

FRAMING THE CANON

A COMPUTATIONAL STUDY OF CANONICITY IN DANISH GOLDEN AGE PAINTINGS (1750-1870)

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OUTLINE

- 1. Introduction**
- 2. Data & Methods**
- 3. Results**
- 4. Conclusions**



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DYNAMICS OF CANON FORMATIONS

Do paintings become canonical because of their intrinsic aesthetic qualities or as a result of extrinsic forces?

Intrinsic factors:

- Aesthetic quality
- Creativity
- Stylistic features

Extrinsic factors:

- Institutional power
- Political interests
- Social dynamics



INVESTIGATING CANONS

Previous research in art history

- Mainly qualitative approaches
- Quantitative studies do not consider the content of the actual paintings

Our approach

- Examining the intrinsic qualities of canonical and non-canonical artworks from the Danish Golden Age using image embeddings
- Provides empirical and data-driven grounding to the debate



THE DANISH GOLDEN AGE (1750-1870)

Period of artistic innovation, and opening of the National Gallery of Denmark in 1848 (*Statens Museum for Kunst*)



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DATA: STATENS MUSEUM FOR KUNST (SMK)

1,656 digitized artworks from Statens Museum for Kunst (SMK) from 1750-1870

	Paintings		Artists			Museums		Period	
	Color	Gray	Danish	German	Other	Danish	Other	pre-1800	post-1800
Count	1,082	574	165	36	71	52	96	304	1352
Total	1,656		272			148		1,656	

Table: Overview of the SMK dataset used in this study, by digitization type, artist origin, museum affiliation, and rough periodization.



OPERATIONALIZING CANONICITY

- We operationalize canonical status through **exhibition history**
 - the canon is instantiated by acts of **reproduction**

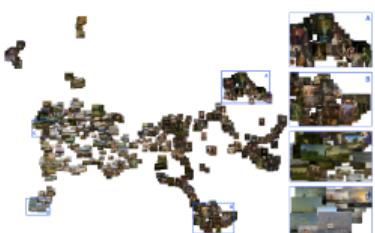
	Color		Grayscale	
	Canon	Non-canon	Canon	Non-canon
Exhibition canon	598	484	641	1,015
SMK exhibitions canon	353	729	369	1,287
On display canon	223	859	227	1,429
Total		1,082		1,656

Table: Overview of canon variables. Note that a painting can appear in multiple canon groups.

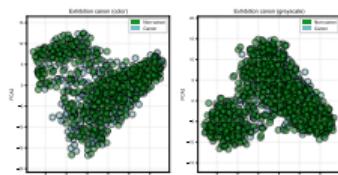


PIPELINE

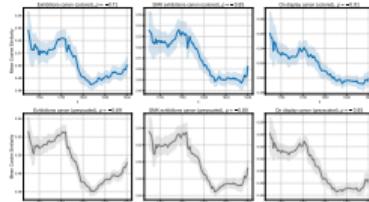
We follow a similar methodological pipeline as Feldkamp et al. [2024] do for modeling canonicity in literary works:



Feature Extraction



Synchronic Comparison



Diachronic Change

	Logistic Regression		MLP Classifier	
	Unbalanced	Balanced	Unbalanced	Balanced
Exhibition canon	0.635 ± 0.038	0.628 ± 0.055	0.696 ± 0.023	0.667 ± 0.038
SMK exhibitions canon	0.63 ± 0.06	0.625 ± 0.046	0.69 ± 0.046	0.654 ± 0.042
On display canon	0.62 ± 0.045	0.55 ± 0.039	0.651 ± 0.047	0.564 ± 0.052

(a) Color embeddings

	Logistic Regression		MLP Classifier	
	Unbalanced	Balanced	Unbalanced	Balanced
Exhibition canon	0.685 ± 0.039	0.682 ± 0.043	0.725 ± 0.039	0.72 ± 0.04
SMK canon	0.659 ± 0.035	0.629 ± 0.027	0.687 ± 0.03	0.639 ± 0.026
On display canon	0.64 ± 0.064	0.572 ± 0.036	0.631 ± 0.074	0.592 ± 0.044

