Microsoft Azure Cognitive Services: Custom Vision API

INTRODUCING THE CUSTOM VISION SERVICE

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Overview

Introducing Microsoft Cognitive Services

Compare the Computer Vision and Custom Vision services

Image classification problems

- Building and training a model
- Making predictions
- Techniques and algorithms

Introducing Microsoft Cognitive Services

Azure hosted AI services

APIs provided for integration into websites and apps

“Pay as you go” payment model

Cognitive Service Areas

Vision

Image classification and recognition

Speech

Conversion between speech and text

Language

Analytics, translation, and spell check

Knowledge

Questions and answers

Search

Text, image, and video search

More on Microsoft Cognitive Services

“Microsoft Azure Cognitive Services: The Big Picture”
Barry Luijbregts
https://app.pluralsight.com/library/courses/microsoft-azure-cognitive-services-big-picture/

Cognitive Services
https://azure.microsoft.com/en-us/services/cognitive-services/

Computer and Custom Vision Services

Computer Vision Service	Custom Vision Service
On general release	Available in preview
Image classification service	Image classification service
Text recognition	
Thumbnail generation	
Service provided, general purpose model	User provided, custom, domain specific model

Advantages of a Custom Classification Model

Increased specificity

Can make finer distinctions using details of images from the problem domain

Reduced distractors

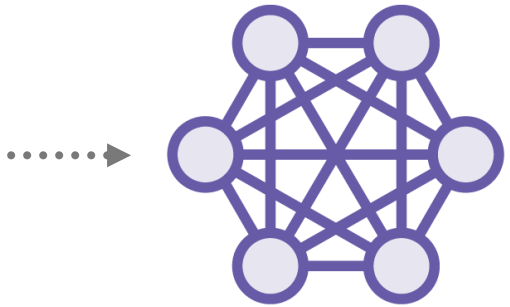
Avoid confusing the model with similar but irrelevant images

More on the Computer Vision Service

"Microsoft Azure Cognitive Services: Computer Vision API"
Eduardo Freitas
https://app.pluralsight.com/library/courses/microsoft-azure-cognitive-services-computer-vision-api/

Computer Vision Service
https://azure.microsoft.com/en-us/services/cognitive-services/computer-vision/

The Image Classification Problem



98% Robin
1% Jay
1% Thrush

Blackbird
Blue tit
Coal tit
Crow
Great tit
Goldfinch
Jay
Robin
Sparrow
Starling
Thrush

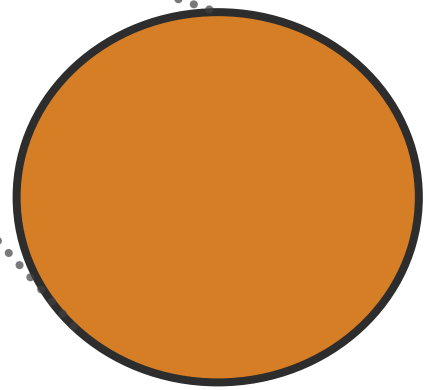
Image Classification Challenges

- Variation of viewpoint and scale
- Image deformation
- Partial obscuring of subject
- Differing light conditions
- Background distractions

The Image Classification “Black Box”

98% Robin
1% Jay
1% Thrush

Parsing the Source Image



Red : 213
Green: 126
Blue: 73

42 122 61 41 113 67 52 101 62 42
122 61 41 113 67 52 101 62 42 122
61 41 113 67 52 101 62 42 122 61
41 113 67 52 101 62 52 101 62 42
122 61 41 113 67 52 101 62 42 122
61 41 113 67 52 101 62 52 101 62
42 122 61 41 113 67 52 101 62 42
122 61 41 113 67 52 101 62 52 101
62 42 122 61 41 113 67 52 101 62
42 122 61 41 113 67 52 101 62

Training the Model

Robin

Blue tit

The Image Classification Pipeline

Input

Pre-classified, training set of images

Learning

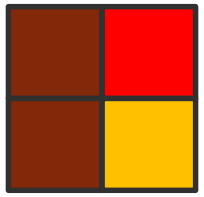
Train the model to distinguish between each category

