



Leveraging Machine Learning to Generate Product Descriptions in E-Commerce



Goutham Kumar Vemasani, Harish Datta Chitneni, Harthik Miriyala, Jinxin Ren, Srujana Kalyadapu, Yu-hui Lin, Dr. Matthew A. Lanham, Dr. Mark Tabladillo
 Purdue University, Mitchell E. Daniels, Jr. School of Business
 gvemasan@purdue.edu; hchitnen@purdue.edu; mharthik@purdue.edu; ren270@purdue.edu; skalyada@purdue.edu; lin1740@purdue.edu; lanhamm@purdue.edu

THE TEAM



BUSINESS PROBLEM FRAMING

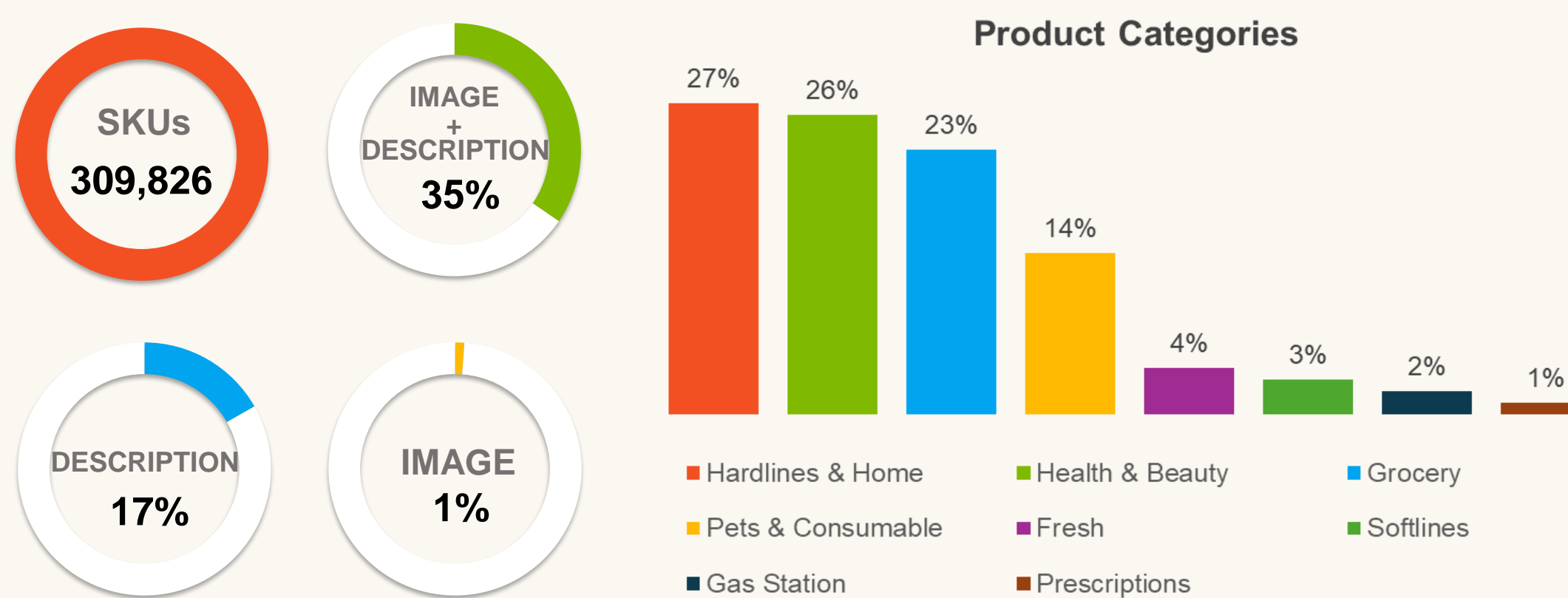
Our team collaborated with a nationwide grocery store chain in the US to tackle the challenge of online product listings. The chain mandates all vendors to provide product details and images for online sales. However, many fail to comply, resulting in numerous unlisted products and revenue loss. Besides, vendors struggle to verify if their descriptions meet standards. Only 35% of products meet these criteria, leading to inadequate submissions.



We propose a new solution that utilizes machine learning technology in product description generation and content scoring. In order to enhance the scalability and automation of the process, we also architected a pipeline in the Microsoft Azure platform to deploy the models. By ensuring that a high-quality description accompanies each product, we aim to reduce operation costs and foster a more satisfying online shopping experience.