(b) Grayscale embeddings

Supervised Classification



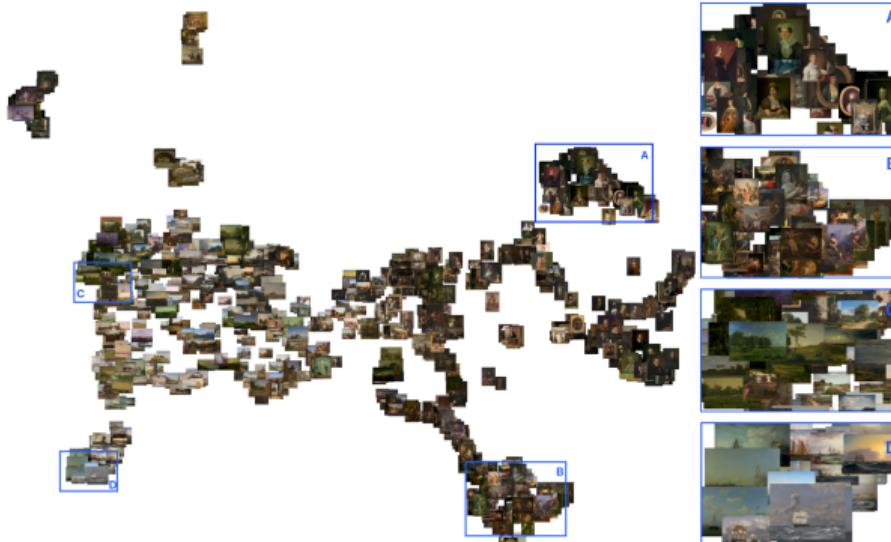
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FEATURE EXTRACTION

We extract image embeddings with *EVA-02-CLIP*



SYNCHRONIC COMPARISON

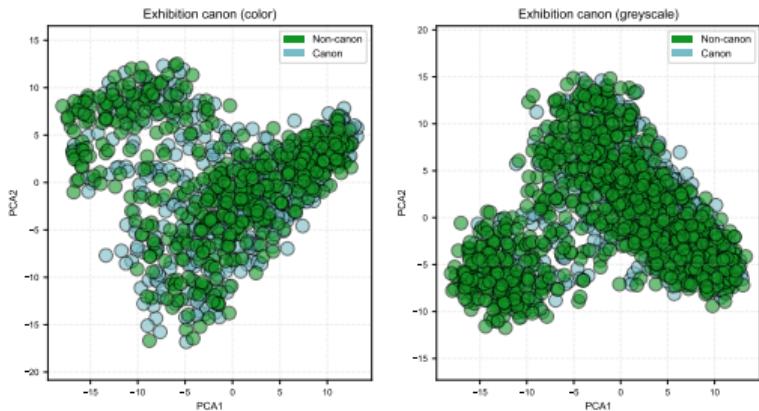
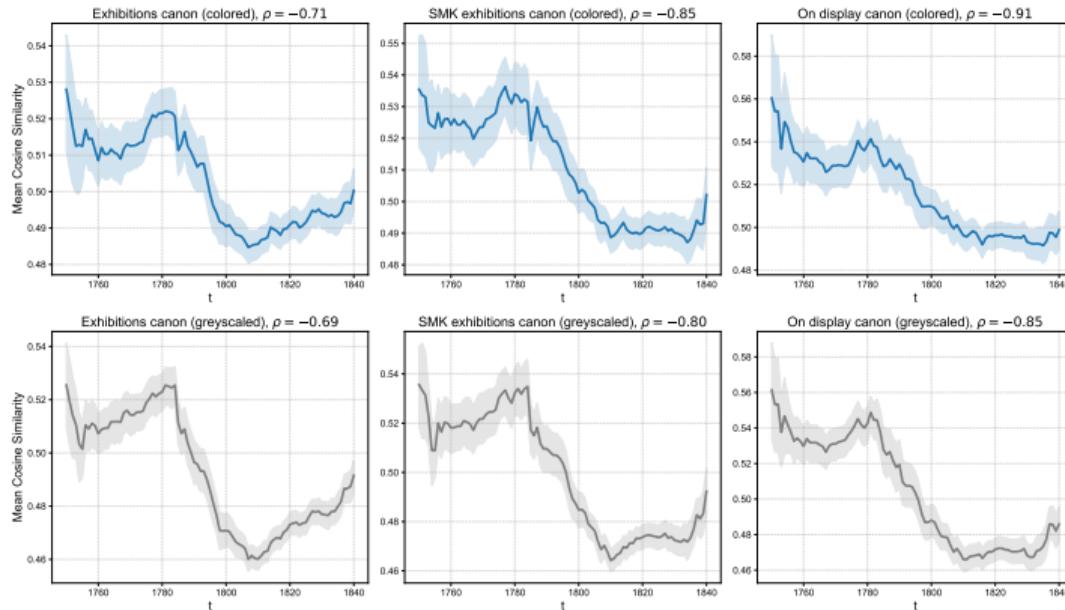


