HASS 02.137

Introduction to Digital Humanities Final Assignment

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# Our Project

In our Mid Term project, we have analysed the Nanyang Art Style which is a Sinocentric art movement that has been spearheaded by Chinese migrants between 1930s and 50s in Singapore. It integrates fundamentals of both Chinese painting traditions as well as styles from the Western schools of Paris like post-Impressionism and Cubism. The aim of this proposal is to introduce Singaporeans to the origins and heritages of the Nanyang Art Style, as well as how it has impacted the art scene locally. We will be further analysing this topic for our final assignment.

# Research Questions

The research questions are as follows: To what extent does the Nanyang Art Style, interpreted through Chen Wen Hsi’s work, intermingle both Chinese and Western elements? How prominent are the Chinese and Western elements reflected in different types of subjects? What approaches should we use to accurately compare the art works? How do the results of these comparisons hold up against our expectations?

# Accomplishments

Using the image analysis methods from our existing research project review “Complementary Quantitative Approach to Unsolved Issues in Art History: Similarity of Visual Features in the Paintings of Vermeer and His Probable Mentors” by Kim, M., & Kim, J. We have utilised various quantitative procedures to meticulously identify distinctive attributes and differences amongst numerous art works to confirm the current qualitative trends in the literature about this period in Singapore's art history. The three main methods implemented are orientation analysis, radial frequency analysis and colour analysis.

# Engaging with the Humanities to Produce Knowledge

Engaging in the work of humanities research, we can learn about the values of different cultures and art styles, about what goes into making a work of art. The act of preserving the history and accomplishments of the past can aid us in taking cognizance of the art scene of the present, also providing us with the means to envisage the future. To effectuate our methodology, we avail ourselves of machine learning procedures to generate graphs and implement categorisation after extracting the relevant dataset for research.

# Results & Analysis

### Data Set Building

Our research is focused on unpacking Chen Wen Hsi’s work, instead of all five Nanyang artists. We settled on Chen Wen Hsi as he primarily works in the Chinese Ink medium but is also notable for his modernist approach to the traditional medium. Aforementioned makes his artwork a suitable candidate for study of both the western and traditional Chinese influences of the Nanyang art movement. His Chinese ink works follow the traditional subjects of flowers, birds, animals and landscapes, with his more avant garde interpretation of the medium distinguishing his work in the Nanyang art movement from the more traditional school of scroll painting.

Through Mr Johnny Quek’s archival project, [Chen Wen Hsi Project - Collate, Verify & Certify His Works](https://chenwenhsi.com/project/), Chen Wen Hsi’s has the largest and well digitised collection that is available for research and public access. This site is well documented allowing us to split his works by subject, for better study of subsections of the entire data set.

### Pre-processing dataset

We are aiming to retrieve data that is based on the use of brushstrokes, shading and the use of lines across the entire painting. In order to highlight the lines and shapes in the image, we are using a Gabor filter as a form of edge detection.

The Gabor filter is associated with the gabor wavelet method implemented in Kim & Kim’s research. The Gabor filter is a linear gaussian filter, that uses frequency (approximates resolution of the filter) and angles (selects strokes in the painting that matches the angle from the vertical) to build a series of kernels that can be used as image masks.

The image masks highlight the outlines of the brushwork, for those at 0 Deg(vertical), 45 deg, 90 deg and 135 deg, with frequency 0.05. This process creates a binary image that focuses on general outlines and texture of the image, overlooking colour, brightness and pixel noise, focusing on the composition of the painting itself.

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|  |  |
| Gabor Filter Angle 0  Andre Derain 1905 the Drying Sails | Gabor filter Angle 45  Andre Derain 1905 the Drying Sails |

Lack of High Resolution Chinese Ink Paintings

Unfortunately, we struggle to find higher quality images that depict the Shanghai School. Many of them were at much lower resolution and suffer from higher compression noise, than those found from *chenwenhsi.com* and NY Metropolitan Museum. To remedy the difference in detail, we reduced the resolution of our larger images to match the average low-quality resolution, at 340px along the longest edge. This drop in resolution means the gabor filter can pick up less detail that would be helpful in our feature extraction process.

