



DataCon Africa 2022  
7<sup>th</sup> Edition

# Recommender Systems

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Deploying recommender systems into production, and measuring the results



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# Recommender Systems

## Digital Content



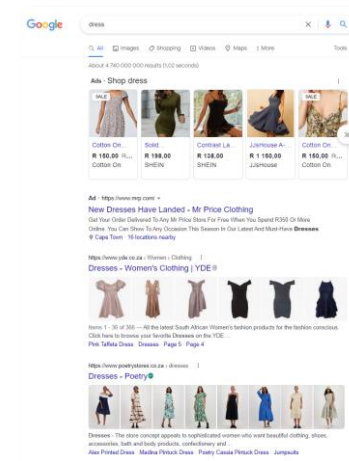
## E-Commerce (On/Offline)



## Social Media

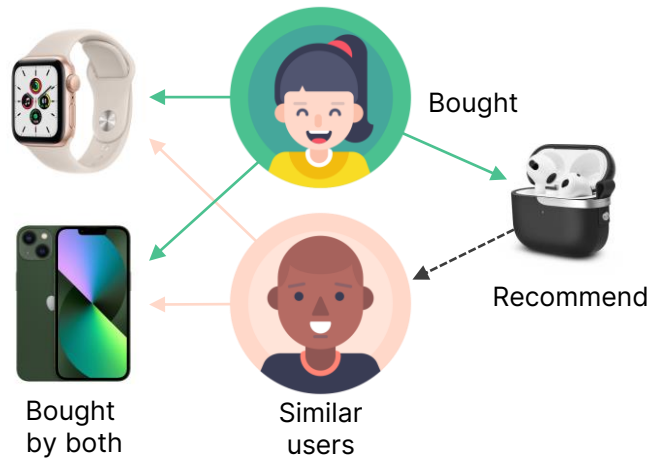


## Online Advertising

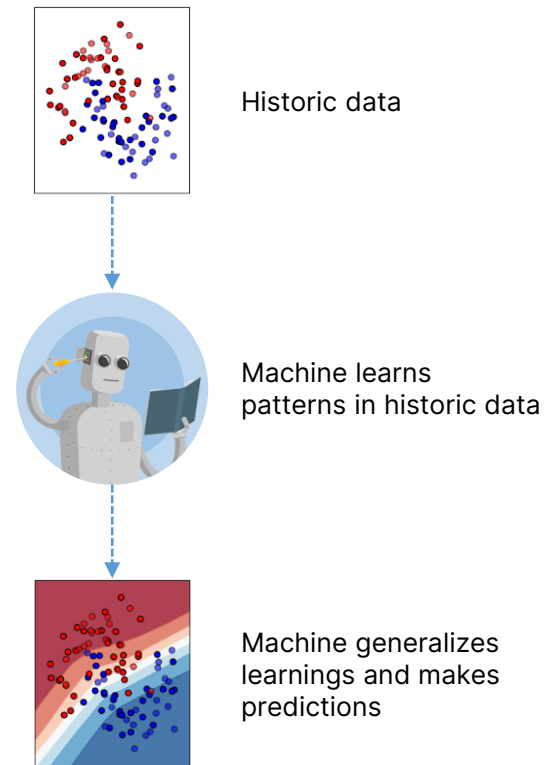


# Typical Methods Behind Recommender Systems

## Neighborhood-Based




## Model-Based





# Hybrid Examples

**TF**









**HOME** IS WHERE YOU ARE

Hello Salutation,  
staying in is the new going out, especially when it's winter. From cosy meals made with love, chill nights in front of the TV or just lounging around with the ones you love. Fill your home with even more special moments with **R50 off R500** of any TF retail brand.

**R50 OFF R500 VOUCHER**  
Valid in-store & online until 12 June 2018  
In & Co apply

Present voucher code at checkout:  
XXXXXXXXXXXXXXXXXX

Shop these **WINTER MUST HAVES...**

|   |   |   |
|---|---|---|
| <br>SHOP NOW R299.99  | <br>SHOP NOW R299.99  | <br>SHOP NOW R299.99  |
| <br>SHOP NOW R299.99 | <br>SHOP NOW R299.99 | <br>SHOP NOW R299.99 |

**WOOLWORTHS** **W**

FOOD WOMEN MEN KIDS BABY HOMEWARE BEAUTY GIFTS FINANCIAL SERVICES WREWARDS

EXPLORE YOUR WREWARDS >

**celebrate HER**  
Honour the women in your life this Women's Month.  
SHOP FLOWERS

Hi Dino,  
Make women's month extra special with our fresh cut flowers that are guaranteed to last as long as it says on the label. For lunch, choose our responsibly sourced fish and join us in making sure there'll be plenty of fish for future generations. Don't forget to redeem your personalised vouchers and save on our Daily Difference offers.

