Automatic Egyptian Hieroglyph Recognition by Retrieving Images as Texts

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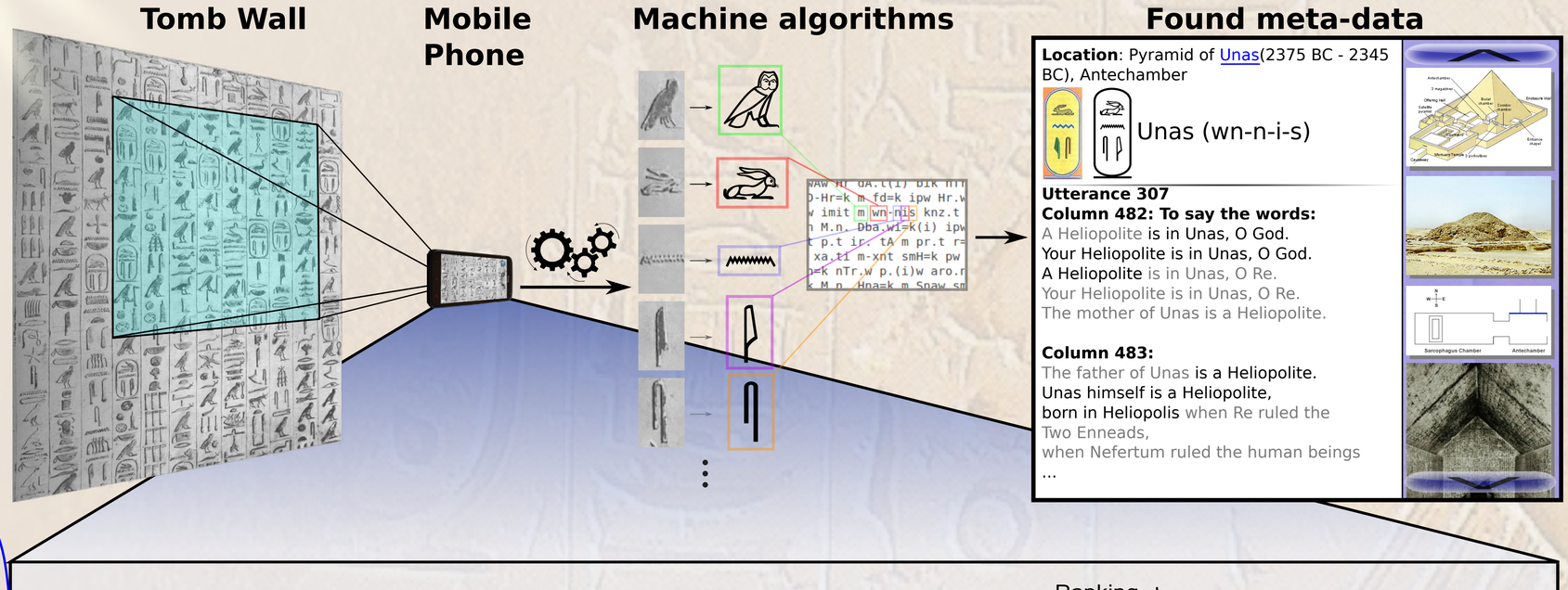
