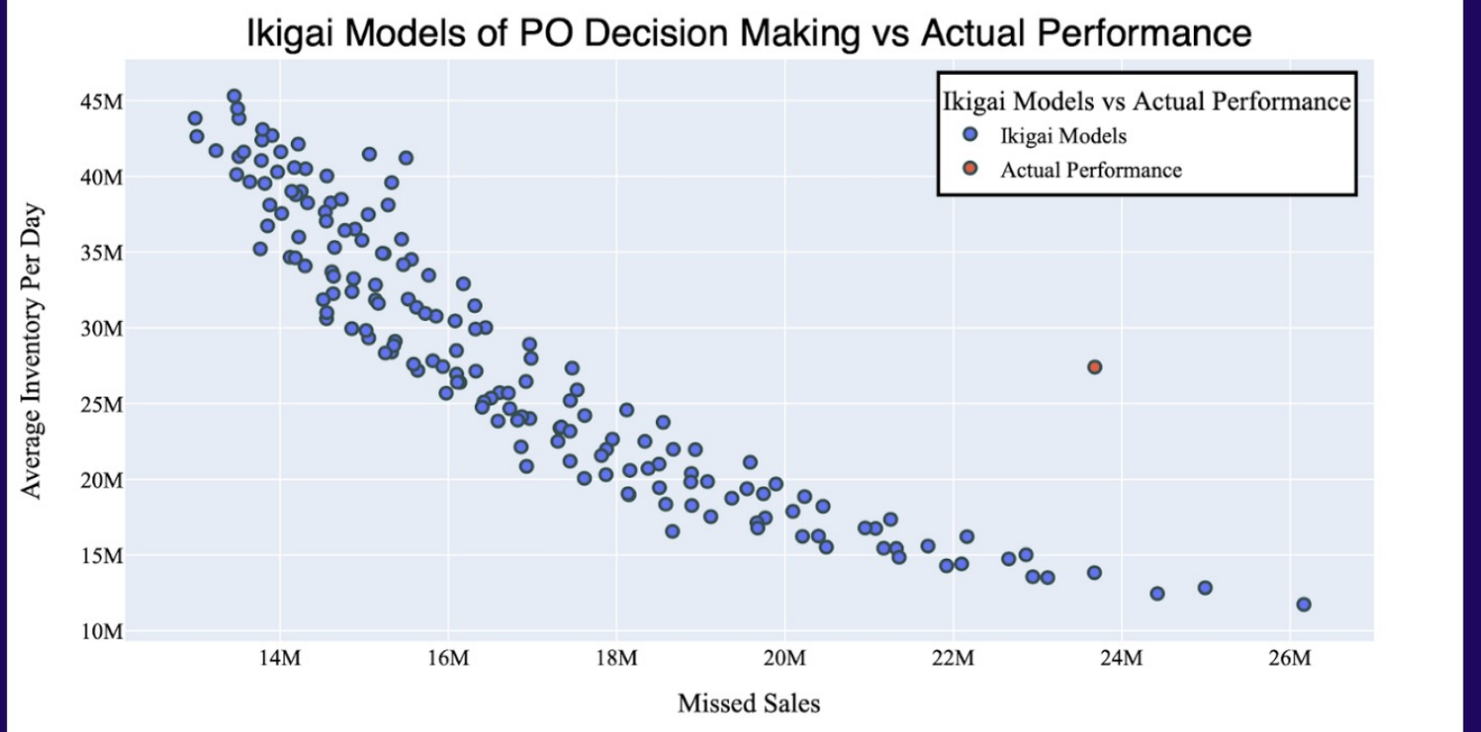
Trade-off curves

Human-in-the-loop

We Know How Much Money You Lost In Sales This Year

Ikigai Labs can identify lost sales and help optimize purchasing decisions while minimizing inventory cost