Happy shopping!  
WREWARDS Team

**WREWARDS VOUCHER**  
DINO BERNICCHI  
14914312  
Voucher valid until 22 August 2017  
WREWARDS: Get R10 off when you spend R100 or more on Household & Toiletries in the foodmarket

**6 VOUCHERS EXCLUSIVELY FOR YOU**  
— REDEEM MORE THAN ONE FOOD VOUCHER AT WOOLIES —

|   |   |  |
|---|---|--|
| WREWARDS: R6 off 1kg Jungle Oats<br>PRINT VOUCHER                               | WREWARDS: 15% off 4 FREE RANGE SKINLESS CHICKEN BREAST FILLETS<br>PRINT VOUCHER | WREWARDS: R7.50 off 500g WOOLWORTHS SALTED BUTTER<br>PRINT VOUCHER |
| WREWARDS: R16 off 550g ROASTED AND SALTED LUXURY TREE NUTS TUB<br>PRINT VOUCHER | WREWARDS: 10% off THICK CUT RUMP STEAK<br>PRINT VOUCHER                         | <b>ACCESS &amp; REDEEM VOUCHERS ON THE NEW WOOLIES APP</b>         |

**SAVE DAILY DIFFERENCE OFFERS SPECIALLY SELECTED FOR YOU**

|   |   |   |
|---|---|---|
| <b>RICE OR CORN CAKES</b><br>BUY ANY 2 FOR <b>35.00</b><br>SAVE R2.00<br>R37.00<br>AVAILABLE IN ASSOCIATED TERRITORIES. EXCLUSIVITY: ORIGINAL ONLY. LARGES. | <b>ASSORTED 100% JUICE BLENDS</b><br>BUY ANY 2 FOR <b>60.00</b><br>SAVE R2.00<br>R62.00<br>AVAILABLE IN ASSOCIATED TERRITORIES. | <b>VEGETABLE CRISPS</b><br>BUY ANY 2 FOR 2 SAVE <b>6.24.99</b><br>100 g   |
| <b>FUTURE LIFE CRUNCH</b><br>BUY ANY 2 FOR <b>29.99</b><br>SAVE R2.00<br>R31.99<br>AVAILABLE IN ORIGINAL AND CHOCOLATE                                      | <b>ITALIAN MEALS</b><br>BUY ANY 2 SAVE <b>R20</b><br>400 g<br>AVAILABLE IN ASSOCIATED TERRITORIES                               | <b>MEDITERRANEAN OLIVE OIL</b><br>BUY ANY 2 SAVE <b>R19.95</b><br>500 ml<br>AVAILABLE IN ASSOCIATED TERRITORIES |





**LOVE IT? GET IT ON YOUR WOOLIES CARD**

**homechoice** **hc**

Your family's favourites  
Chosen by your personal shopper

Hi Dino. Your homechoice personal shopper is always on the lookout for products you'll love. See what she's chosen for you this time.  
You have up to R3500 to shop with us

We know you'll love these

|   |  |
|---|--|
| <br>Zena 3-ply 4kg Mink Blanket<br>From R84 p/m or R949 Cash<br>Shop Now | <br>Camilla 1-ply 2kg Mink Blanket<br>From R69 p/m or R799 Cash<br>Shop Now |
| <br>Astrid Bedding Sets<br>From R89 p/m or R999 Cash<br>Shop Now        | <br>Jaden Bedding Sets<br>From R62 p/m or R699 Cash<br>Shop Now            |

