Human classification of depicted materials in paintings

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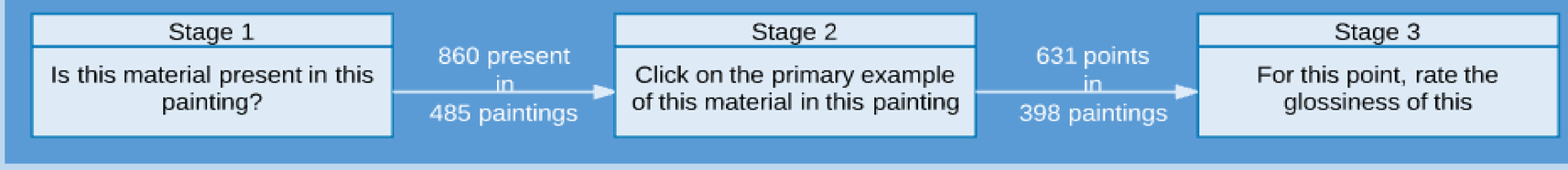
Introduction

Artists are capable of realistically rendering materials, and have been able to do so for hundreds of years. This implies a body of knowledge related to material depiction and perception exists within painters' expertise. Here we make a first step towards gathering this expertise and translating it to knowledge for perception. At this preliminary stage we've collected perceived glossiness judgements from seven materials depicted in paintings using a crowd sourced data gathering approach.

Method

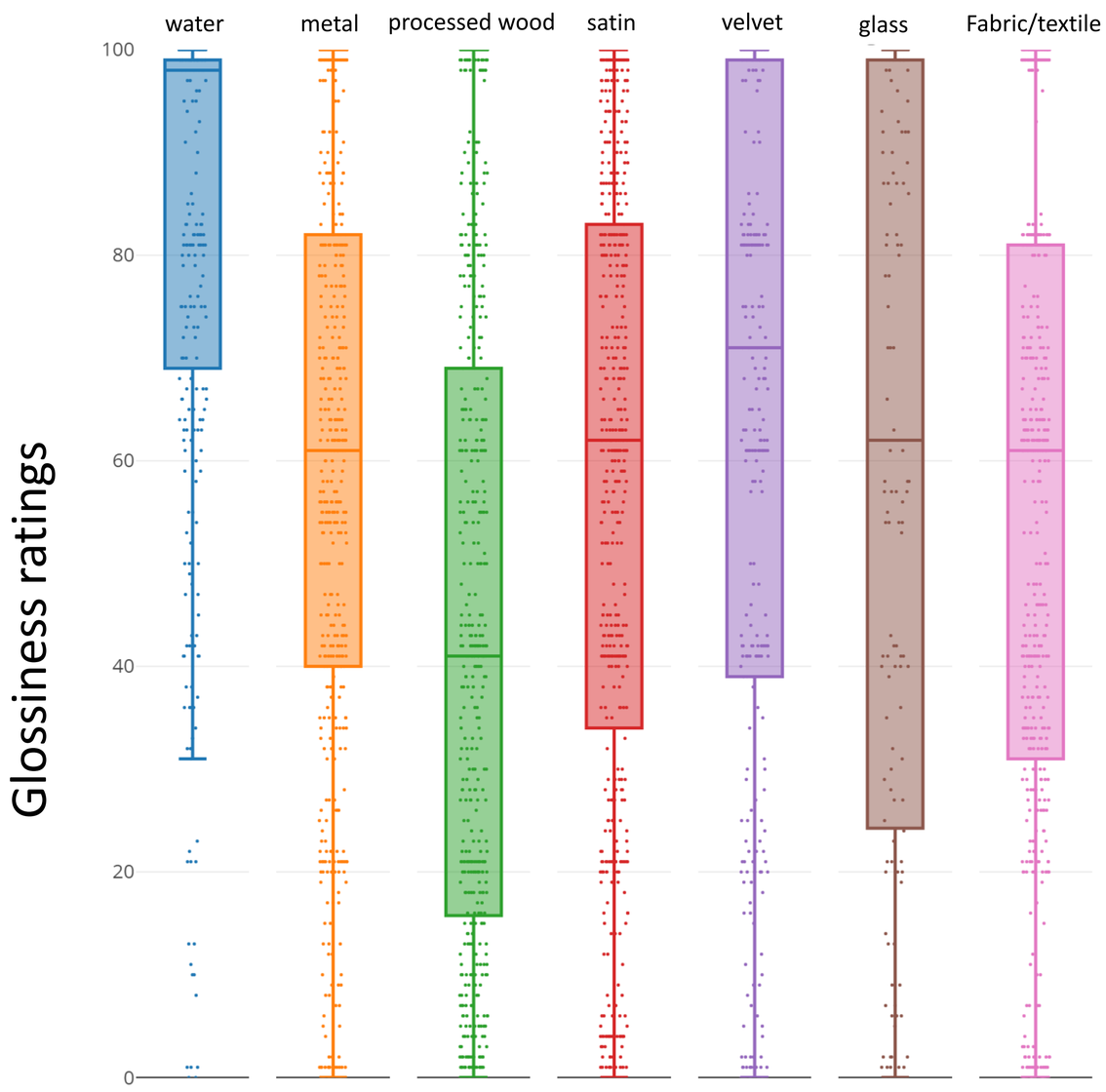
Data collection consisted of three stages, each performed by Amazon Mechanical Turk workers. In the first stage, we asked multiple workers whether or not water, velvet, glass, metal, satin, fabric/textile, processed wood were present for each painting, for one material at a time. If the ratio between yes/no was 0.8 or higher, other workers would proceed to mark this material in the second stage using a mouse-click. In the third stage, other workers would be presented with a painting, and asked to judge the glossiness of this material using a continuous scale, provided with 6 labels ranging from "Not" to "Extremely glossy". In this way, we collected 631 marks across seven materials. Each marked material was judged by an average of 4.7 workers on perceived glossiness, resulting in just under 3000 glossiness judgements. In total 739 workers participated. The painting-stimuli were a subsection of the open-access collection of the Metropolitan Museum of Art.