by Nate Lanier and John Tsitsiklis

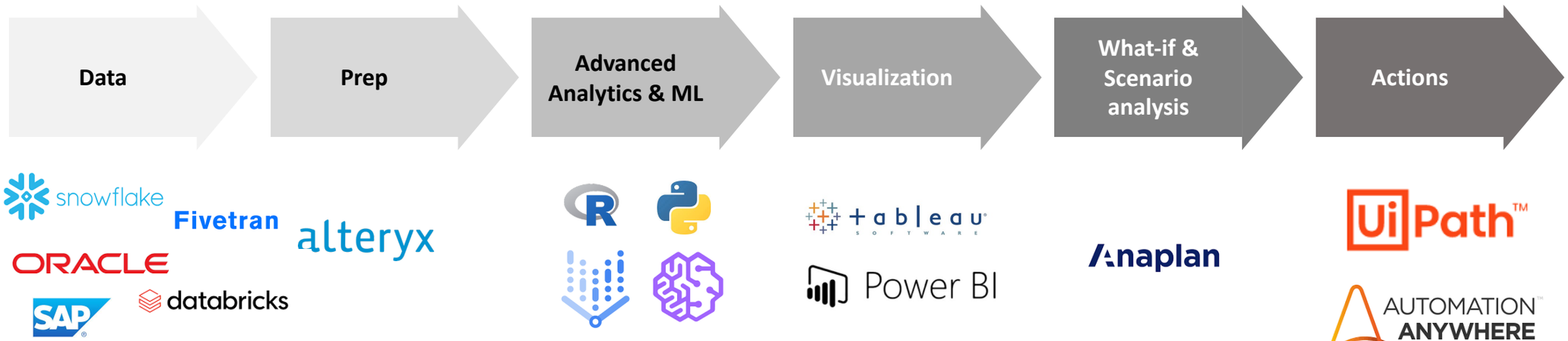


can *simulate* 10^{19} scenarios

Data Operations with *ease* of *spreadsheet (no-code)*, *scale* of *cloud*

make decisions to achieve best *ROI*

how much *new* inventory to order *every* day



Q1. What is the ground truth?

DeepMatch

Q2. What action should we take?

DeepCast

Q3. What strategic changes to make?

DeepRL

No-Code Operational BI Platform

About Ikigai

Vinayak Ramesh
CEO & CO-Founder

Vinayak previously co-founded & was CTO of Wellframe which was acquired by HealthEdge in 2021 He received his S.B./M. Eng degrees from MIT and is Forbes 30 under 30.

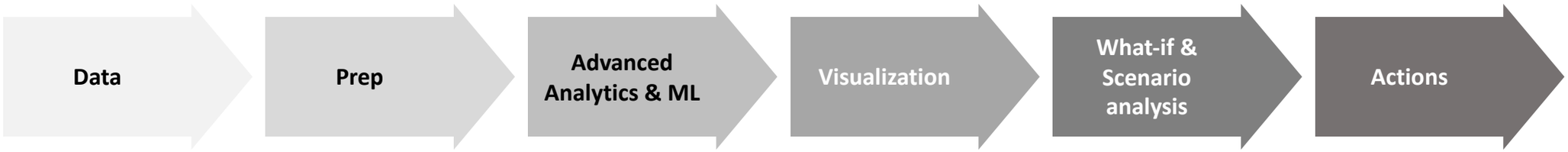
Devavrat Shah
CTO & CO-Founder

Devavrat previously co-founded Celect, which was acquired by Nike in 2019. He is a Viterbi chaired professor of Computer Science and AI at MIT since 2005 where he founded MIT's Statistics and Data Science Ctr.

8VC

databricks

Technology



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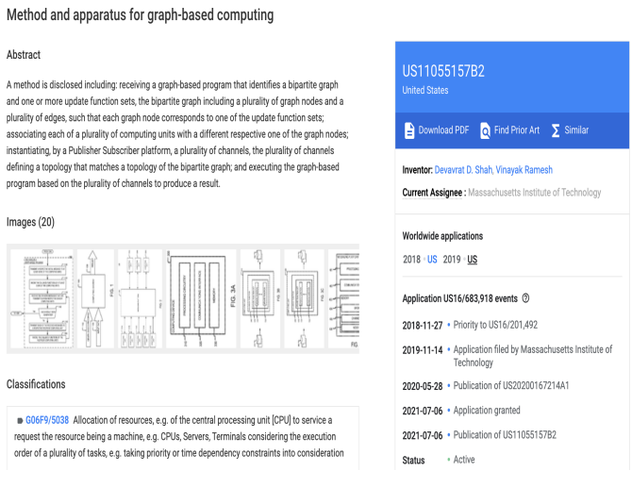

Q2. What action should we take?

DeepCast

time series forecasting
w extremely limited data

Q3. What strategic changes to make?

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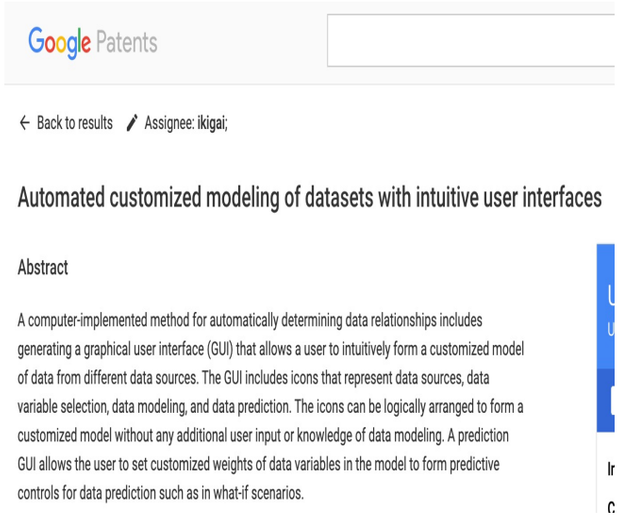
Interpretable RL w upto
10^{19} scenario analysis



Customers

भारतीय स्टेट बैंक
State Bank of India

SPIRIT

बैंक ऑफ़ बड़ौदा
Bank of Baroda

KPMG

SPENCER'S

EY

NORTHERN TRUST

MARY KAY

AMERICAN EAGLE OUTFITTERS

S&P Global

birddogs

Medica

HSBC

LENNOX

kotak
Kotak Mahindra Bank

zuora

Give It a Try?

info@ikigailabs.io