

Can we date an artists work from catalogue photographs?

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Introduction

This poster presents an interdisciplinary computational study of modelling artistic style, and how this style changes over time.

Sir John Kyffin Williams (1918-2006) was a very prolific painter with a large body of work.

His style evolved over his career and is often thought to have gotten darker over the years due to epilepsy.

This evolution of this style led us to wonder: is it possible to date his paintings from images alone?

Background

Williams was primarily known for his landscapes of north west Wales and Anglesey. While his style and technique changed over the years, his landscapes in oil are instantly recognisable, featuring bold chunks of colour and a palette which matched the Wales landscape he painted.

The aesthetic of these paintings is contrasted by the paintings he made during his trip to Patagonia in 1968.

The paintings made during this trip differ starkly from his previous landscapes, incorporating pinks, purples and oranges.

William's work is well represented in public collections in Wales, but has little in the way of known dates of production.



"Snowdon, the Traeth and the Frightened Horse", Sir John Kyffin Williams, 1948: note curved strokes, rather than blocky application



"Above Carneddi, No. 2", Sir John Kyffin Williams 1985: note much blockier style and changed use of colour



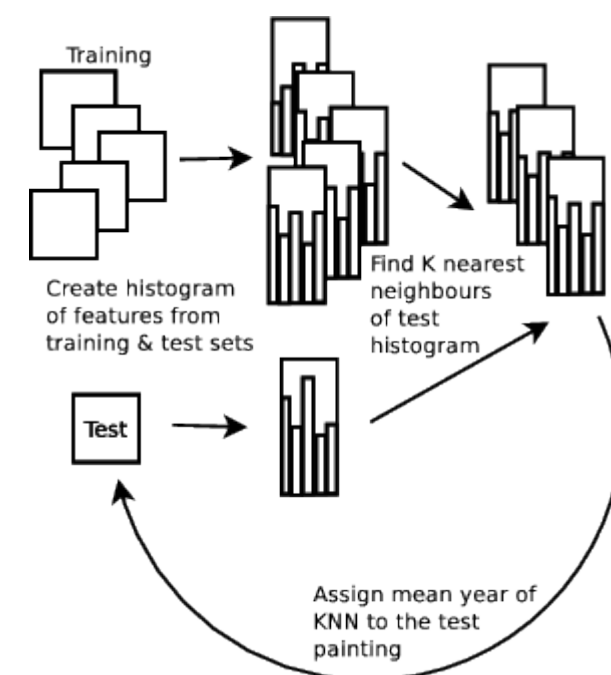
"Lle Cul", Sir John Kyffin Williams 1969: from the Patagonia period, note the difference in colours

Type	Number	Number (year known)
Landscapes	247	64
Portraits	52	35
Seascapes	11	2
Still Lifes	4	1
Other or studies	8	0

Methodology

Out of our database of 325 paintings, 102 have a known date of creation. In order to gather meaningful statistics, only these 102 paintings were considered for analysis.

We use a leave-one-out cross validation methodology, taking a painting which the year is known and then using our classifier to guess the year. This approach allows us to see if the guess was correct or not and, if not, how wrong it was.



To simplify the classification stage we use the K-Nearest Neighbour (KNN) with the other 101 paintings for which we know the date.

To measure goodness of fit we use Pearson's Correlation Coefficient and Pearson's r for significance.

Colour Analysis

Colour analysis was performed by statistical analysis of RGB and HSV colours within an image.

Our intuition for this was that we should see a reduction in colours over time, following the hypothesis that William's paintings grew darker over time.

To provide a fuller view colours were also binned into a colour histogram.

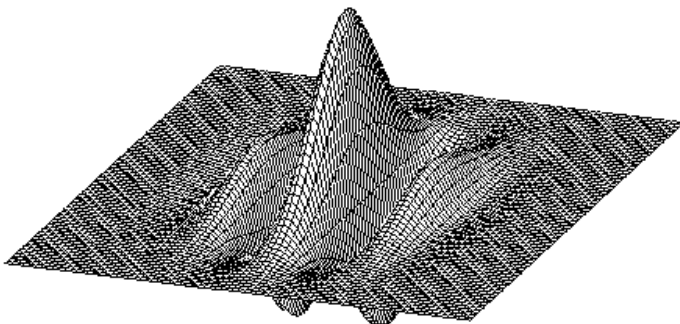
Edge Analysis

To investigate the blockiness of William's work we observe a rough mixture of how many edge pixels there are in a painting and in what orientation.

We investigated two line-based features, a count of Canny edge pixels and the use of Steerable filters.

