
Awear

An iOS application that serves as your personal, virtual closet



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The Problem

A photograph of a woman with dark hair tied back, wearing a striped shirt, looking down at a rack of clothes. She appears to be carefully examining a piece of clothing she is holding. The background shows a closet full of hanging garments.

Tedious Task

It is hard to visualize what items go well with each other and to remember what items you have paired together.

A photograph of a woman with long brown hair, seen from the side and back, looking at a rack of clothes hanging on a rod. The clothes include various items like shirts, jackets, and dresses in different colors and patterns.

Outfit Repeating

One has to make an effort to remember when the last time an item or entire outfit was worn.

A photograph of a closet filled with clothes and shoes, illustrating a disorganized state. The closet has multiple shelves and hanging rods. The shelves are filled with various pairs of shoes and some folded clothing. The hanging rods are filled with long-sleeved shirts and blouses. The overall appearance is cluttered and lacks organization.

Disorganization

The process requires being in a closet and physically putting outfits together, which often leads to disorganizing the closet.

Use Cases

As a user, I would like to be able to...

- ◆ Upload photos of my clothing items and have them categorized and stored in my mobile closet
- ◆ Delete clothing items in my mobile closet
- ◆ Be presented with a generated outfit based on my closet and occasion requirements

Solution Proposal

Solution Proposal

An iOS application that has:

- Closet Database
- Item Details
- Outfit History
- Outfit Generator



Development Tools

Environment & Language

- Xcode 9.3
- Swift 4.1

Documentation & Standards

- Xcode's built-in Markdown
- iOS Human Interface Guidelines

Version Control

- Bitbucket
- Git

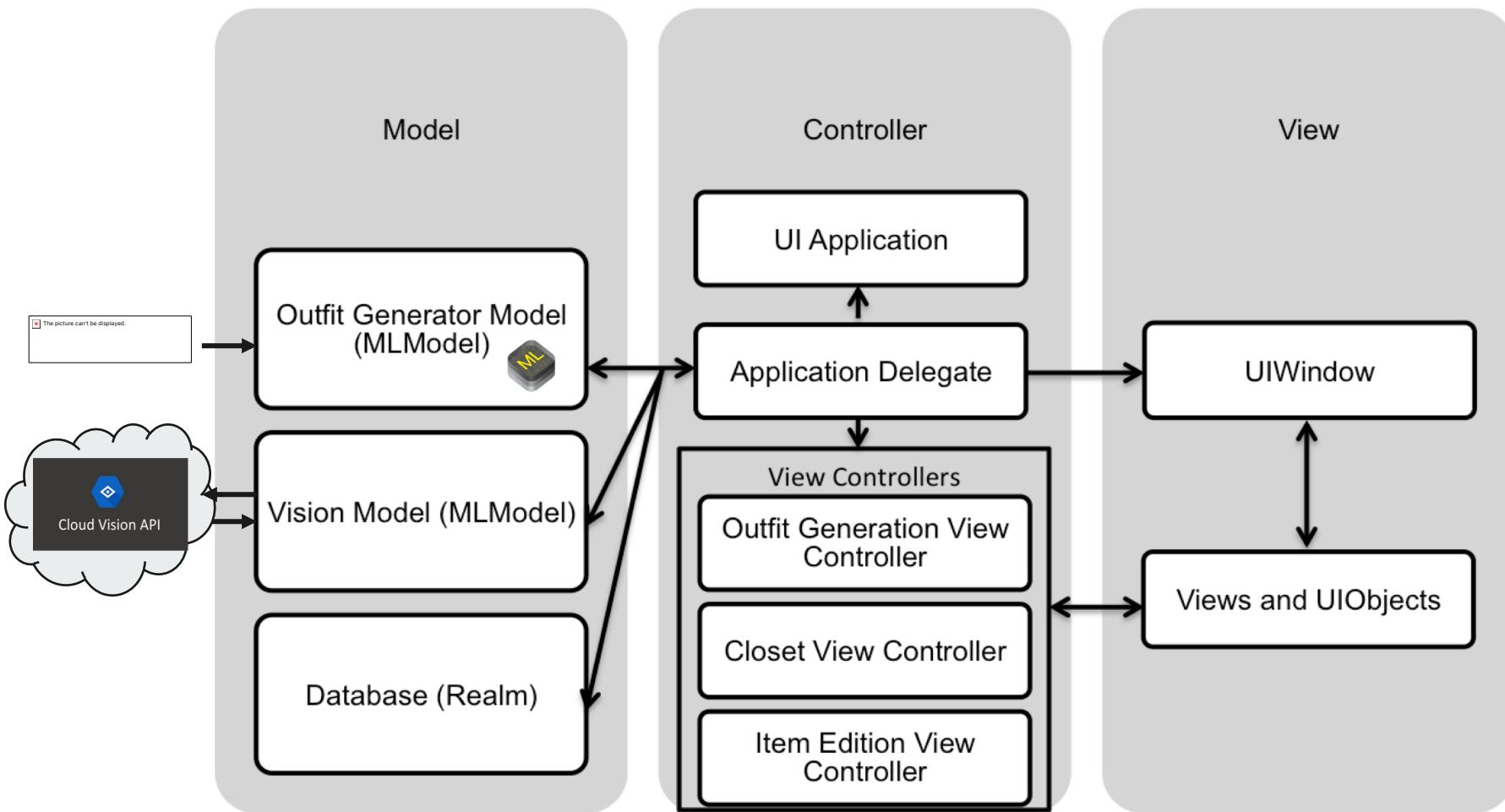
Test Frameworks

- XCTest
- XCUITest

Competitor Analysis

	Features				
	Closet Database	Item Details	Outfit History	Analyze Photos (Vision API)	Outfit Generator
GlamOutfit		✓	✗	✗	✗
Stylebook		✓	✓	✓	✗
Awear		✓	✓	✓	✓

Architecture



Demo

Algorithms Used

Google Cloud Vision API





Vision API Enhancements

- How to identify clothing related labels?
- No label database provided by Google
- Solution: test API to obtain as many clothing related labels as possible
- Used large-scale fashion database by The Chinese University of Hong Kong (over 200,000 images)
- Obtained 200 labels (categories, subcategories and tags)

