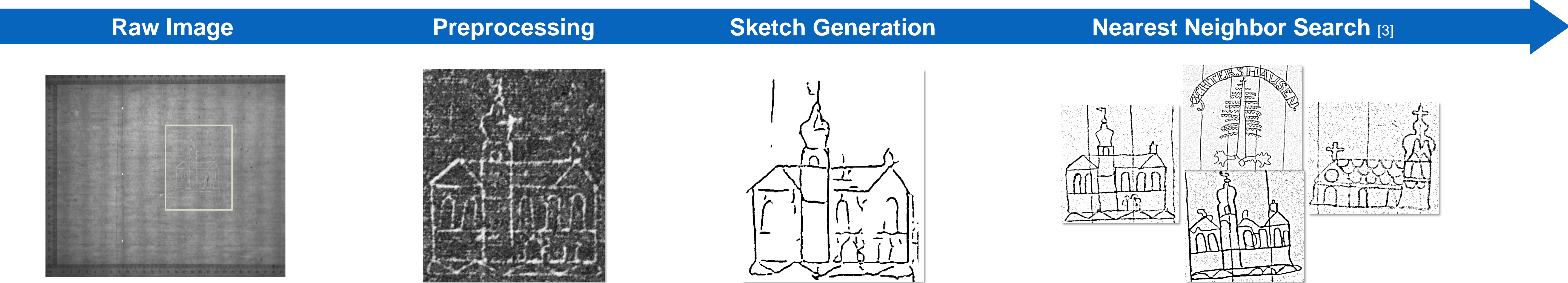


Detection and Classification of Historic Watermarks

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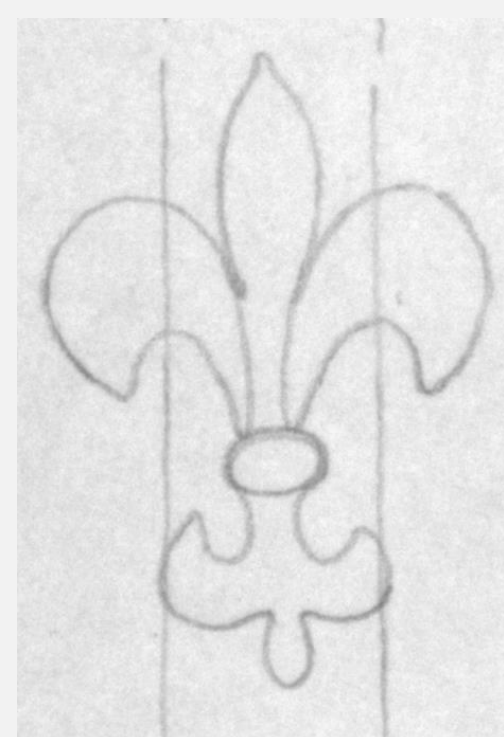
Motivation

- Historians deduce a paper's origin from dated documents with identical watermarks
- Many watermarks are digitized and available online
- **Finding specific watermarks for non-experts is difficult**
- For experts, it is a **manual, slow, and costly process**
- DNB currently answers requests it gets by mail manually

History [1], [4]