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| Gabor Filter Angle 0  Andre Derain 1905 the Drying Sails | Gabor filter Angle 45  Andre Derain 1905 the Drying Sails |

This may cost our model’s accuracy, but it enables us to increase the size of our dataset to include the Shanghai School paintings, which at a much lower resolution would result in all of Chen Wen Hsi’s paintings being categorised under the Paris Style category with its higher resolution images.

### Feature extraction

Each image has 4 filtered images tied to it. In order to find patterns within these filtered images we make use of grey level co-occurrence matrices (GLCM). This method describes the texture or patterns of pixel brightness across the image. A pixel is compared with its neighbour at distance d and at direction angle Θ. We have 4 angles and use a dynamic distance that targets to have 256 bins per side. This means that we should try to keep the distances relative to the image size not hard coded, to account for different image resolutions.

This GLCM algorithm generates 4 matrices one for each angle (0, 45, 90, 135). Each matrix can be described using 6 different features.

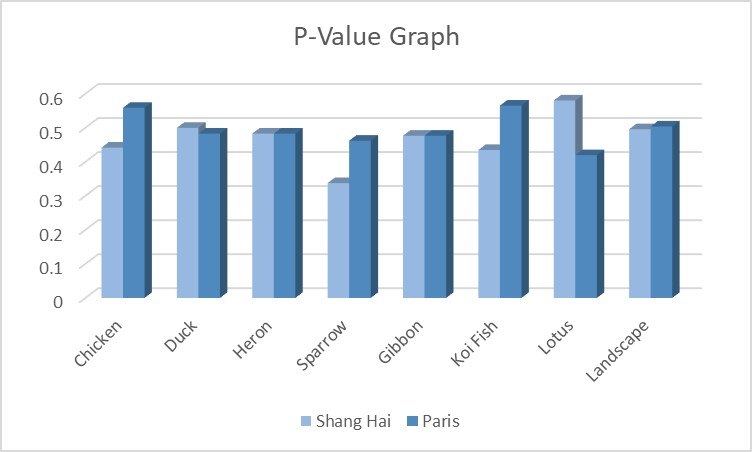
* ‘contrast’:
* ‘dissimilarity’:
* ‘homogeneity’:
* ‘ASM’:
* ‘energy’:
* ‘correlation’:

Thus, in total each image will have 4(Gabor filter) \* 4(GLCM) \* 6(GLCM properties) = 96 long vectors to describe it.

### Supervised Machine Learning

Using these features use a support vector model, with a gaussian kernel. To build the two categories, we use the data from the Paris School and the Shanghai School. This model is used to categorise Chen Wen Hsi's paintings. Before the values are used in machine learning, we normalise the matrix along each feature. The model generates two p values, one for likeness to Shanghai dataset and one to the Paris dataset. Naturally the painting is categorised by the higher p value. In the model, those that have 50-50 probability are categorised under Shanghai.

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| --- | --- | --- | --- | --- |
| Subject | Paris (1) | Equal p\_value | Shanghai (0) | Total |
| Chicken | 31 | 0 | 19 | 50 |
| Duck | 16 | 0 | 21 | 37 |
| Gibbon | 13 | 0 | 41 | 54 |
| Heron | 29 | 5(Shanghai in model) | 13 | 47 |
| Koi fish | 15 | 0 | 7 | 22 |
| landscape | 8 | 0 | 20 | 28 |
| lotus | 0 | 0 | 11 | 11 |
| Sparrow | 30 | 0 | 8 | 38 |
| Total | 142 | 5 | 140 | 287 |



|  |  |  |  |
| --- | --- | --- | --- |
|  | Mean | Interquartile Range | Standard Dev |
| Paris\_p | 0.626 | 0.0502 | 0.0701 |
| Shanghai\_p  \*excluding equal p paintings | 0.580 | 0.0232 | 0.0187 |

From the model’s results we find an interesting mix of abstract and traditional paintings under the Shanghai School category. This could be reflective of the art movement's own development incorporating some western ideas on the use of colour and tones. (“Art in Late-Nineteenth-Century Shanghai,” 2001b) This mix of abstract and traditional is present among images with a higher probability of likeness to the Shanghai dataset.

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| *Shanghai\_p =*0.607  Chasing cwh | *Shanghai\_p =*0.600  Chen wen hsi assembling chickens |
| *> 90th percentile* | |

And with those that have lower probability.

