



CRAFT: Complementary Recommendations with Adversarial Feature Transform

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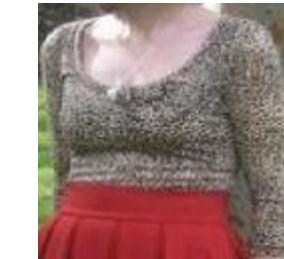
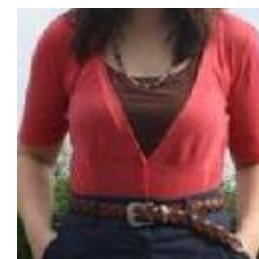
Motivation: Visual Complementary Recommendation

Pairing tops with this bottom

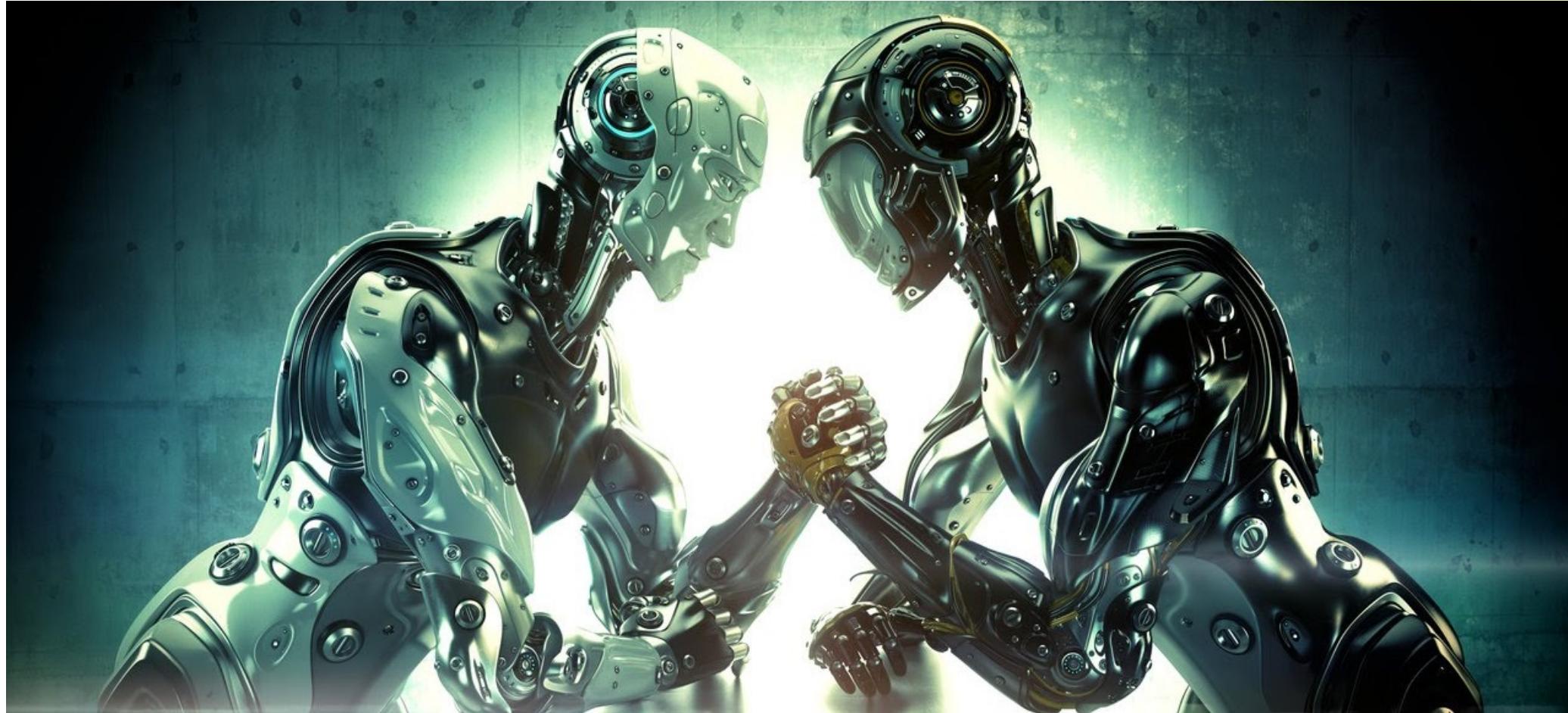


Motivation: Visual Complementary Recommendation

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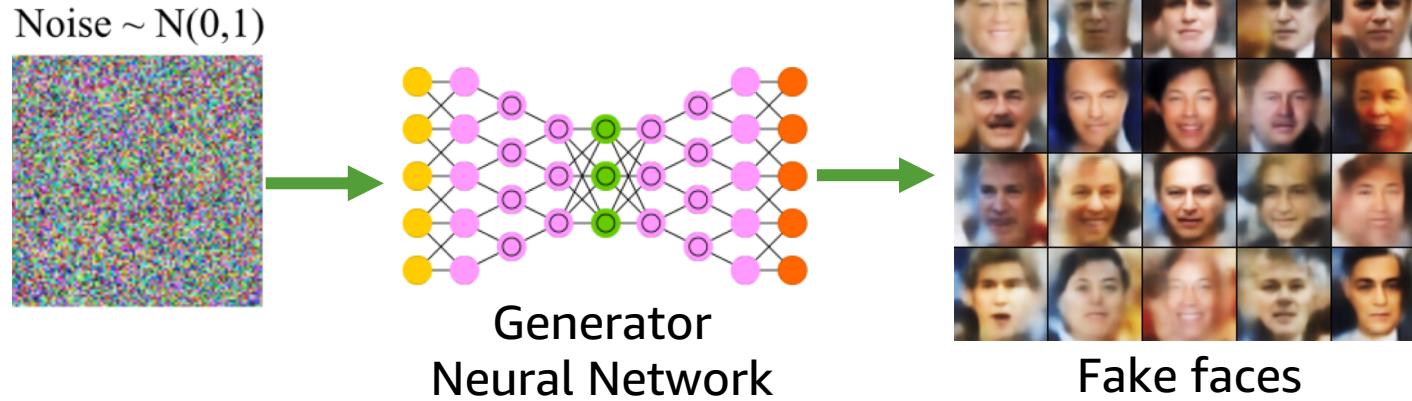