Evaluation

Validate the model produces accurate predictions with new images

Nearest Neighbour Comparisons

A



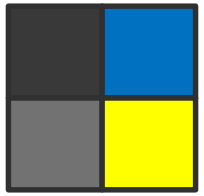
B

131 40 9 255 0 0
131 40 0 255 192 9

234 73 16 228 28 28
211 66 15 209 187 47

Robin

C



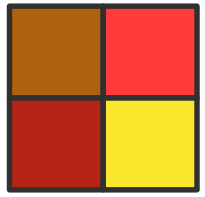
D

57 57 57 0 112 192
114 114 114 255 255 0

88 88 88 18 48 174
48 48 48 198 212 2

Blue tit

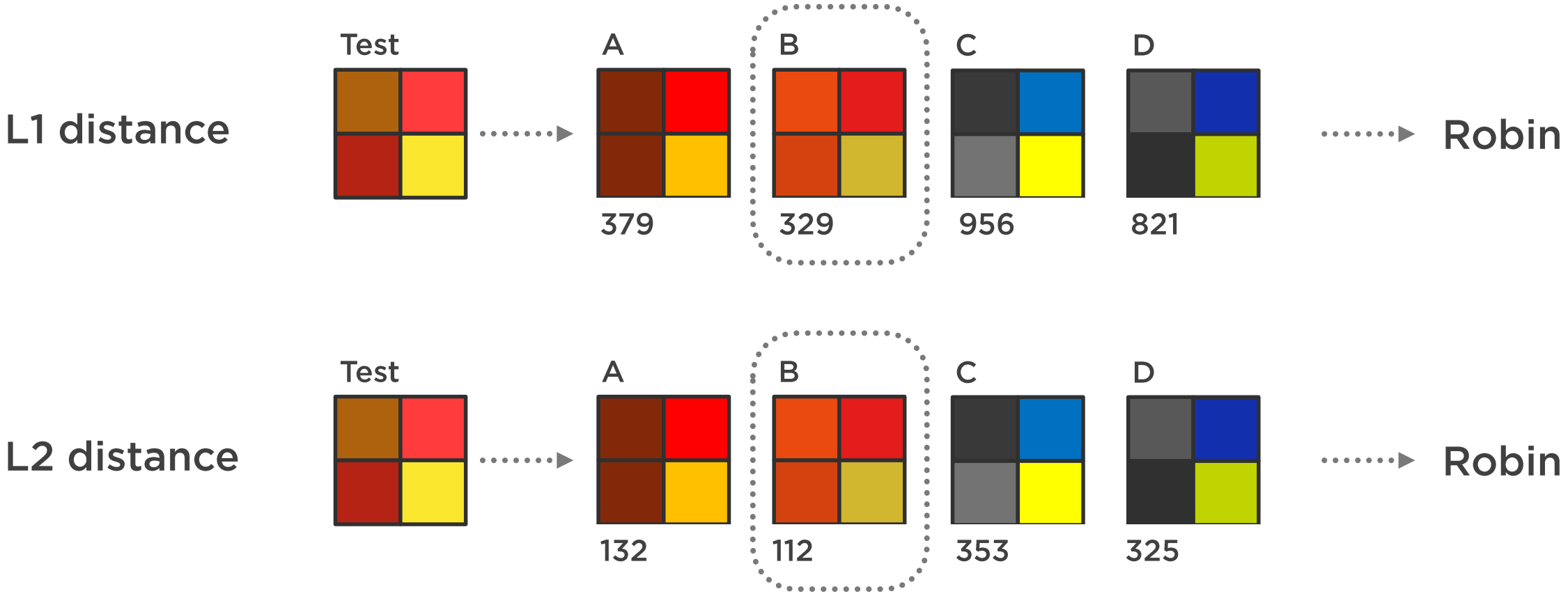
Test



174 98 14 255 59 59
180 35 20 250 231 46

?

Distance Functions



Improving Nearest Neighbour

Adopt majority voting

- Using the K-nearest neighbour classifier

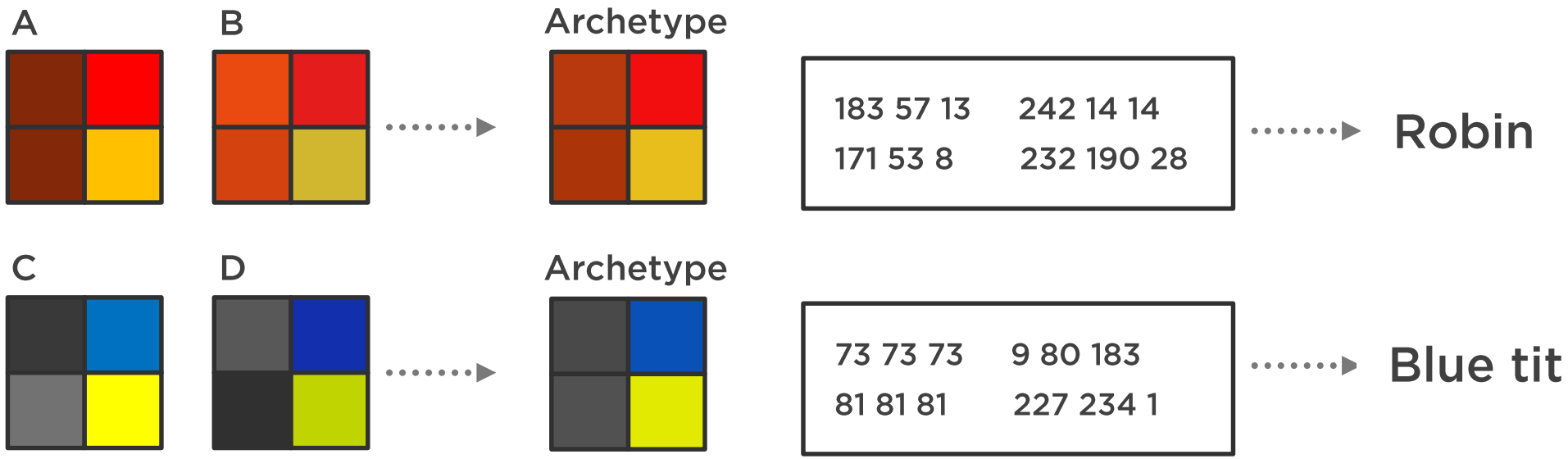
Apply averaging to the images

- Reduce the effect of irrelevant pixel variations

Use indexing to get results quicker

- Partially trade off accuracy for speed

Beyond Nearest Neighbour



Further Reading

"Machine Learning Projects for .Net Developers"
Mathias Brandewinder
https://www.apress.com/it/book/9781430267676

Stanford computer science class: Convolutional Neural Networks for Visual Recognition
http://cs231n.github.io/

"Understanding Machine Learning"
David Chappell
https://app.pluralsight.com/library/courses/understanding-machine-learning

Summary

Introduced the Custom Vision Service as part of Microsoft's Cognitive Services

Discussed the image classification problem and how computer based algorithms can solve them