DATA

The dataset is provided by a major grocery store in the U.S. It comprises 309,826 unique products spanning diverse categories and contain attributes such as product names, descriptions, and images (URL).



ANALYTICS PROBLEM FRAMING

Our project uses state-of-the-art models for automating online retail product descriptions, focusing on two tasks:

- Image-to-text task (including Optical Character Recognition & Captioning): To capture information from product images
- Text-to-text task: To refine auto-generated product description

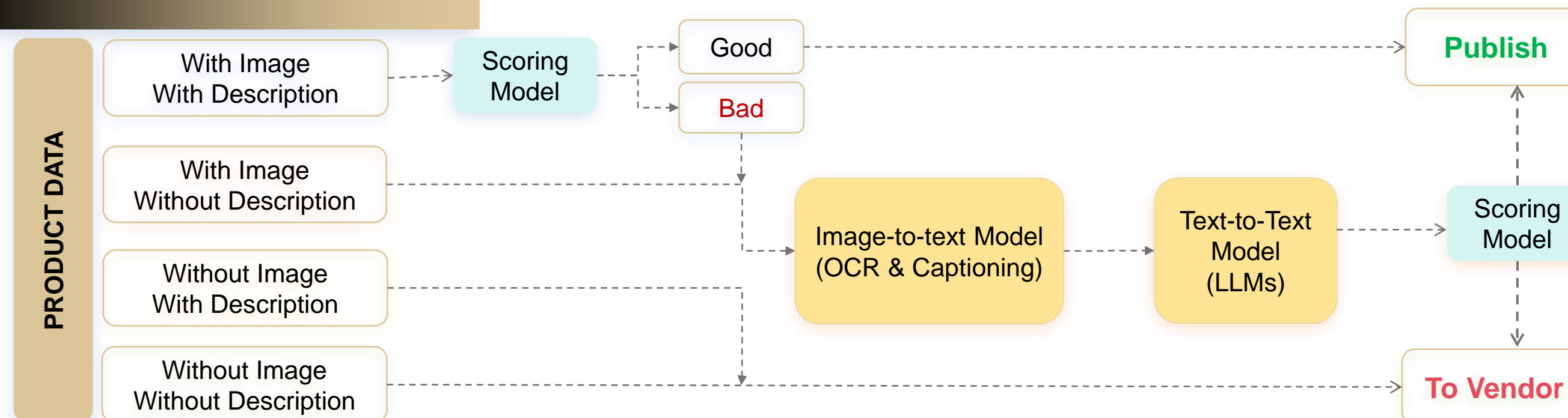
Based on practical trials with open-source models on Hugging Face, we're confident in AI's capability for these tasks. Moreover, if clients pursue extreme performance and are open to reasonable cost, we also offer Azure AI Vision as a premium, upgraded solution for the image-to-text task.



The generated text will be measured by a scoring model that focuses on 4 rubrics:



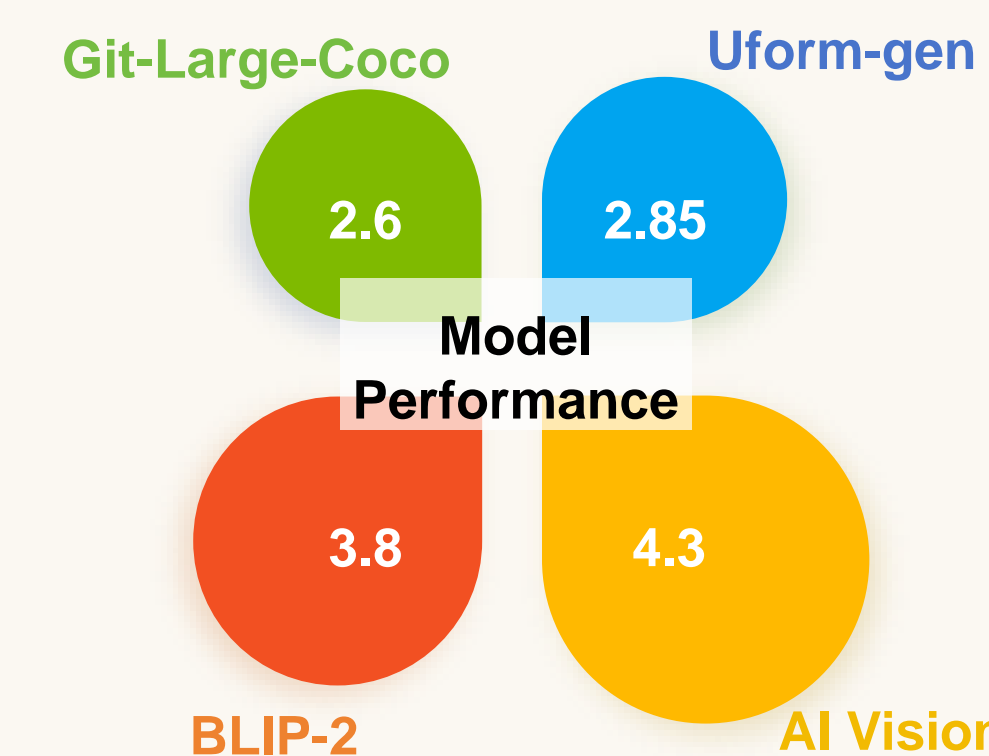
METHODOLOGY



Our project presents a methodology for enhancing online product descriptions through a ML pipeline in Azure cloud with alternate paths for each product scenario. For the products with no description or improper description, we extract information from the product images through image-to-text model. The pooled contents from vendors and images are refined into the desired format, and then the text-to-text LLM is used to generate descriptions. Lastly, the output quality is assessed using a scoring algorithm powered by LLMs.

MODEL BUILDING

Evaluating Image-to-Text Models:



- Sample Selection: 80 diverse product images across 8 categories.
- Model Testing: Human evaluators rate text outputs from different open-source models on a 1-5 scale (1 = irrelevant, 5 = highly accurate).
- Final Choice: Select the model with the highest average score for implementation.

OCR Model

AI Vision

Read Output :
 General NATURALLY FLAVORED Honey Nut Cheerios first WHOLE OATS ingredient GRAIN lower CHOLESTEROL® AMPLY MADE Gluten Free Sweetened Whole Grain Cereal with Real Honey & Natural Flavor NET WT 1 LB 1 OZ (17 OZ) (461g)

Caption Output :
 a box of cereal with a red bowl of oats

Tags Output :
 breakfast cereal, box, cereal, convenience food, food, container

LLM Generation

Natural Flavor Honey Nut Cheerios

Generated Description: Introducing our Natural Flavor Honey Nut Cheerios, a delightful blend of wholesome ingredients and natural flavors crafted to start your day off right. Made with the goodness of whole oats as the first ingredient, this cereal is a hearty choice...

Scoring

Average Score of 3 Types of Product Description

Scoring LLM: GPT-3.5, Mixtral 8x7B

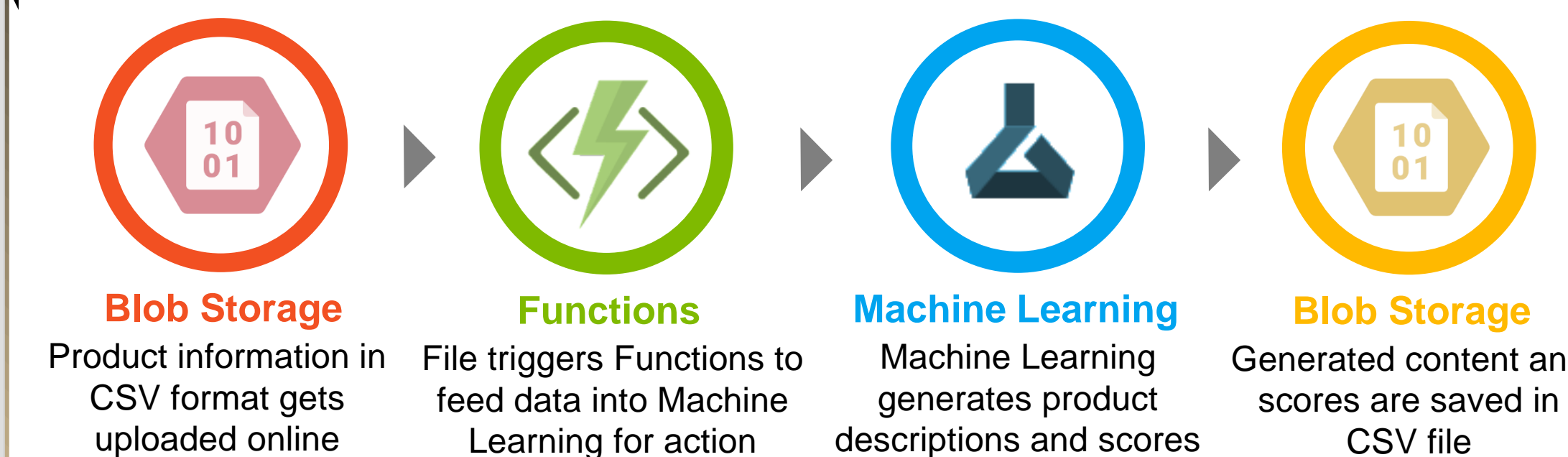
Relevance: Failed (Original), Passed (GPT-3.5, Mixtral)