Recommended tops

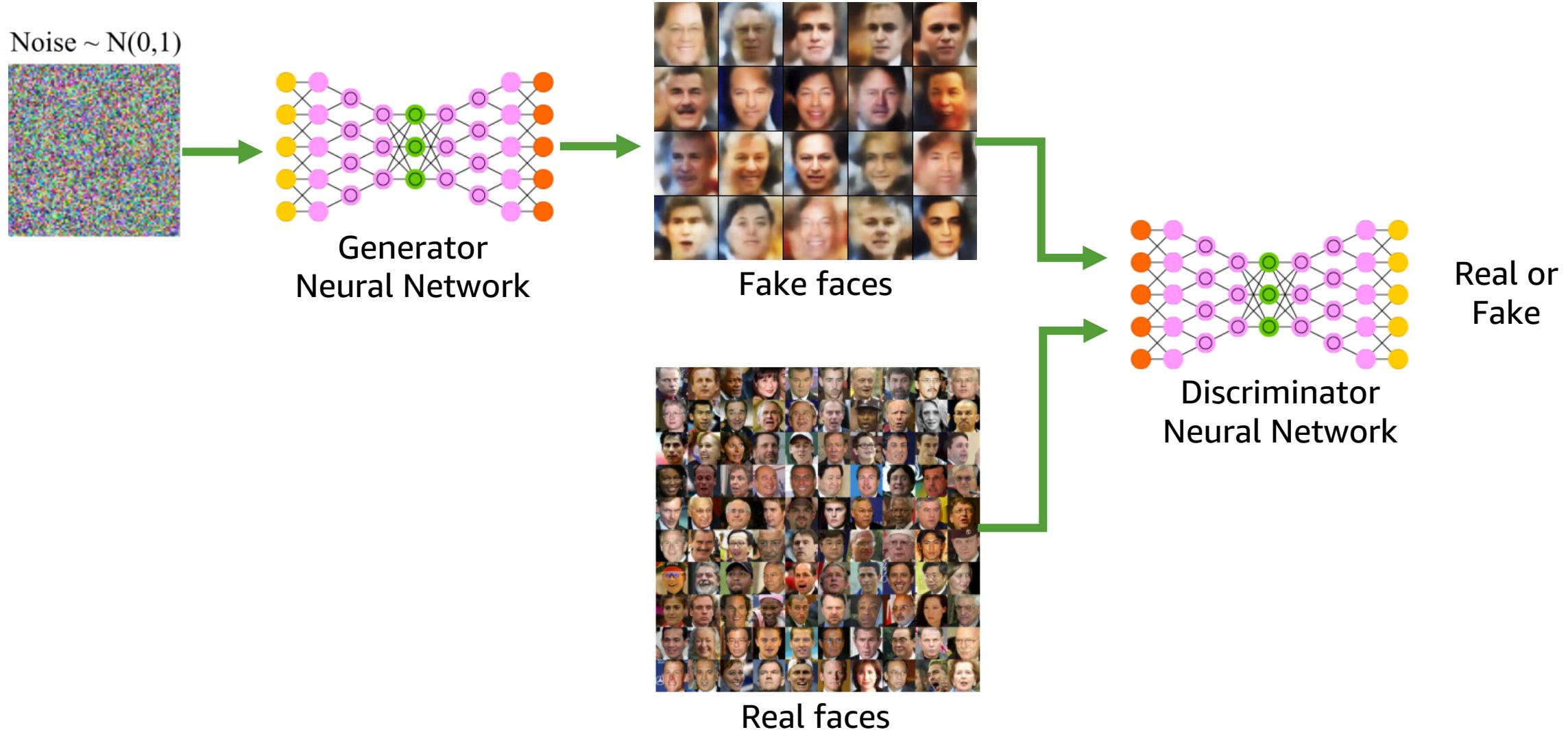


Unsupervised Learning with Generative Adversarial Networks (GAN)