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|  |  |
| *Shanghai\_p =*0.539  Chen wen hsi gibbons 10 | *Shanghai\_p =*0.534  Chen wen hsi chickens 8 |
| *abs(paris\_p - shanghai\_p) <=0.1* | |

In these samples we observe bolder brush strokes and the use of colour for shape and form. Often forgoing the naturalistic appearance of the subject. Such characteristics can be found in Fauvism. (Rewald,2004)

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| Maurice de Vlaminck 1905-06 Barges on the Seine *Fauvism* |

In the paintings that are categorised under the Paris style, we observe a greater use of colour to depict depth and texture. The colours appear to be more naturalistic, though still highly stylised, than those categorised under the Shanghai style. It seems that the model has prioritised the post-Impressionist elements in the Paris category. (Voorhies, 2004)

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| --- | --- |
|  |  |
| *Paris\_p =*0.667  Chen wen hsi chickens 13 | *Paris\_p =*0.69  Landscape Chen wen hsi 1 |

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|  |
| Paul Cezanne landscape 4 |

The model’s handling of Chen Wen Hsi’s more abstract work brings to light some flaws in the methodology. It is possible that in the Gabor filter, the bolder brushwork is hard to differentiate from the traditional style which has a foreground subject against a more plain backdrop. The harsh contrast leads will mean that traditional brushwork would appear to have the same weight under a Gabor filter.

In the heron paintings that lie on the delineating support vector we observe these two characteristics. The elements of variety in colour tones and the use of bold strokes to depict our subjects.

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|  |  |
| Chen wen hsi egret  Shanghai\_p = paris\_p = 0.5 | Chen wen hsi egrets  Shanghai\_p = paris\_p = 0.5 |

# Learning Points and Possible Improvements

The process of this project has aided us in understanding more about the rather niche part of local history and origin of our country’s art style, grasping the power of these objects of humanistic study. As technological innovations proliferate, we can adopt digital and computational methods to humanities investigations to fortify our research that requires navigating through a sea of data. We have the opportunity to approach labyrinthine issues from multiple perspectives, discovering creative solutions. Additionally, the research has provided us with insights on various art comparison frameworks.

If given the opportunity to redo our project with more time and resources, we would take the time to source for clear and higher quality images. This refinement would get us more accurate data, instead of lowering our dataset’s resolution to the lowest available, may allow the model to better separate Chen Wen Hsi’s more Avant Garde paintings to the more traditional Chinese ink ones. Another enhancement to consider would be to expand the scope of the art style study to include more Nanyang artists other than Chen Wen Hsi for a more sizeable spread of artworks. We can compare Nanyang Art Style with modern trending art styles rather than just those from Shanghai School and Western schools of Paris. This may deduce if Nanyang art style has any significant influences in today’s art style. Surveys will also be a great way to acquire beneficial statistics. What we propose will be to craft a questionnaire style survey to study if Nanyang Art Style is still prominent in the present day.

# Conclusion

Often the art scene and much of its history is left out of the public’s subconscious. Through this coursework, we genuinely wish that our proposal will be able to exacerbate the appreciation and comprehension of the Nanyang Art Style. The potentiality to unsheathe deductions through the comparison of different art styles can assuage us in identifying resemblance and uniqueness in future art styles. Especially with the consistent growth of the flourishing art scene in Singapore, it is crucial to introduce a convenient and efficient procedure for consumers to smoothly tackle comparisons among art movements.

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4. Chen Wen Hsi Source https://chenwenhsi.com/

# Appendix

In the attached zip folder,

* ImageDataProbCat.csv
  + The listing of all the Chen Wen Hsi works predicted by the model
  + We have paris\_p, shanghai\_p for respective probability
  + We have Category 0 = Shanghai, 1 = Paris
* Svc
  + The images that were predicted, the first number is the prediction
    - *0\_chen-wen-hsi-assembling-ducks* Shanghai Category
    - *1\_chen-wen-hsi-ducks-1* Paris Category
* shanghai \_close, paris\_close
  + These folders are those with images that have probability difference of less than 0.1
  + The starting number is the p value
  + If it is shanghai it is the shanghai p value
  + If it is paris it is the paris p value
* Shanghai\_extremes, paris\_extremes
  + These images are those with 90th percentile p value for their respective categorisation
  + If it is shanghai it is the shanghai p value
  + If it is paris it is the paris p value
* Paris
  + Paris dataset
* Shanghai
  + Shanghai dataset