Google Cloud Vision API

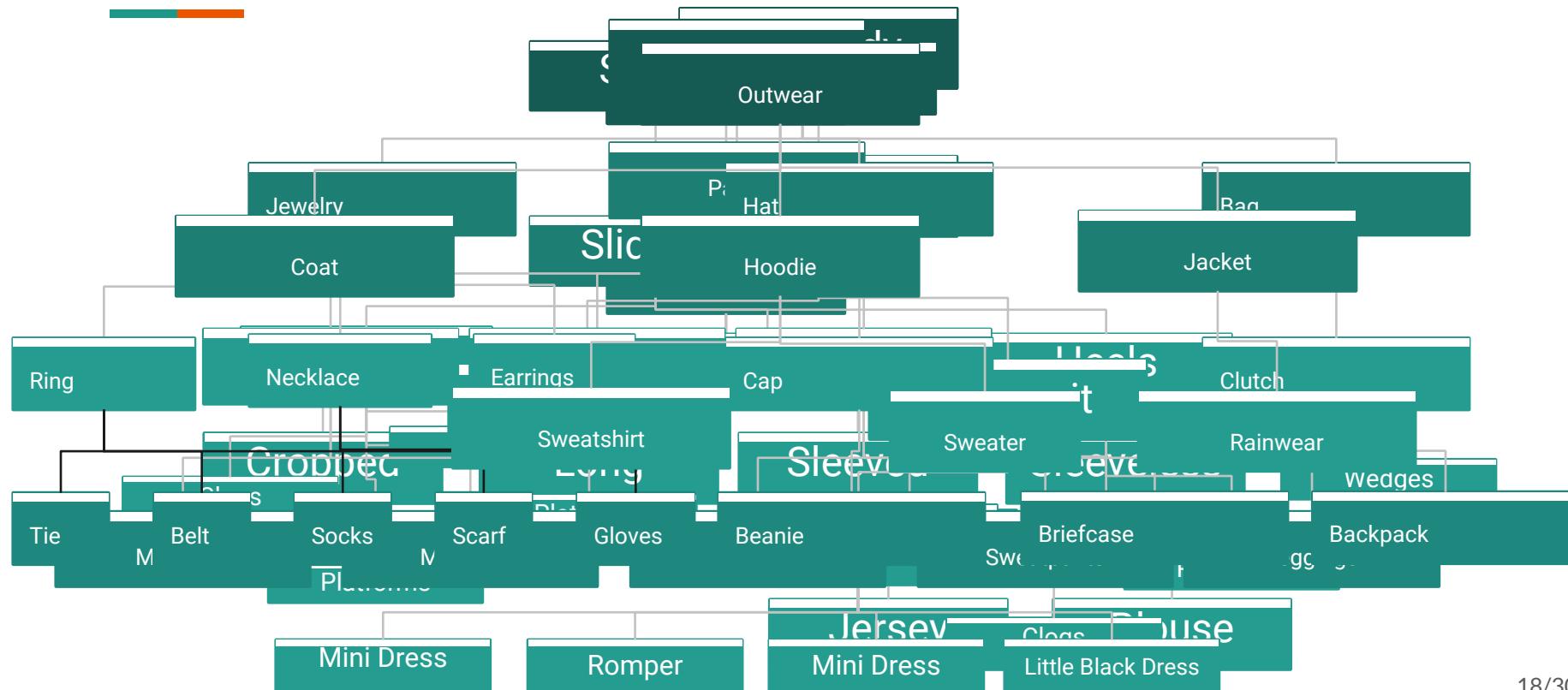
From 1277 labels

- bulldog
- picture editor
- old growth forest
- psychedelic art
- quilt
- creative arts
- chest of drawers
- guard dog
- fast food
- breakfast sandwich
- hamburger

To 206 clothing labels

- wedding dress
- sari
- nightgown
- little black dress
- gown
- dress
- day dress
- dance dress

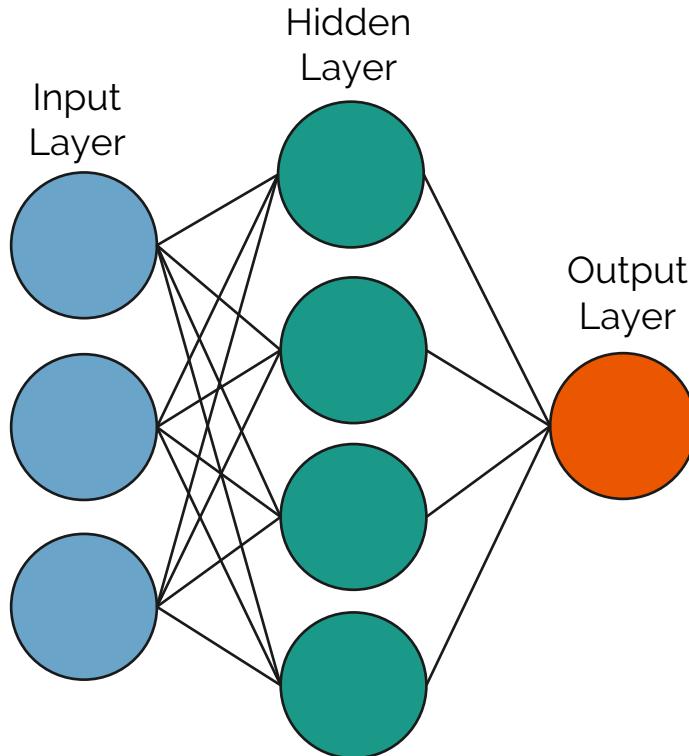
Clothing Hierarchy



Label Grouping

- How to use labels for machine learning?
- 200+ labels
- Solution: build a hierarchy by style
- Use major categories for machine learning
 - Casual
 - Nightlife
 - Work
 - Vacation

Keras



- Artificial Neural Network
- Multiple hidden layers of non-linear processing
- Assign weights to features and provide output