Generating Faces with GAN



Generating Faces with GAN



Generating Faces with GAN



2014



2015

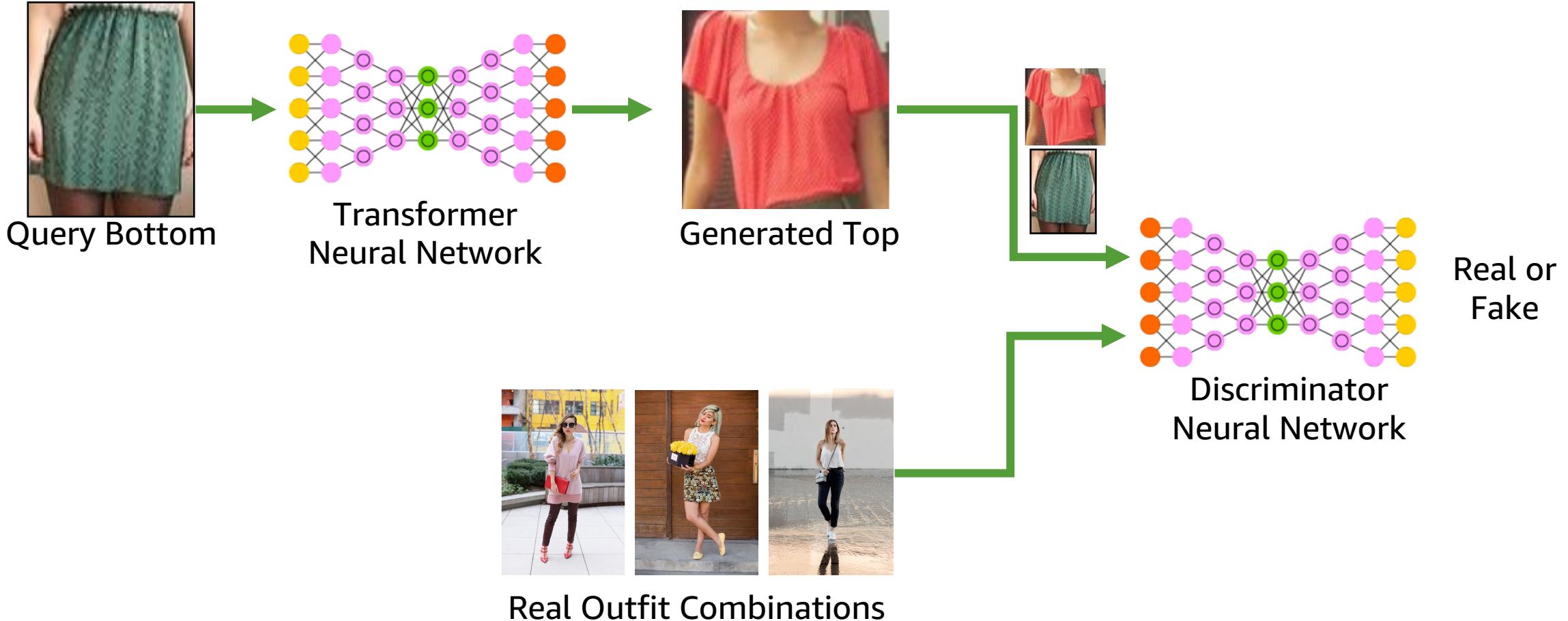


2016

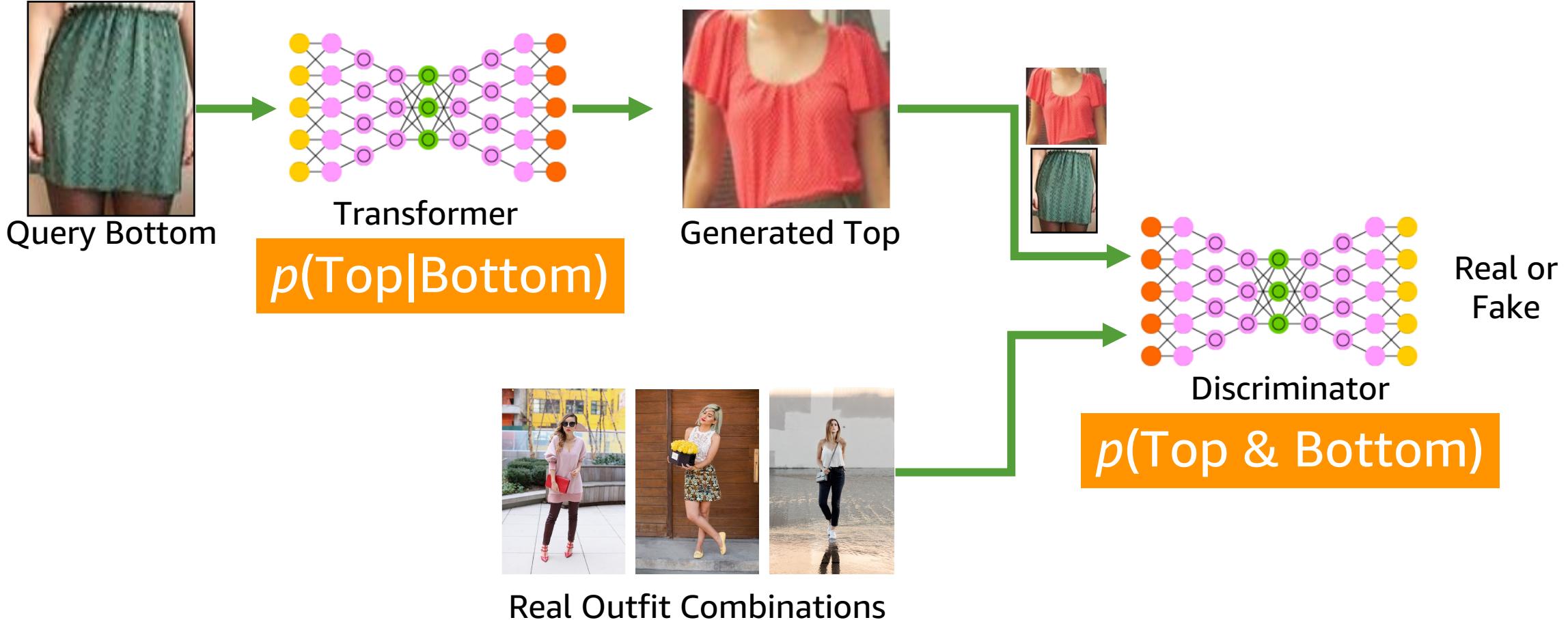


