



# **Automatic Handwriting Analysis**

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Pattern Recognition Lab, Friedrich-Alexander University of Erlangen-Nuremberg October 30th, 2018



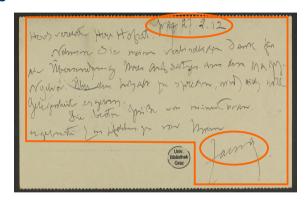


### **Handwriting Analysis**

Who?

Script Type?

Category?



When?

Where?

What?

Source: University Library Graz, Department for Special Collections, legacy of Hugo Schuchardt, id 12977;

Vincent Christlein | Automatic Handwriting Analysis



When?

Where?

What?

# **Handwriting Analysis**

Who?

Script Type?

Category?



Source: CLaMM'16 [1], id: IRHT\_P\_009806



## **Handwriting Analysis**

Who?

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When?

Script Type?

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Where?

Category?

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What?

 $\Rightarrow$  Need expert in history / paleography / forensics!

Source: CLaMM'16 [1], id: IRHT\_P\_009806



When?

Where?

What?

## **Handwriting Analysis**

Who?





Script Type?



Category?



- $\Rightarrow$  Need expert in history / paleography / forensics!
- ⇒ Time and cost intensive
- ⇒ (Semi-)Automatic methods needed



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Who?



When?

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What?

- ⇒ Need expert in history / paleography / forensics!
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#### State of the Art in Writer Identification I

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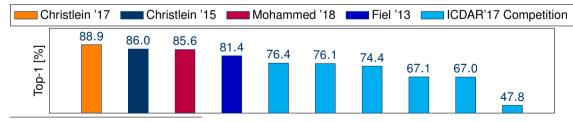
- ICDAR'13 benchmark dataset: 250 writers, 4 samples each
- Top 1: 99.6% accuracy
- All 3 among first 3 hits: 77% accuracy



#### State of the Art in Writer Identification II

• ICDAR'17 Historical-WI: 720 writers, 5 samples each





V. Christlein, M. Gropp, S. Fiel, et al., "Unsupervised Feature Learning for Writer Identification and Writer Retrieval", in ICDAR, 2017



# **Classification of Latin Medieval Manuscripts (CLaMM)**

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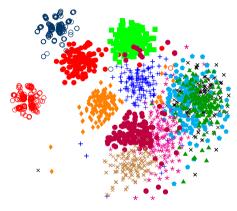
Source: http://clamm.irht.cnrs.fr/script-classes

2000 images, 12 script types (Uncial, Praegothica, Cursiva, . . .)

F. Cloppet, V. Églin, V. C. Kieu, et al., "ICFHR2016 Competition on the Classification of Medieval Handwritings in Latin Script", in ICFHR, 2016



## **Script Type Classification**



- Caroline
- × Cursiva
- o Half-Uncial
- + Humanistic
- Humanistic cursive
- Hybrida
- Praegothica
- ▲ Semihybrida
- \* Semitextualis
- Textualis
- × Textualis meridionalis
- Uncial

- Supervised: 85% accuracy
- Unsupervised: Model selection for OCR/HTR

M. Kestemont, V. Christlein, and D. Stutzmann, "Artificial Paleography: Computational Approaches to Identifying Script Types in Medieval Manuscripts", Speculum, vol. 92, 2017



# **Summary**

## Visual image retrieval/classification

- Large-scale analysis
- Meta-data acquisition
- Assisting the expert
- Model selection for OCR/HTR



- Caroline
- × Cursiva
- o Half-Uncial
- + Humanistic
- Humanistic cursive
- Hybrida
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- ▲ Semihybrida
- \* Semitextualis
- Textualis
- \* Textualis meridionalis
- Uncial

# Thank you for your attention!







# References





#### References I

- [1] F. Cloppet, V. Églin, V. C. Kieu, D. Stutzmann, and N. Vincent, "ICFHR2016 Competition on the Classification of Medieval Handwritings in Latin Script", in *ICFHR*, 2016.
- [2] V. Christlein and A. Maier, "Encoding CNN Activations for Writer Recognition", in DAS, 2018.
- [3] V. Christlein, M. Gropp, S. Fiel, and A. Maier, "Unsupervised Feature Learning for Writer Identification and Writer Retrieval", in *ICDAR*, 2017.
- [4] M. Kestemont, V. Christlein, and D. Stutzmann, "Artificial Paleography: Computational Approaches to Identifying Script Types in Medieval Manuscripts", *Speculum*, vol. 92, 2017.