Keras



**Input
(Features)**

Standard Deviation of Colors

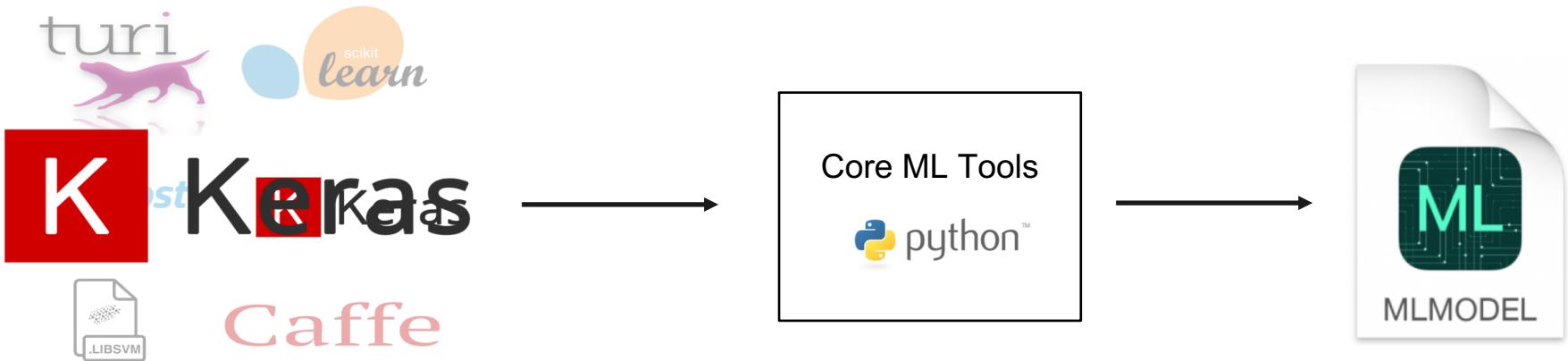
Categories Combination

Tag Combination

**Output
(Outfit Score)**

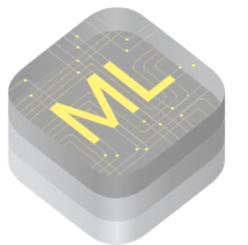
Probability that
the outfit works

Core ML & Keras



Pivoting

Classification



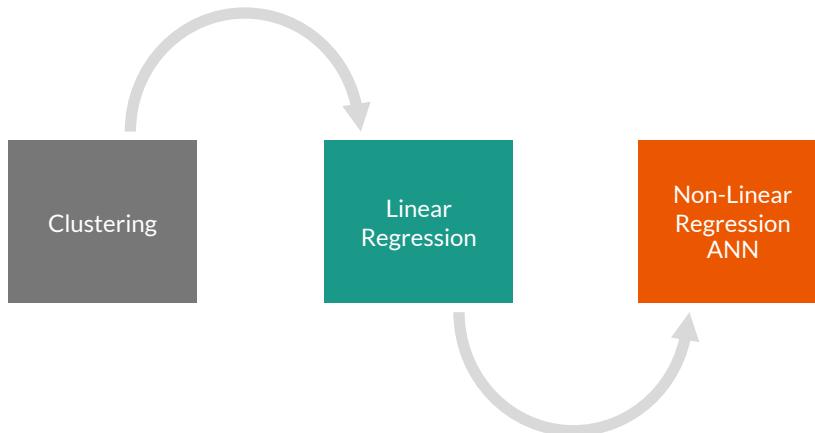
Testability

Reliability



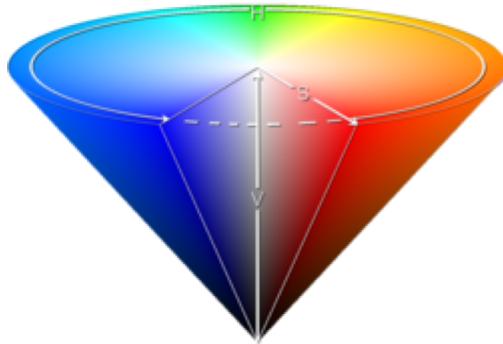
Cloud Vision API

Machine Learning Algorithms



- Need for continuous output
- Output is not a linear function of the input
- Generalizable
- Noise tolerant
- Keras specialty

Machine Learning Features



- Use of Hue, Saturation and Brightness (HSB) instead of RGB standard deviations
- Use of tag match percentage as a feature to allow for variable input size

Opportunities

Commercial Opportunities

- Integrate with a store inventory to show recommendations to users of similar clothes
- Allow stores to display their own suggestions of outfits



Questions?



References

[Google Cloud Vision API Documentation](#)

[Keras Documentation](#)

[Core ML Documentation](#)

[iOS Interface Standards](#)

[Large-scale Fashion Database by The Chinese University of Hong Kong](#)