2017

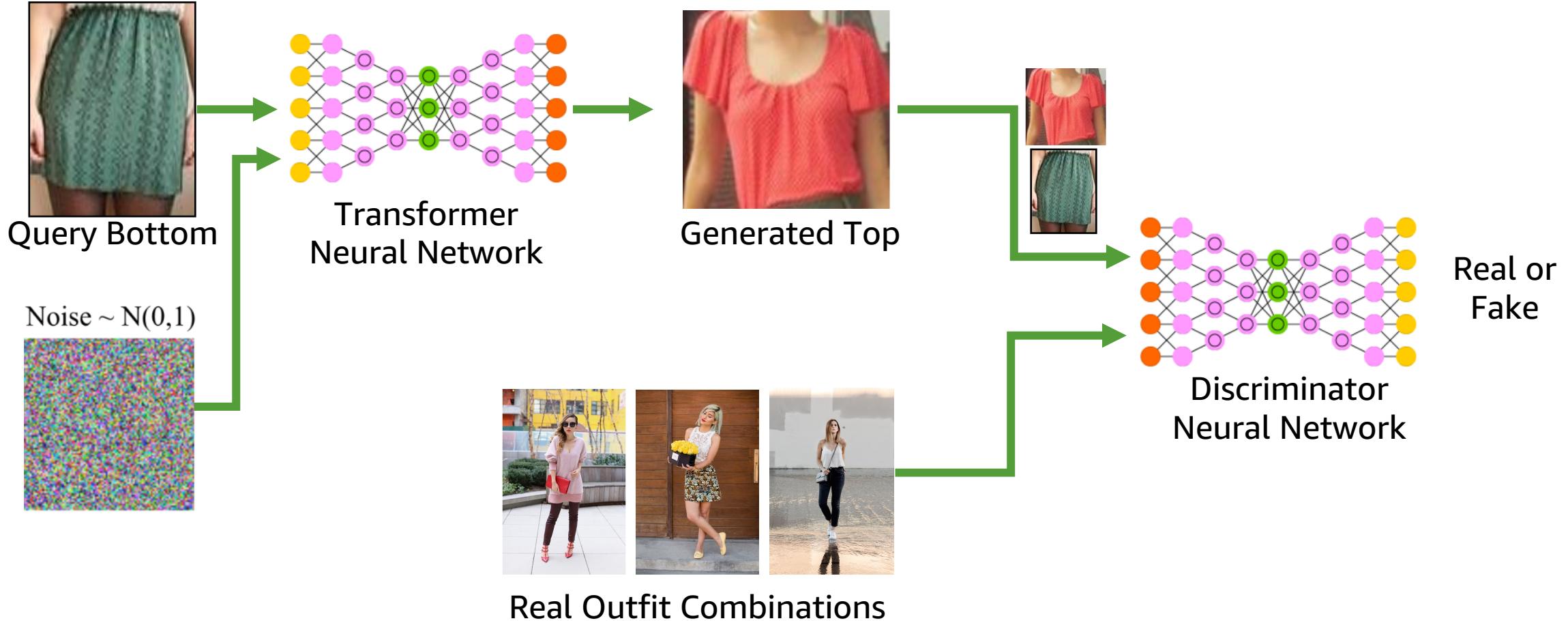
Recommendations: Can we GAN?



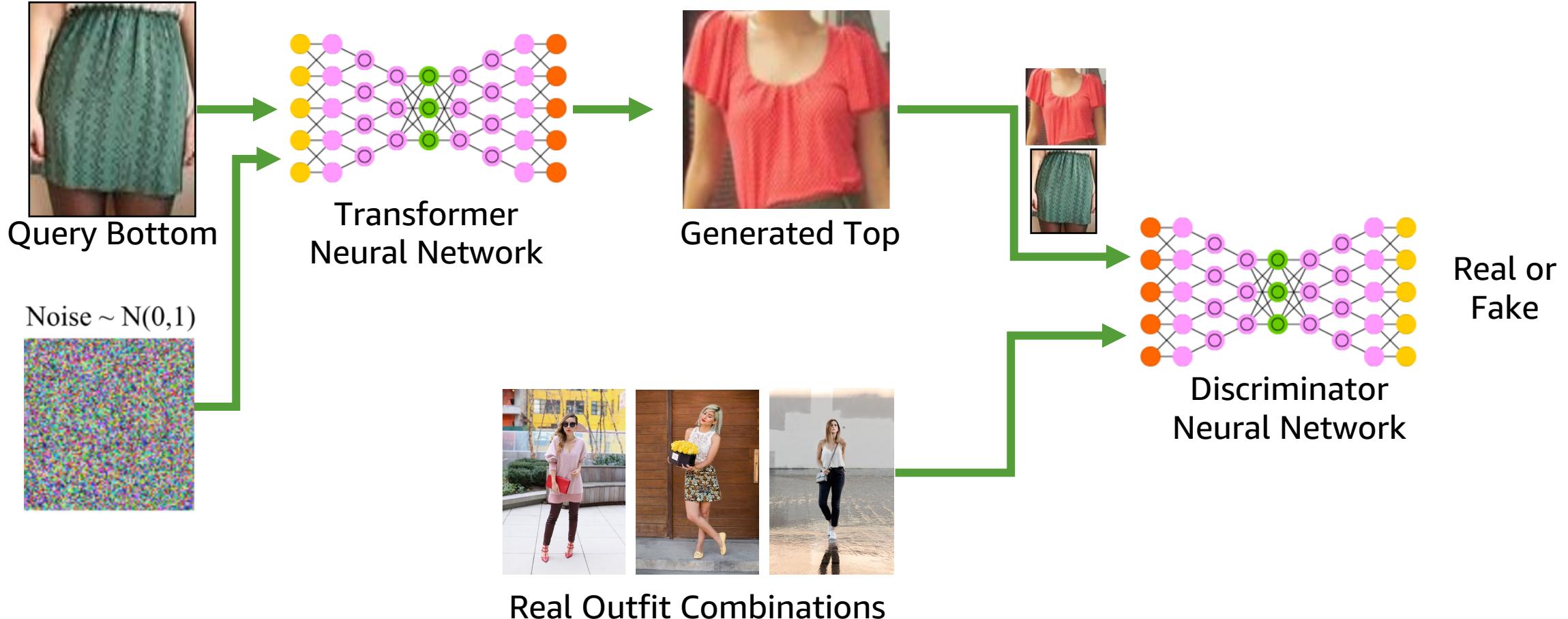
Recommendations: Can we GAN?