Figure: PCA plots (components n = 2) for 'exhibition canon', color and greyscale



Figure: PCA plot for all paintings, colored

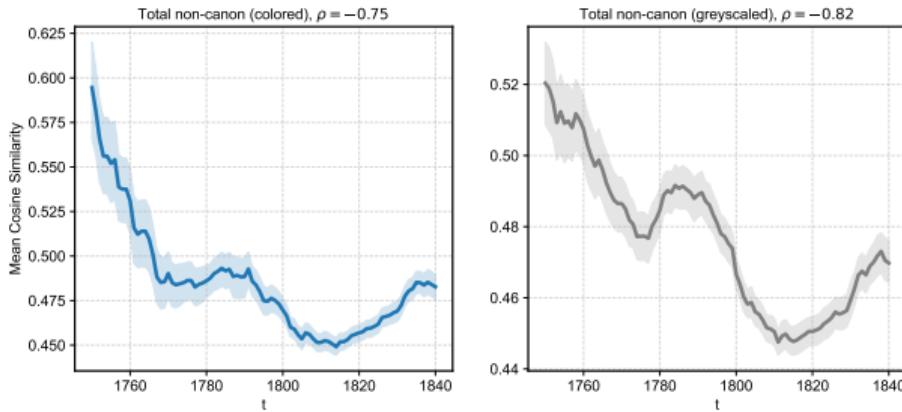
DIACHRONIC CHANGE: INTRA-GROUP SIMILARITY



Intra-group (*within-canon*) similarity in a rolling window (size = 30, step = 1)