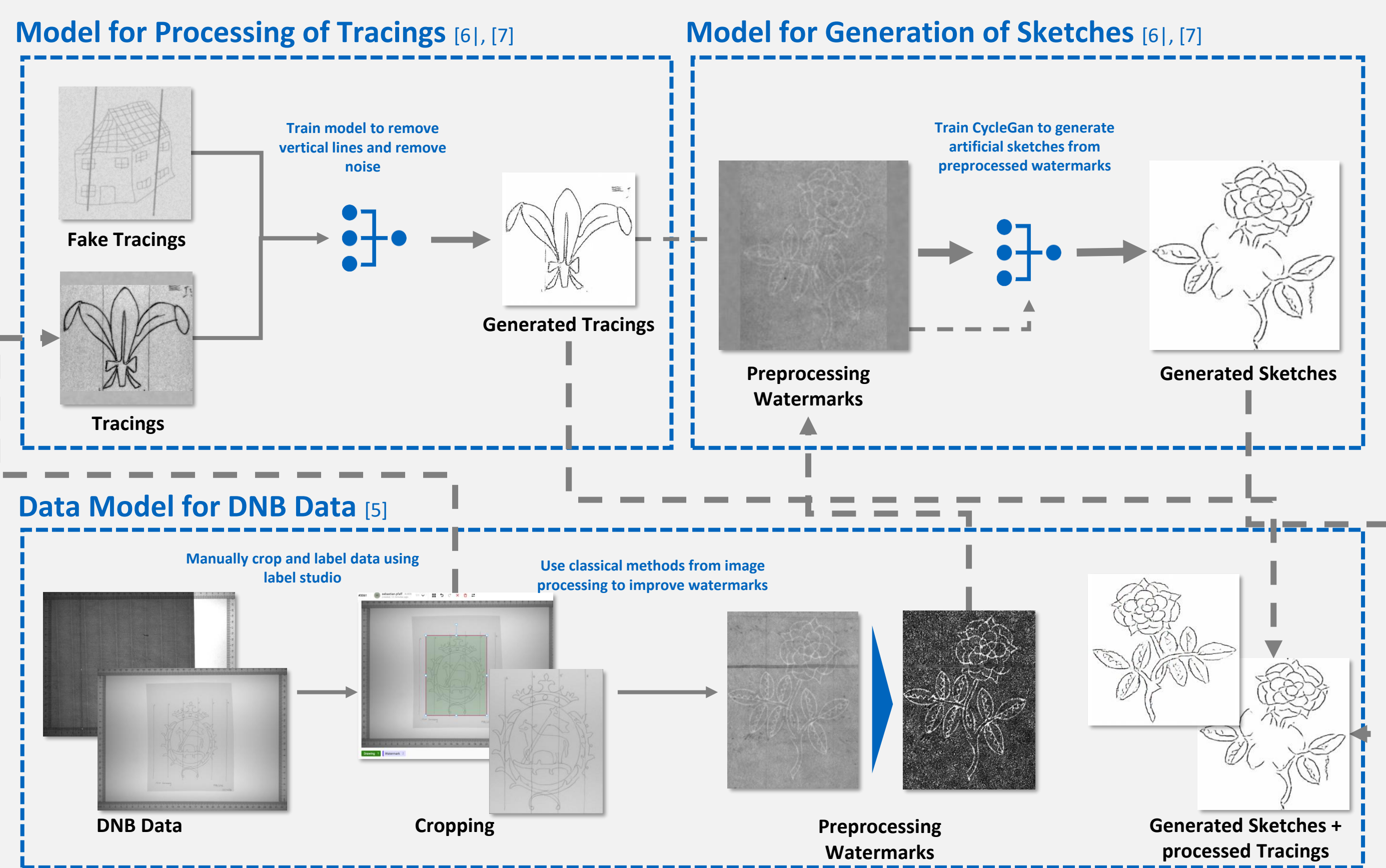
- A pulp from dissolved rags was pressed through meshed frames, then dried and glazed
- The frames often contained symbols stitched onto them using wires. These symbols are visible on the finished paper
- High quality paper was very expensive, thus papermakers wanted to "brand" their products
- Watermarks were historically often collected as tracings