Add Noise to Make it Generative

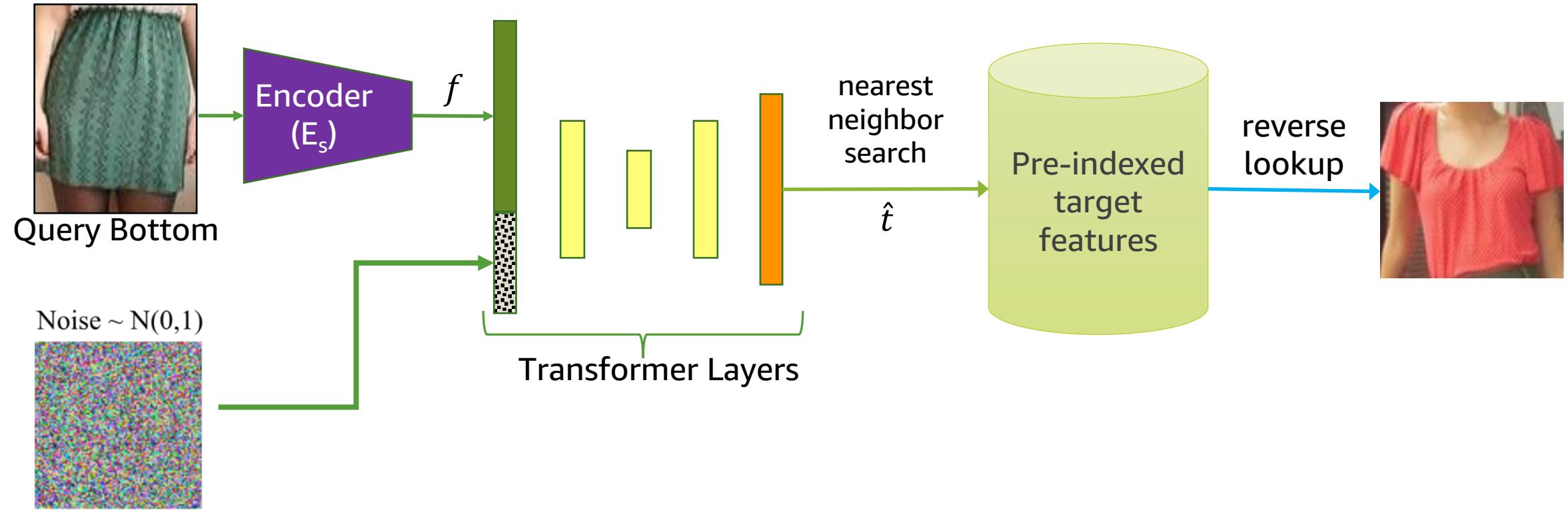


Train a Feature Transformer Instead

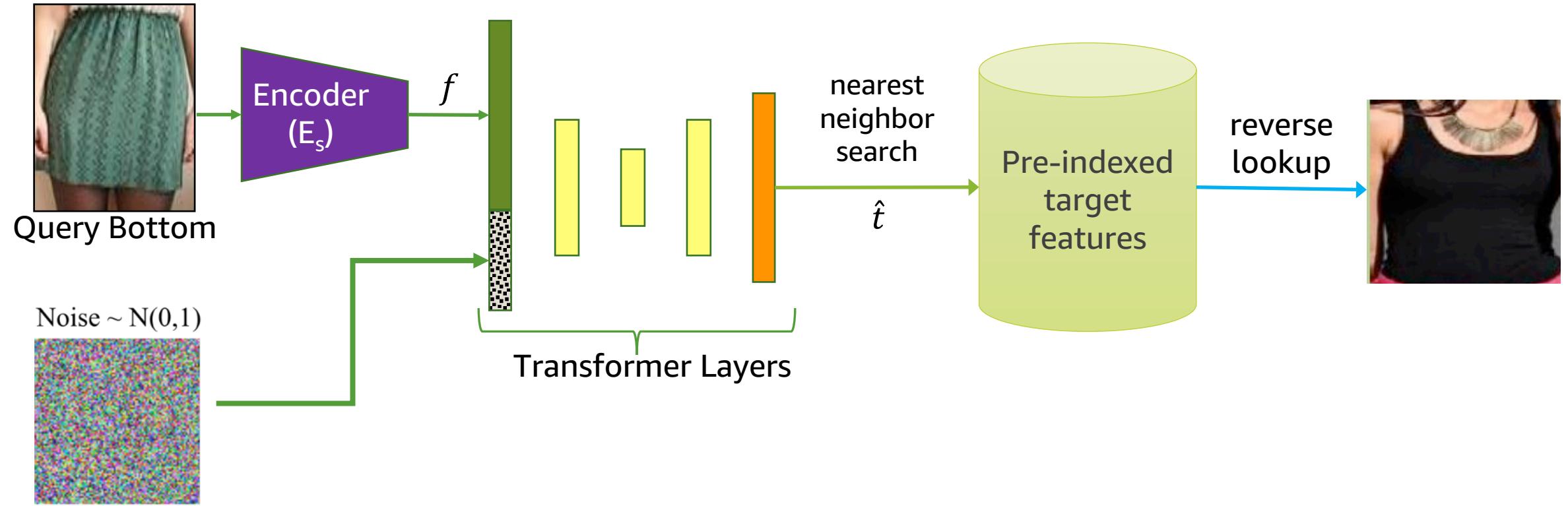


Train the transformer network on pre-computed feature embeddings!