# Powering The Change

## Programming Paradigm



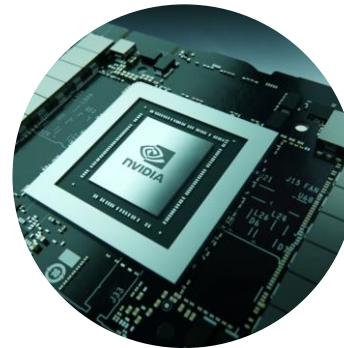
AI is software that writes software

## Data Modernization



Big data collection, organization and operationalization

## Accelerated Computing



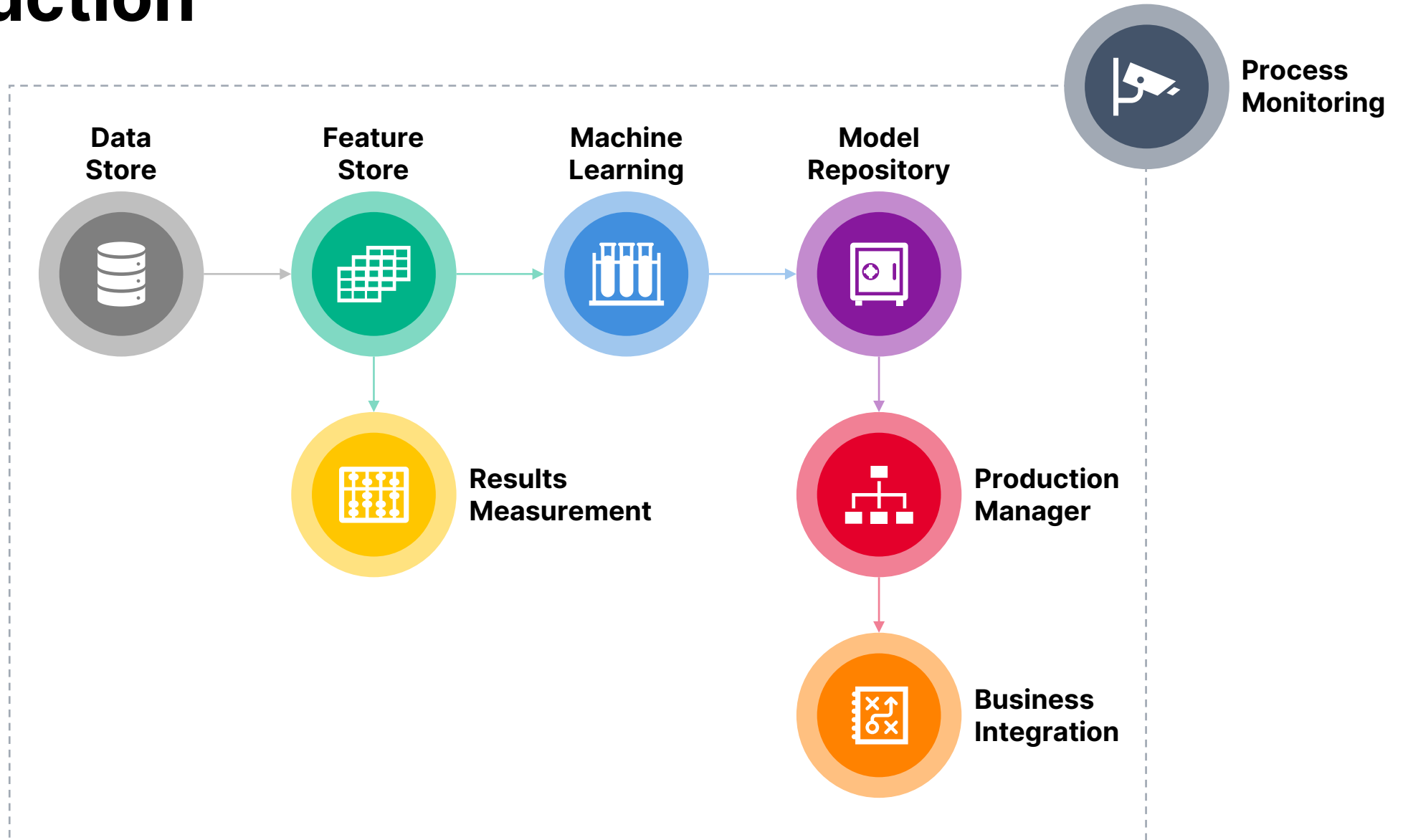
80x GPU improvement over CPU in a few years