Texture Analysis

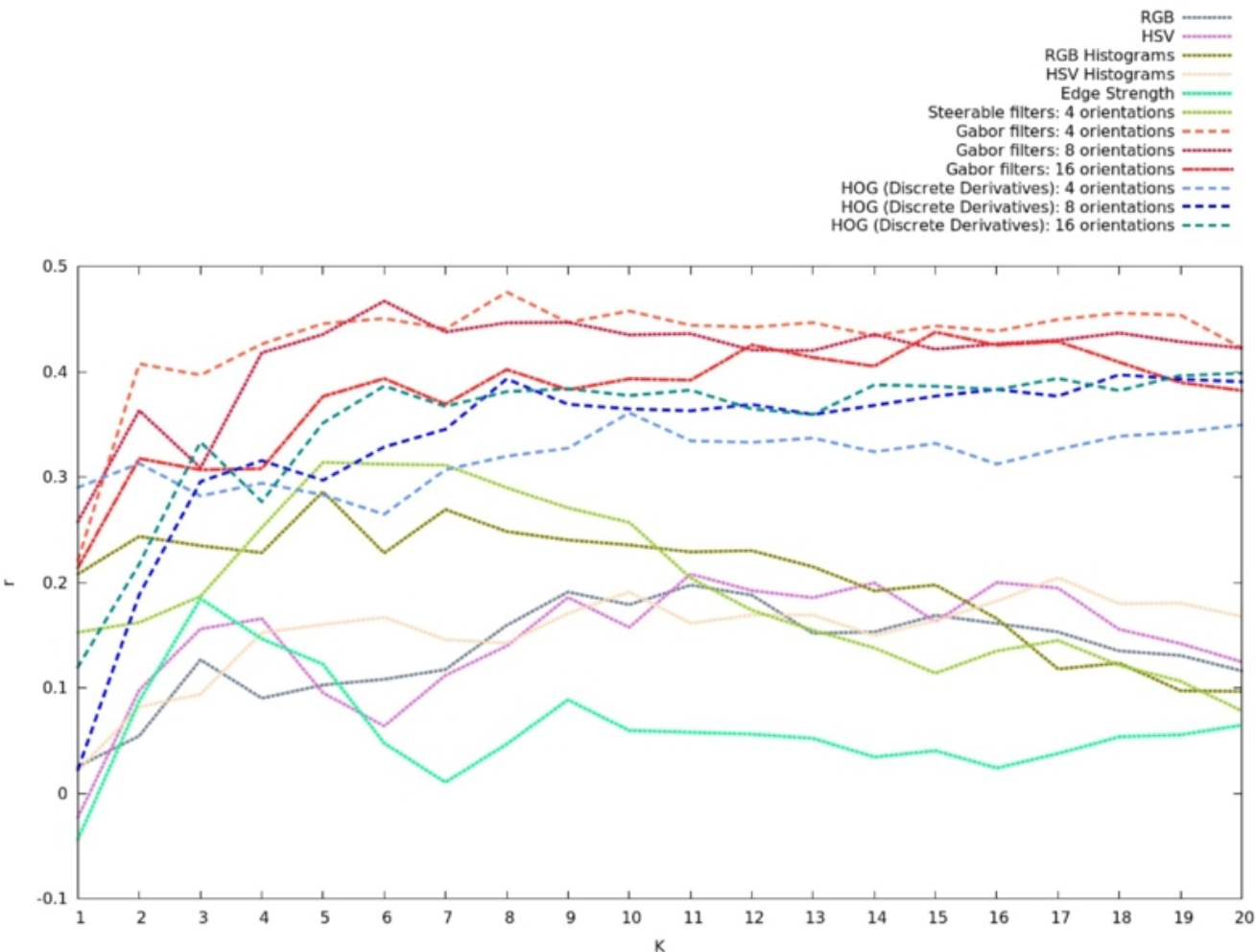
Because William's work was highly textural; a texture-based approach was thought to yield the best results.



Histograms of line orientations were build up using discrete derivative filters and Gabor filters with variable orientations to capture the dominant angles of paint strokes.

Results

We obtain strong correlations (approaching 0.5) between predicted and actual date.



Results of Pearson's Correlation Coefficient (r) against the number of neighbours to consider (K)

If we take a different approach and set the value of K at its optimum based on a visual inspection of the graphed results: a K value of around 7-8 we can also determine how far out our best performing technique: Gabor filters, 4 orientations.

71% of all paintings can be classified within 15 years using this approach.

References

[1] *Can we date an artist's work from catalogue photographs?*, A. Brown, G. Roderick, H. Dee and L. Hughes, 2013, Image and Signal Processing and Analysis (ISPA), 2013 8th International Symposium on.

[2] *Gabor Filters*, T. Trapp, 1998, [Online] Available: http://homepages.inf.ed.ac.uk/rbf/CVonline/LOCAL_COPIES/TRAPP1/filter.html

Expert Knowledge

We also considered another view on the entire problem: using expert knowledge to form the most representative painting for a given year.

We name the expert chosen paintings *Artistic Exemplars*.

In a feature space of analysed paintings we can also determine two useful pieces of information which have similar connotations to Artistic Exemplars:

Centroids: the statistically central point of all paintings in a given year.

A *Statistical Exemplar* which is the closest painting to the Centroid.

We can then use these to classify paintings based on their nearest Exemplar, rather than K neighbours.

Method	r	P(r)	C(15)
Artistic Exemplars	0.328	< 0.0001	57%
Statistical Exemplars	0.383	< 0.0001	61%
Centroids	0.403	< 0.0001	64%

Results for exemplar methods. r is the correlation, P(r) is the significance and C(15) is the correct classifications within 15 years