Inference: Generating Recommendations



Inference: Generating Recommendations



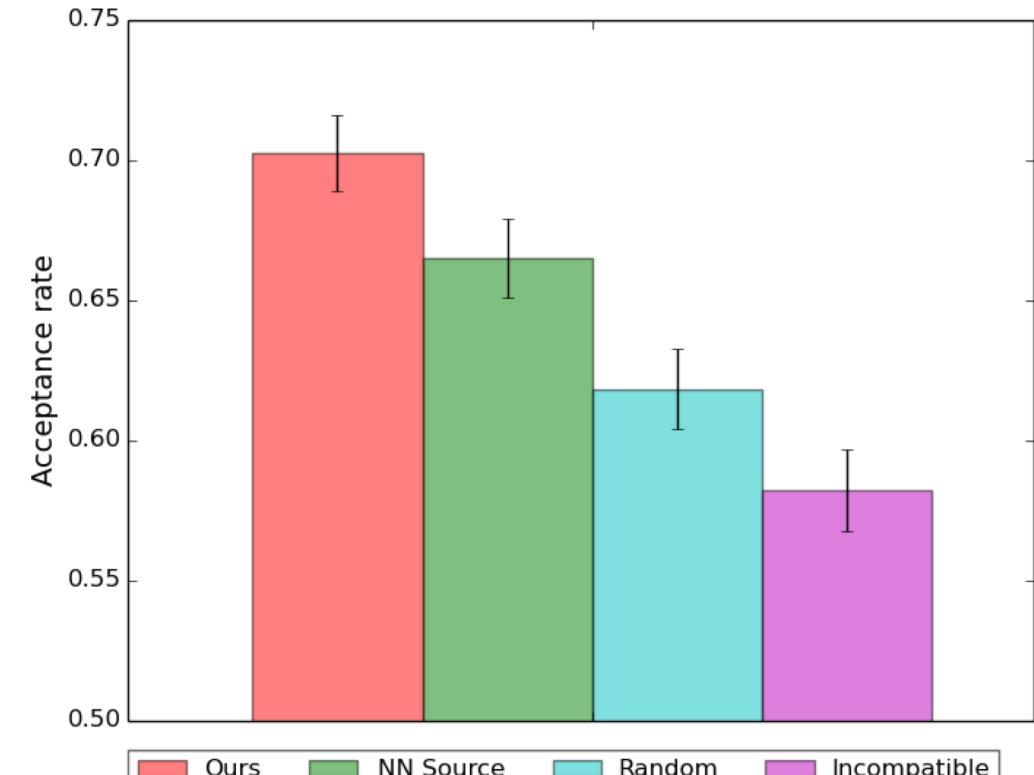
success



Rated by Fashion Experts



Domain experts pick acceptable matches from algorithmically generated recommendations.



Higher acceptance rate is better

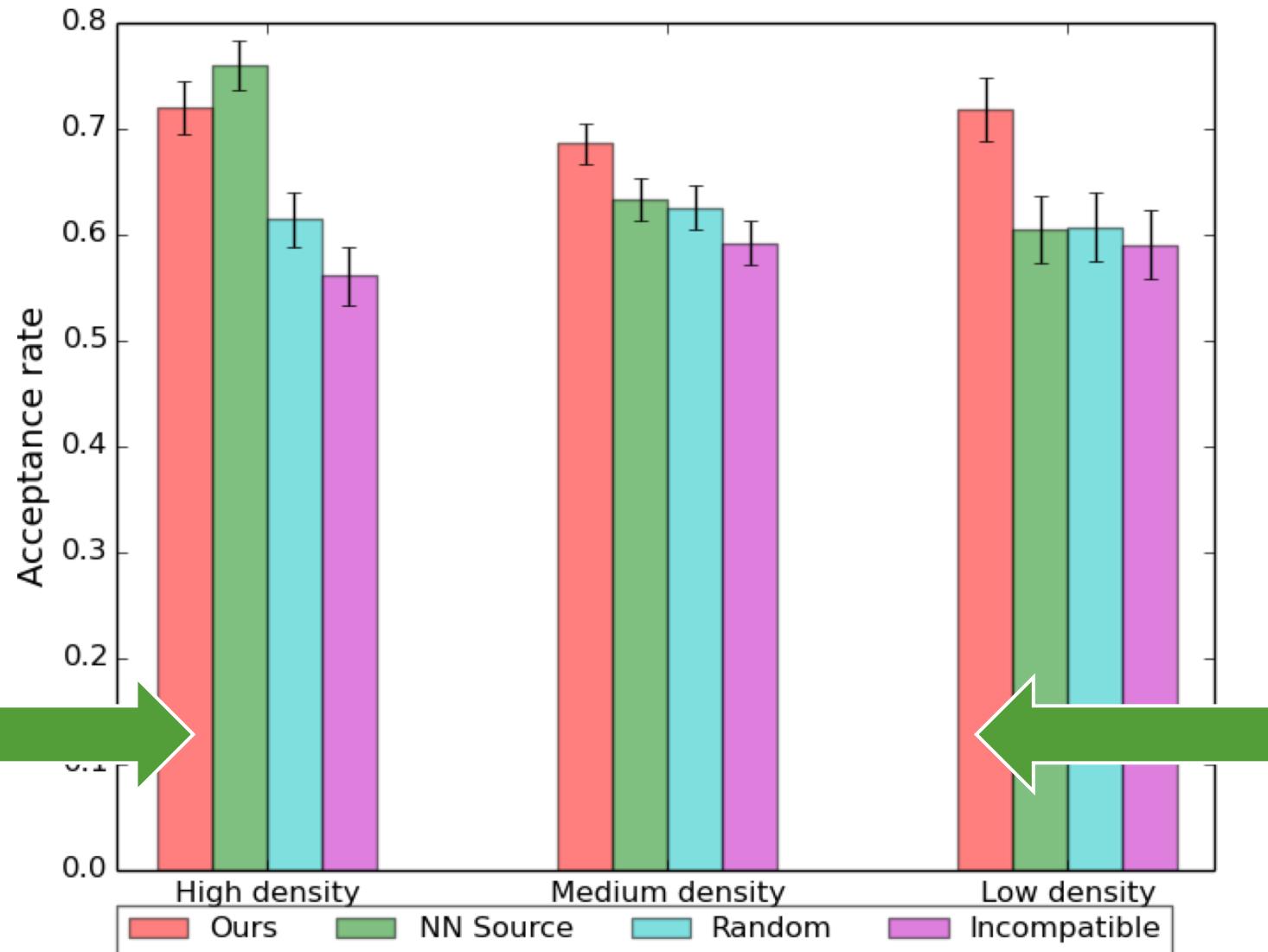
The Litmus Test!