## Best Practice AI Production

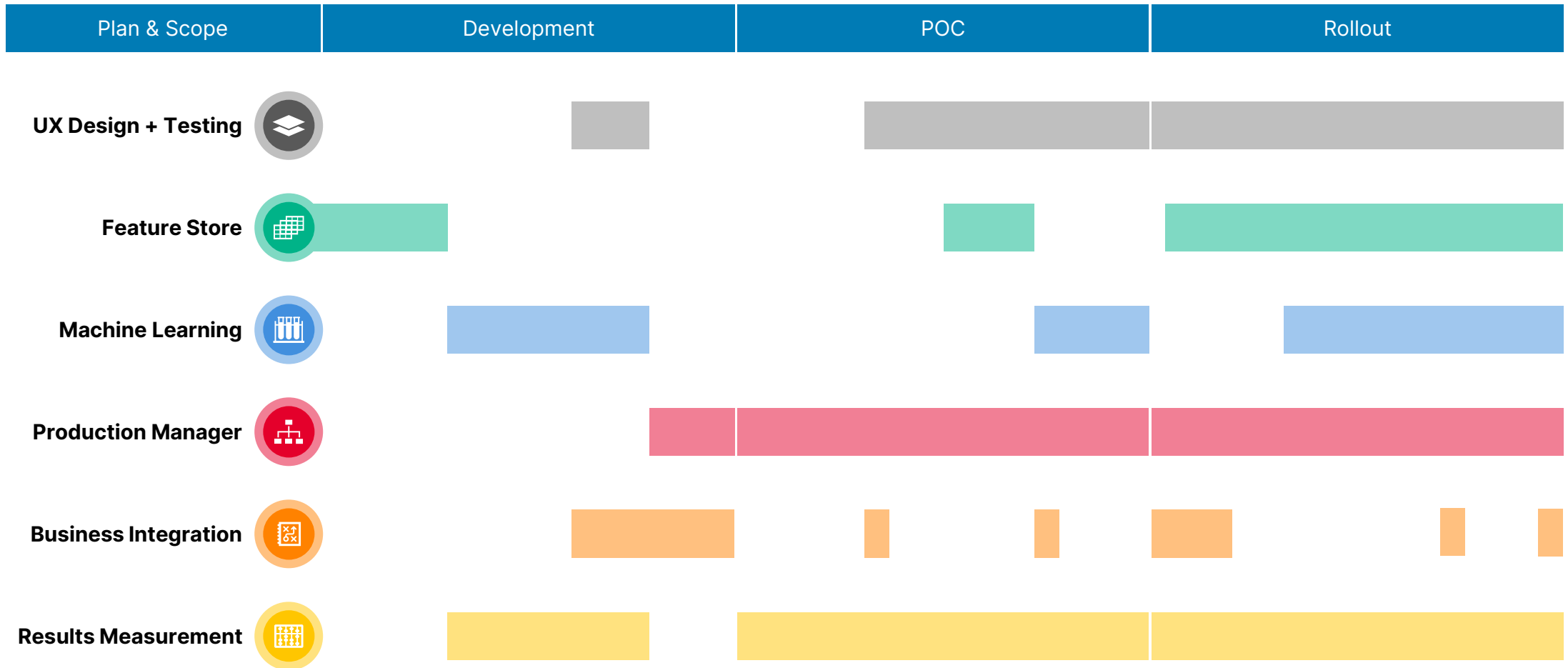


From concept to integrated and scaled product

# AI Production



# Development and Deployment Plan



# Tracking Performance

## Model Development

### Model Training



Training data

### Model Testing



Data not used  
in training

### Model Validation



Unseen data

### Retro Testing



Train on one  
period, validate  
on a future period

### Shadow Scoring



As if the model  
was live

## Model Production

### POC



Live – small  
sample or single  
channel

### Production



Live – full rollout



# Structured Approach To Results Measurement

## Build Test Framework



Flexible  
Scalable  
Reusable

## Select Test Groups



A/B selection  
Test grain  
Reselection horizon

## Estimate Uplift Drivers



Track key metrics  
Est. behavior change  
Explain calculations

## Calculate Profit & ROI



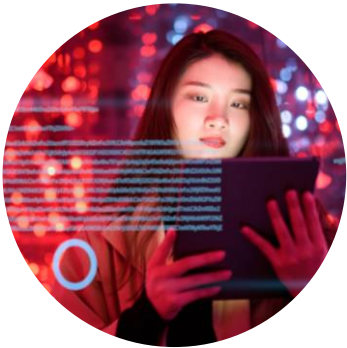
Convert uplift to profit  
Work with Finance  
Business buy-in

# Typical Production Problems

- 1 Over engineering
- 2 Loss of critical data feeds
- 3 Manual execution
- 4 End-user internet / data constraints
- 5 Not measuring results
- 6 Slow rollout – lack of momentum
- 7 Underestimating the costs

# Common Recommender System Flaws

**Significant Data Requirements**



**Sparse User-Item Data**



**Missing Product Data**



**User/Item Cold Start Problems**



**Long Payback Period**



# Perception-Based Recommenders



Natural Language Processing systems understand product name, brand, description, pricing, sizing, fit, & other text-based data

## Levi's Original Denim Trucker Jacket

R 1,099.00

A Trucker Jacket makes an outfit. You'd be hard-pressed to find a jacket with an easier shape, more versatile weight or inherent sense of cool. Bonus: The deep inside pockets are roomy enough for your essentials. The original denim jacket since 1967. Meant to be worn forever, wherever, whenever. Features button closure at cuffs.