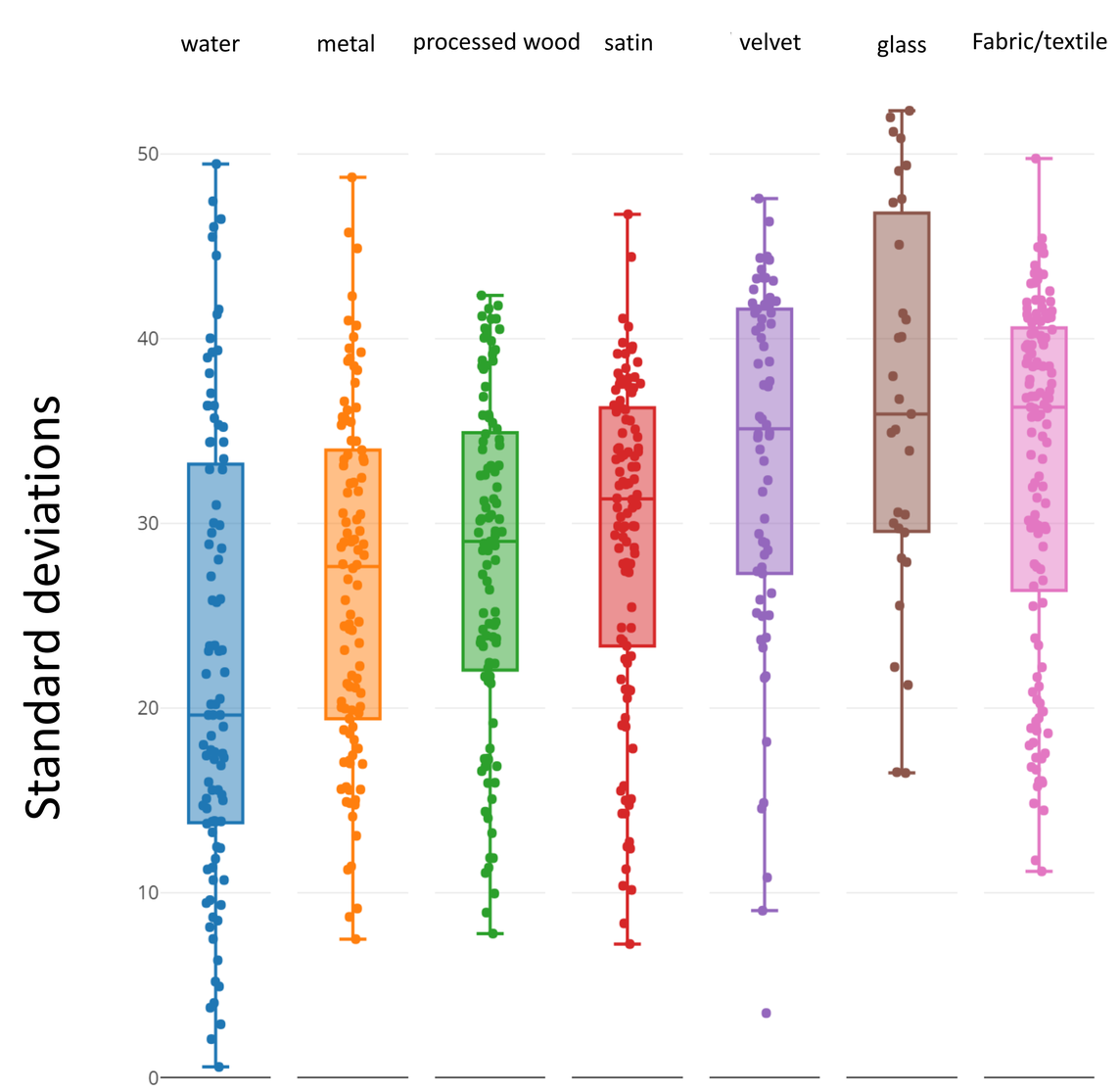
Analysis

To quantify whether some materials are (depicted) more glossy than others, we plotted the glossiness ratings per category. Furthermore, we were interested in whether certain material categories are depicted less ambiguous than others. To assess ambiguity, we calculated standard deviations per stimulus across (approximately) 5 raters.

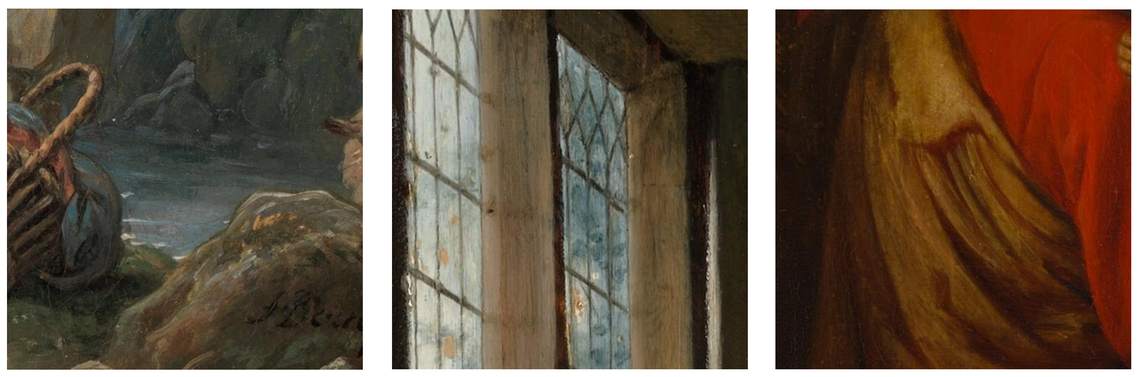
Distribution of glossiness ratings per material



Interobserver agreement



Low glossiness



Water | Glass | Satin

High glossiness

Water | Glass | Satin

Discussion

The distributions of the glossiness ratings showed differences between materials, yet overall displayed a medium or higher glossiness. Water was judged as most glossy with an average of 98. Velvet and glass were also perceived to be highly glossy, as both top quartiles were above 99. Fabrics/textile and satin overall appeared less glossy than velvet.
Water showed the strongest inter-observer agreement, with an average standard deviation of 19.
Fabric/textile showed the smallest inter-observer agreement, which makes sense considering the visual diversity found within fabrics and textiles.

Acknowledgement

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