Popular
Items



Peculiar
Items



Recommendations for a Infrequent Bottom



Top worn with Query



Query



Recommendation from our algorithm



Recommendation from NN Source (corresponding top of Nearest Neighbor bottom)



Recommendation using incompatible algorithm

Note: These are subjective opinions of one of the many fashion experts.



Other Applications



Hardlines

Given a **query item**, recommend
visually complementary items.



Furniture Recommendations

- Home Innovation Team adopted our approach
- Score: Average number of items selected by interior designers from the 7 recommended items
- Very encouraging results with purely unsupervised method.



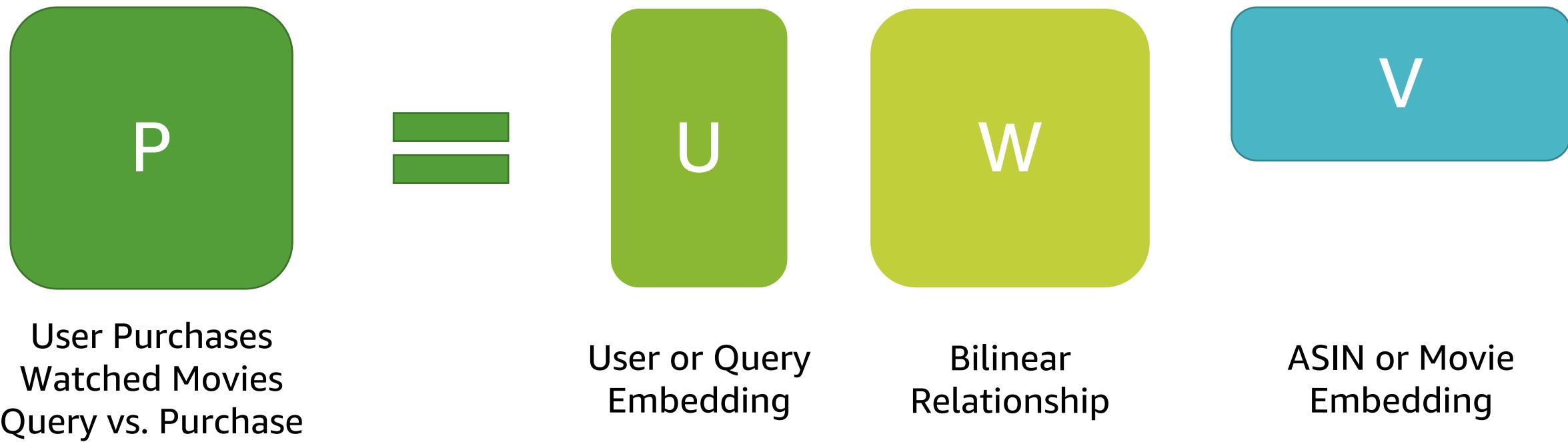
Method	Average Score
Fully Supervised	4.30
Unsupervised (Ours)	3.85

Courtesy: Brian Mann and Qiuying Lin
from Home Innovation Team

- Semi-supervised using
 - Labelled data
 - Specialist selection signals
 - Customer click/purchase behavior
- Extend to other, potentially non-visual, domains.
 - Product Search and Recommendations