SELECT COLOUR: Light Wash



Size:

☐ S ☐ M ☐ L ☐ XL

|                               |  |
|-------------------------------|--|
| CARE GUIDE                    | Wash your Trucker Jacket sparingly and spot treat if needed; this increases its lifespan and saves natural resources. When you eventually launder your Trucker Jacket, wash and dry it inside out with like colors; liquid detergent is recommended. |
| MODEL SIZE & MEASUREMENTS     | Model is a size 8 (32) and 175cm tall. Model is wearing a size small.  |
| FIT                           | Straight silhouette. Hits at your hip.   |
| FABRIC                        | Denim.   |
| SLEEVE LENGTH                 | Long Sleeve  |
| SAFE & SECURE PAYMENT OPTIONS | TFG account card: VISA or Mastercard; Snapscan (Orders up to R5000) or EFT (i-PAY).  |

Additional product shots augment image data



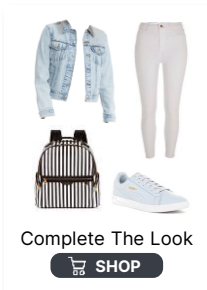
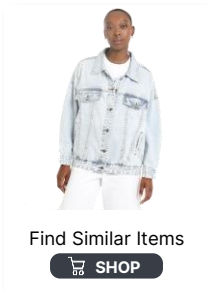
Computer Vision systems understand image composition, color, gender, style, design, shape, size, material, branding, & other image-based data



GAN inpainting improves image occlusions

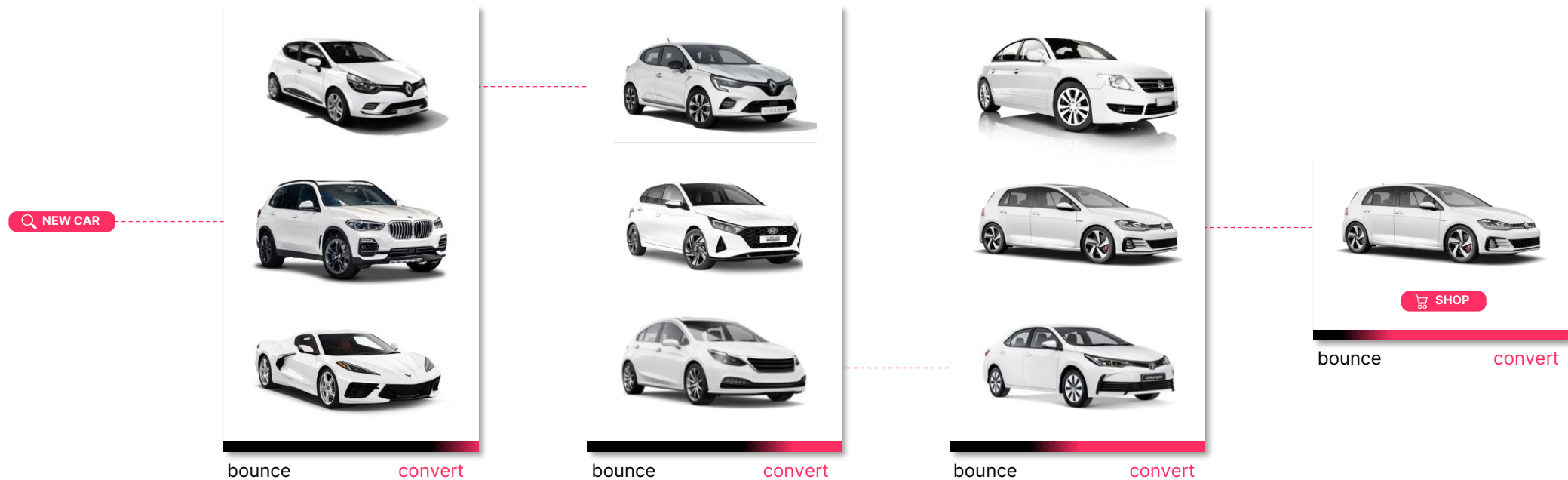
01110010 01100101 01100011  
01110011 01111001 01110011  
01110100 01100101 01100011

Unstructured data embeddings allow real-time processing





# Session-Based Recommenders





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