Completeness: Passed (Original, GPT-3.5, Mixtral)

Readability: Failed (Original), Passed (GPT-3.5, Mixtral)

Confidence Scores: Passed (Original, GPT-3.5, Mixtral)

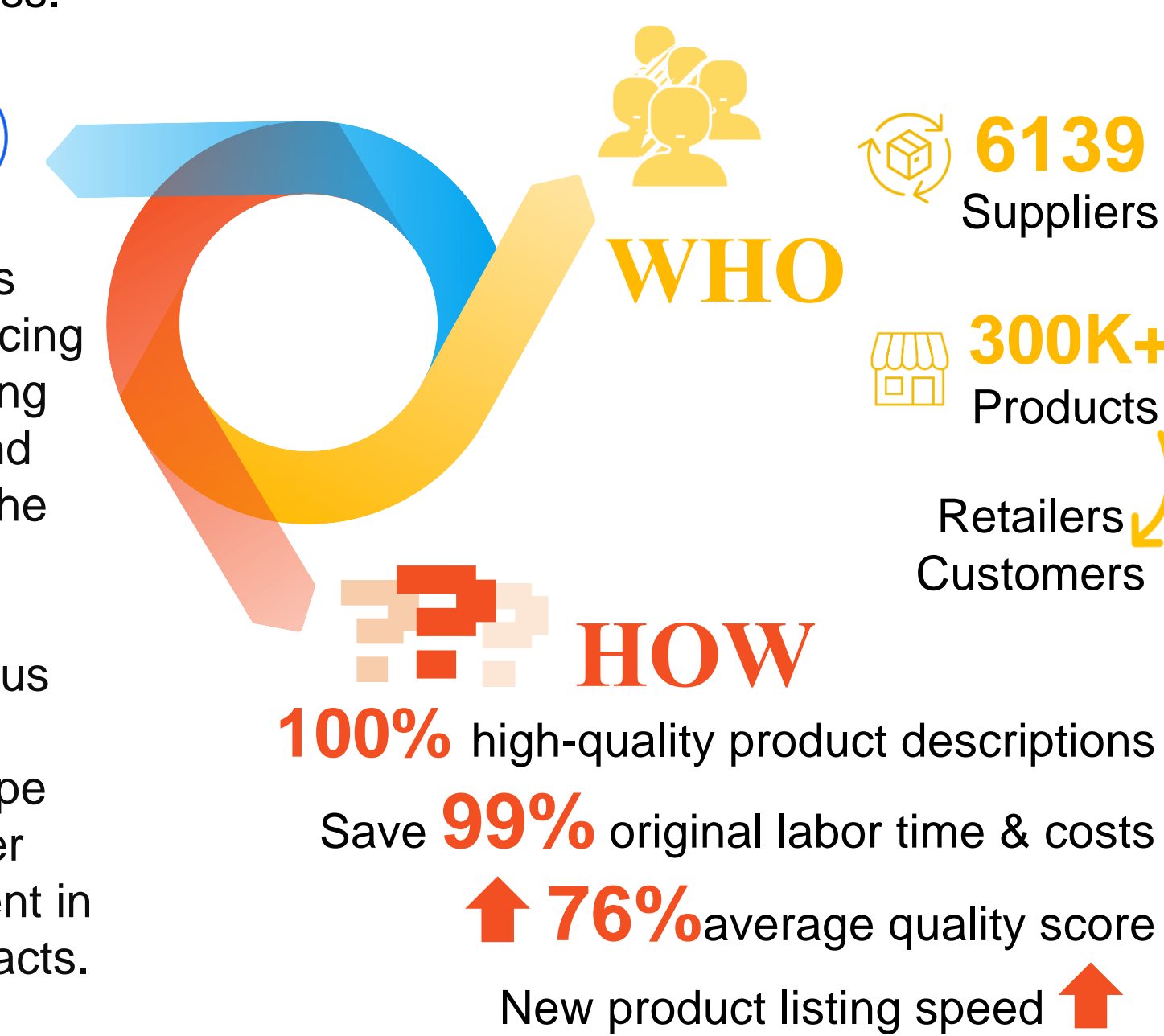
DEPLOYMENT & LIFE CYCLE MANAGEMENT



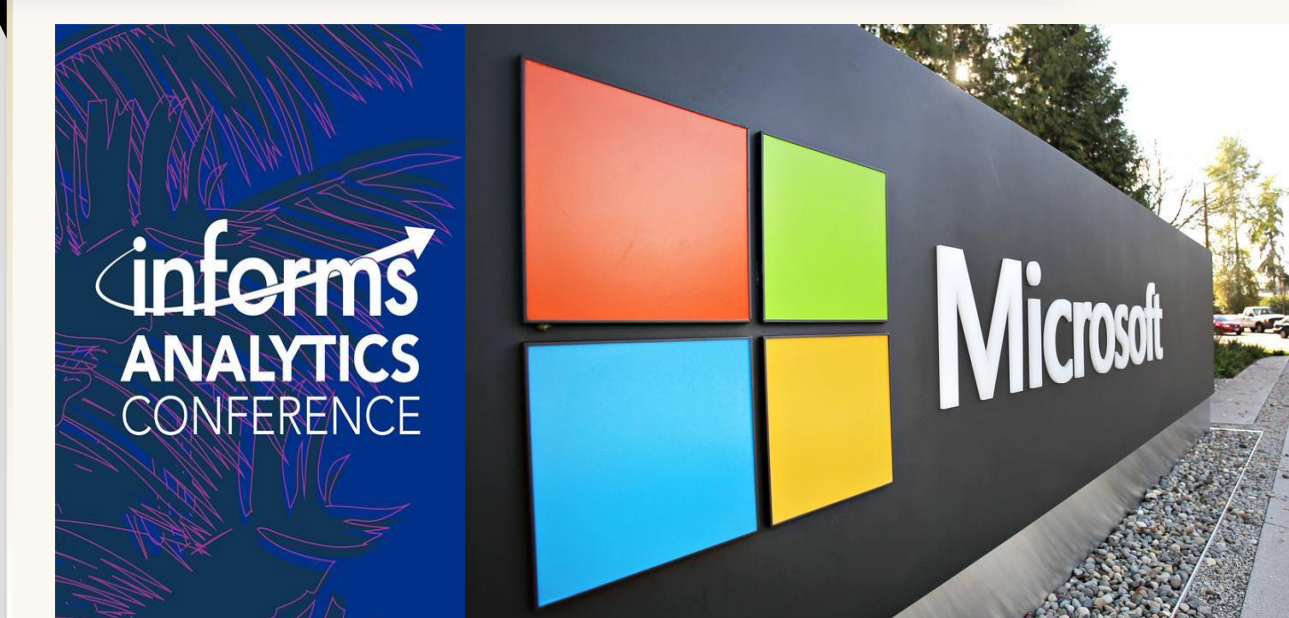
To deploy our solution, we developed an Azure pipeline that automatically processes product description creation and scoring. Architected with cloud services, the pipeline provides scalability, reliability, and cost-effectiveness. After deployment, we can seamlessly update our models without interrupting the service. Leveraging features such as model versioning, rolling updates, and A/B testing, we can iterate rapidly, adapt to user needs, and maximize business agility and competitiveness.

IMPACT

Our project demonstrates promising results in reducing operation costs, enhancing customer satisfaction, and boosting profitability for the retailer. It also has great potential for similar applications across various industries, such as consumer goods. We hope our work facilitates further research and development in this field for broader impacts.



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