Recommendations & Search



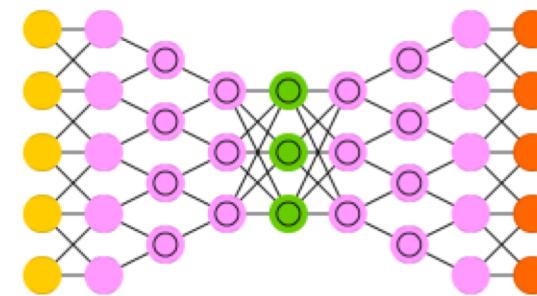
Recommendations & Search

P

=

U

User Purchases
Watched Movies
Query vs. Purchase



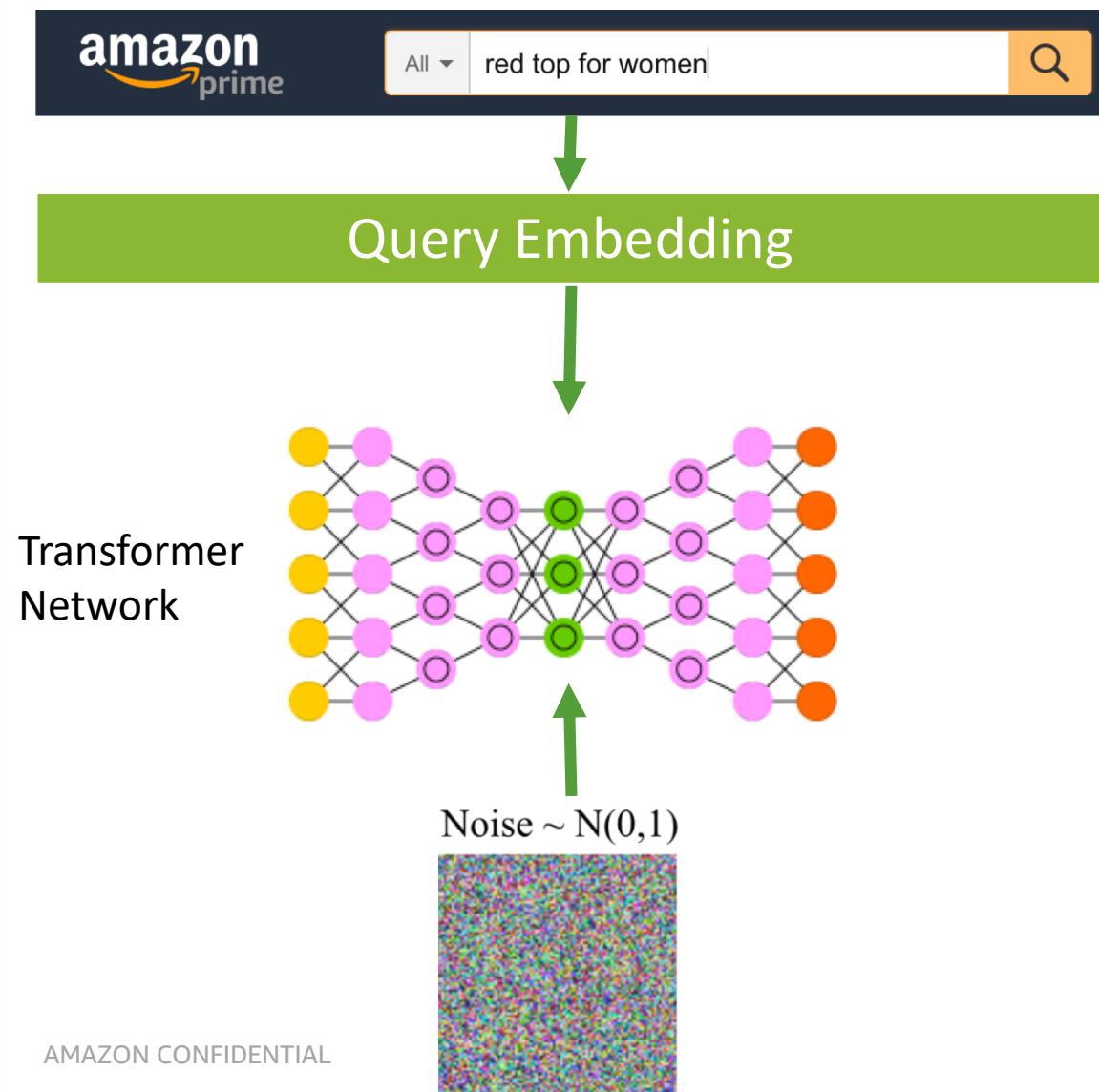
V

User or Query
Embedding

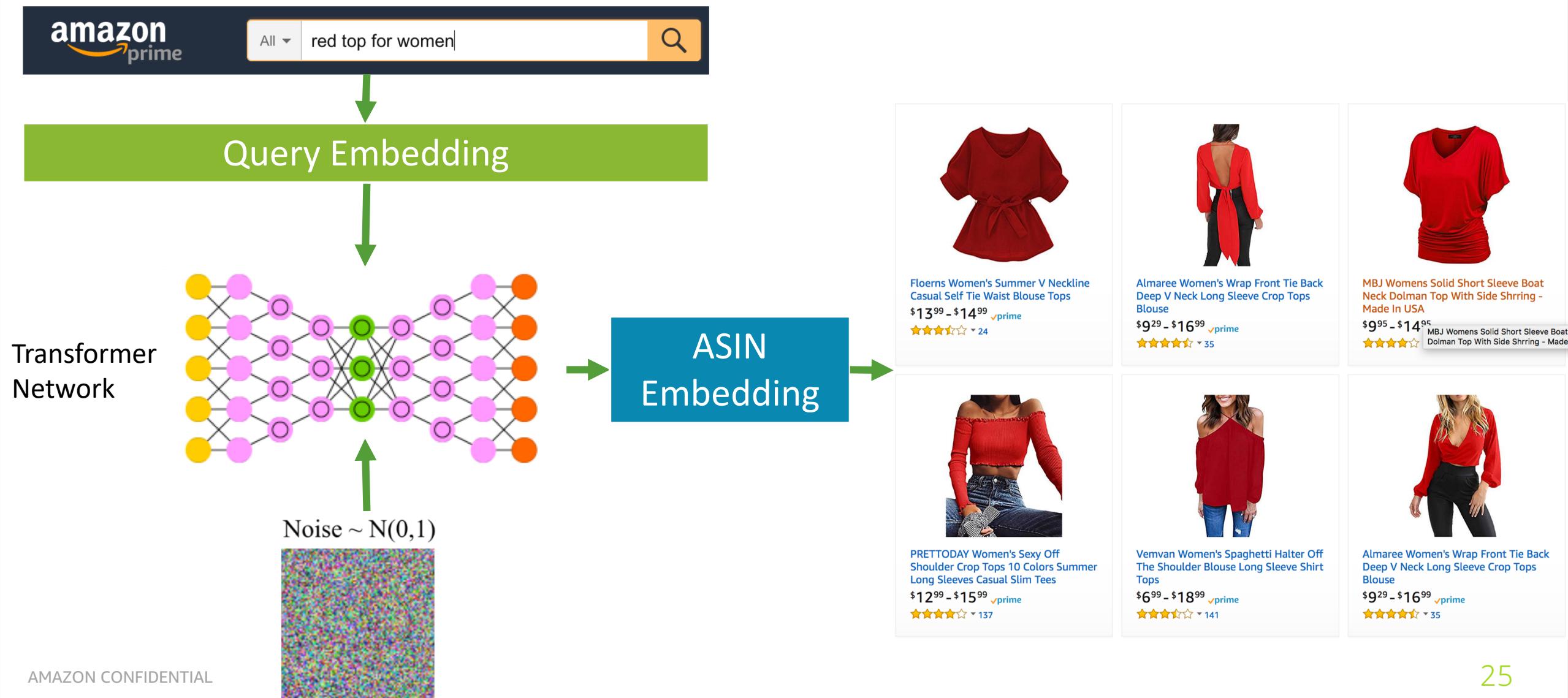
Feature
Transformer

ASIN or Movie
Embedding

Product Search: Potential Use-Case



Product Search: Potential Use-Case



Contributors



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CRAFT: Yes we GAN!