Watermarks

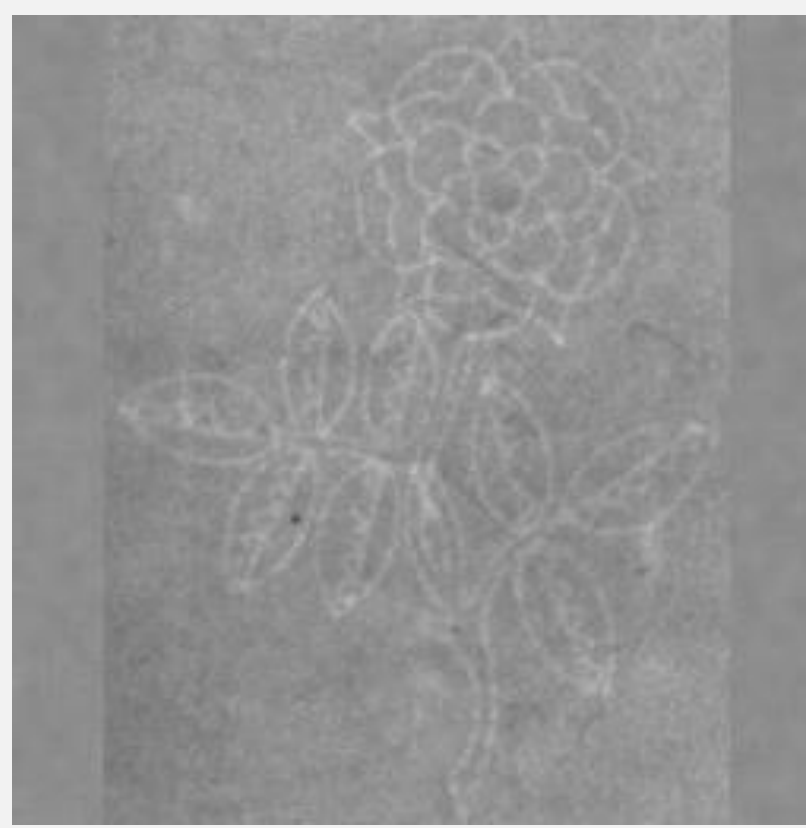
Tracings

Pipeline



Results

Qualitative results



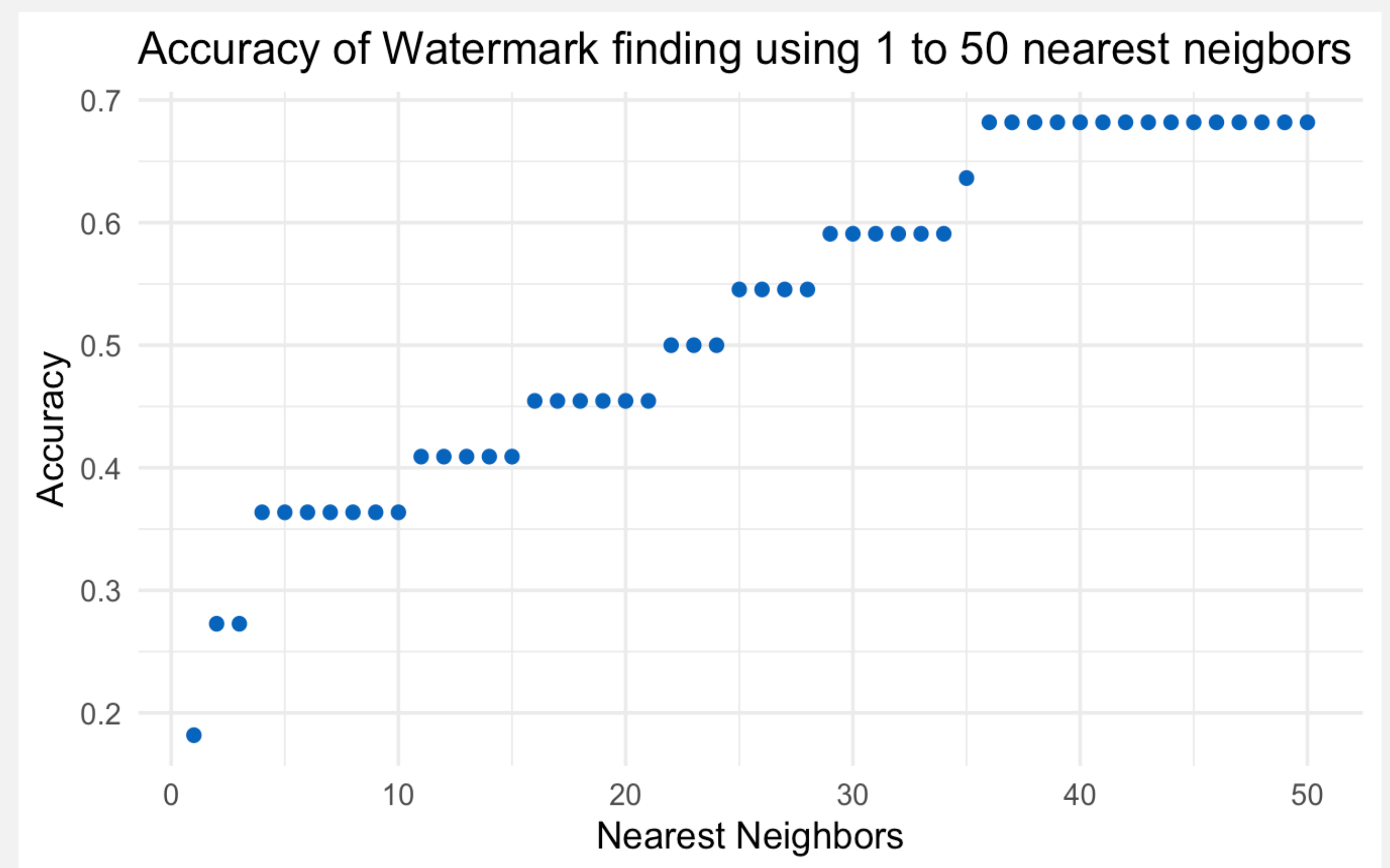
Watermark

Artificial tracing

Human tracing

Quantitative results

- **68% accuracy** for 50 nearest neighbors
- **54% accuracy** for 25 nearest neighbors



Use Cases

- Historians may find the origin of paper more effectively. Thus, reducing the workload on watermark experts, and easing a major bottleneck in historical research
- Group and compare watermarks quicker and more efficiently
- Enables non-experts to search for watermarks effectively
- Add new images without the need to retrain the model
- Explore watermarks in the dataset of watermarks and tracings

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- [5] Deutsche Nationalbibliothek. 2023. *Historical Paper Collections*. 06. <https://www.dnb.de/EN/Sammlungen/DBSM/PapierhistorischeSammlungen/papierhistorischeSammlungen>.
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