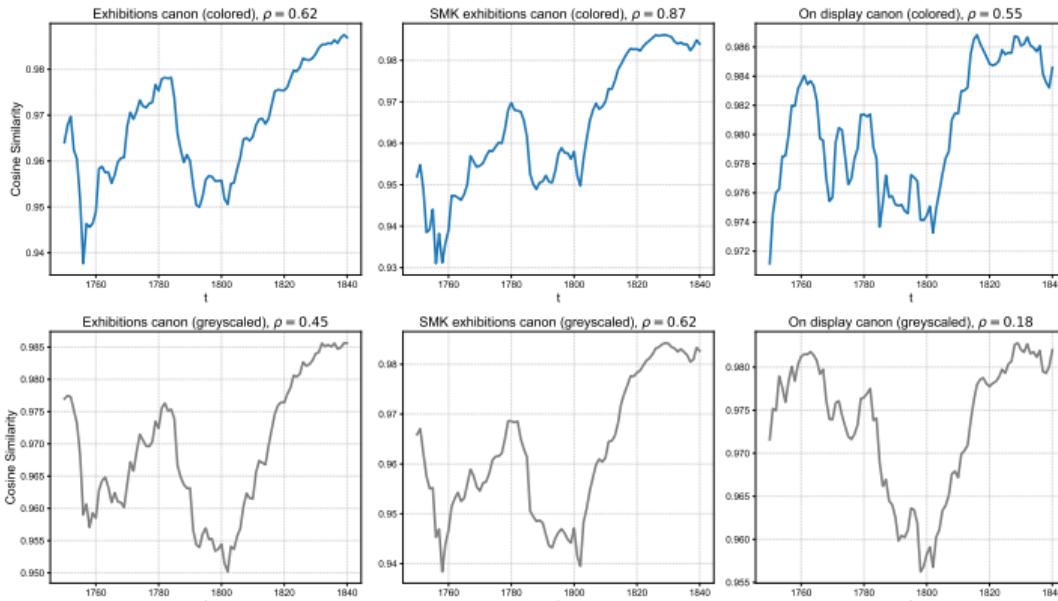
DIACHRONIC CHANGE: INTRA-GROUP SIMILARITY



Intra-group (*within-noncanon*) similarity in a rolling window (*size* = 30, *step* = 1)



DIACHRONIC CHANGE: INTER-GROUP SIMILARITY



Inter-group (*canon vs non-canon*) similarity in a rolling window (size = 30, step = 1)



SUPERVISED CLASSIFICATION

- Binary classification of canon vs non-canon for each canon label
- Table shows the mean K-fold ($K = 10$) cross validated macro F1 scores
- Subtle, but above chance distinction between canon and non-canon embeddings

	Logistic Regression		MLP Classifier	
	Unbalanced	Balanced	Unbalanced	Balanced
Exhibition canon	0.635 ± 0.028	0.628 ± 0.055	0.666 ± 0.023	0.667 ± 0.028
SMK exhibitions canon	0.63 ± 0.06	0.625 ± 0.046	0.69 ± 0.046	0.654 ± 0.042
On display canon	0.62 ± 0.045	0.55 ± 0.039	0.651 ± 0.047	0.564 ± 0.052

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(b) Grayscaled embeddings

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CONCLUSION

- Synchronic comparison shows no difference between canonical and non-canonical works for the first principal components
- Diachronic results do not suggest that canonical artworks introduce novel motifs or trends adopted by non-canonical works and do suggest that the two groups become more similar over time
- Supervised classification shows above-chance results, indicating that we cannot dismiss the hypothesis that there are *some* inherent aesthetic characteristics in canonical art for our subset



IMPLICATIONS & LIMITATIONS

- Unlike Feldkamp et al. [2024] do for canonical literature, we do not find evidence that canonical artworks introduce trendsetting motifs
 - Might be due to **medium-specific differences**: literature's broader distribution and consumption versus the visual arts' historical exclusivity and institutional containment
- Are we simply modeling *in-group* differences if all paintings in our sample carry a 'canonical' quality? I.e., a '**canon of the canon**'?
- Biases in museum practices: SMK's digitization efforts favor canonical paintings – higher quality digitization of culturally recognized works



THANK YOU

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SLIDES

[https://github.com/centre-for-humanities-computing/canon-paintings-smk/blob/
main/CHR_canon_paintings_presentation.pdf](https://github.com/centre-for-humanities-computing/canon-paintings-smk/blob/main/CHR_canon_paintings_presentation.pdf)



Feldkamp, P., Lassche, A., Kostkan, J., Kardos, M., Enevoldsen, K., Baunvig, K., and Nielbo, K. (2024). Canonical Status and Literary Influence: A Comparative Study of Danish Novels from the Modern Breakthrough (1870–1900). In Hämäläinen, M., Öhman, E., Miyagawa, S., Alhajjar, K., and Bizzoni, Y., editors, *Proceedings of the 4th International Conference on Natural Language Processing for Digital Humanities*, pages 140–155, Miami, USA. Association for Computational Linguistics.