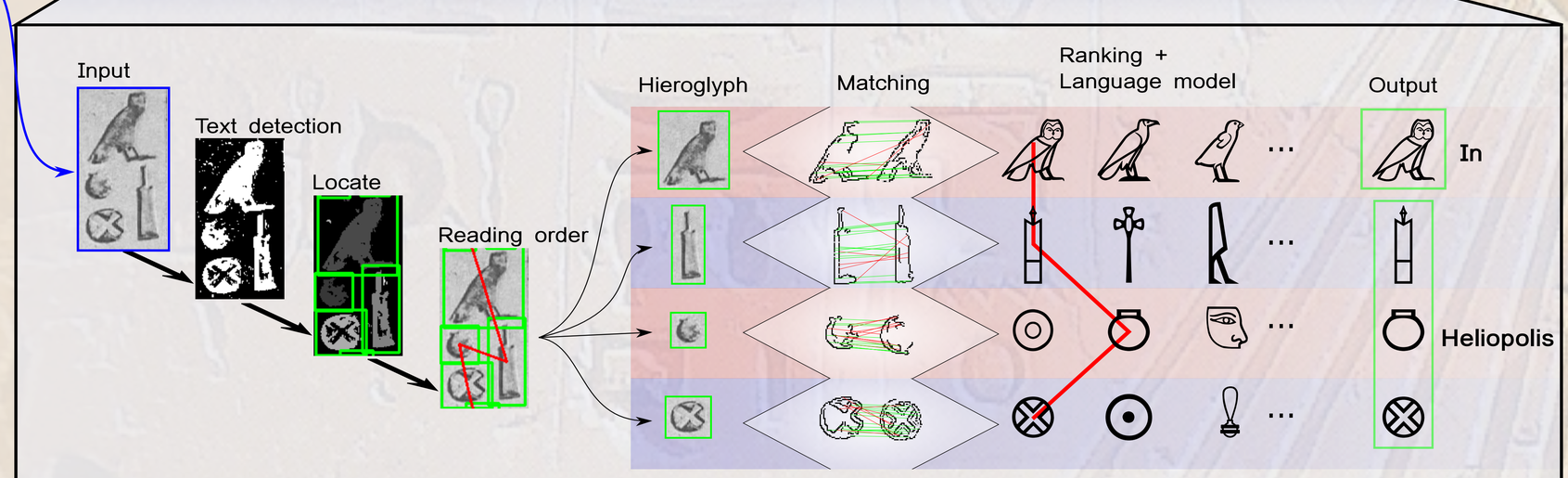
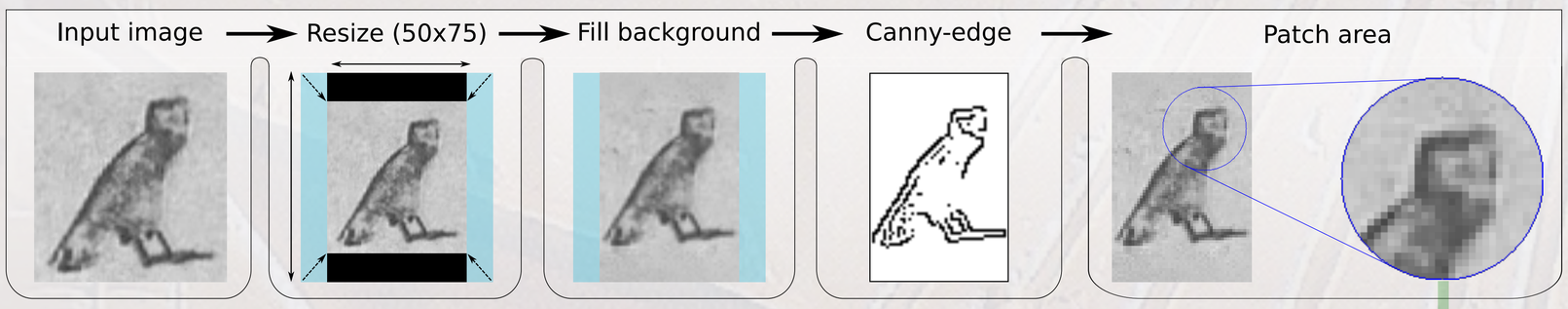
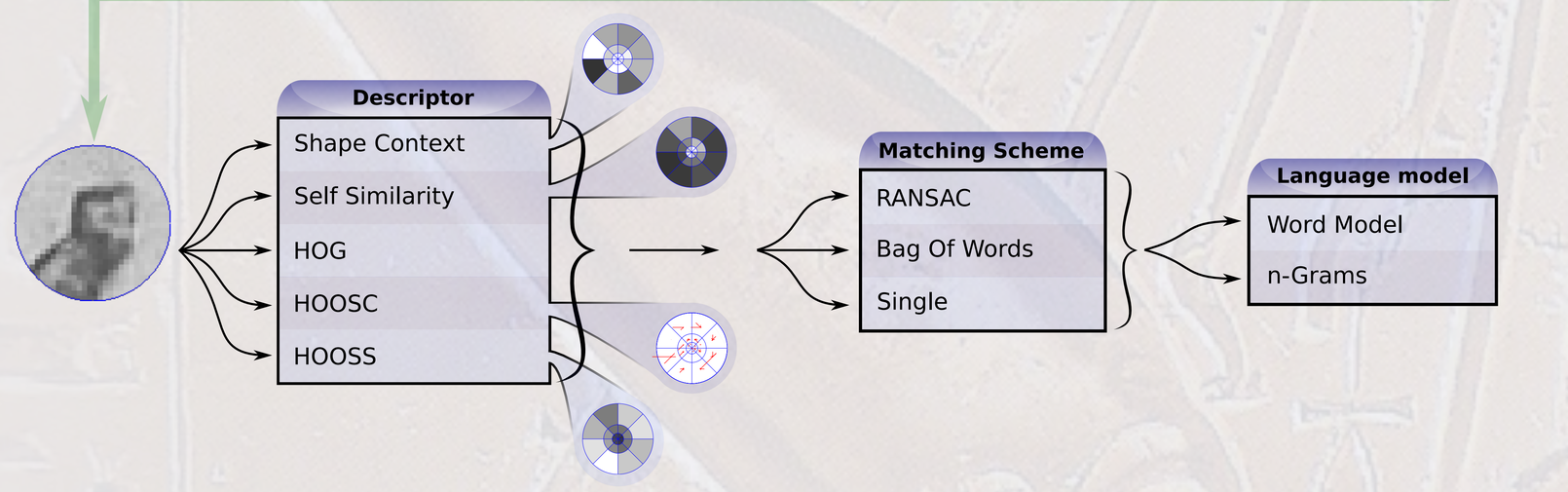
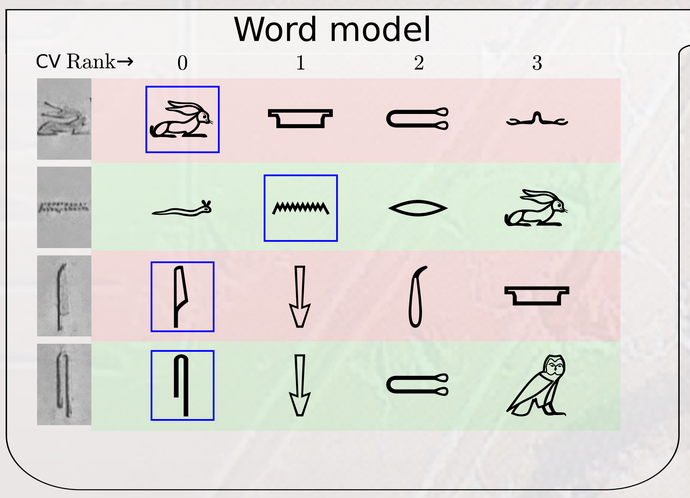
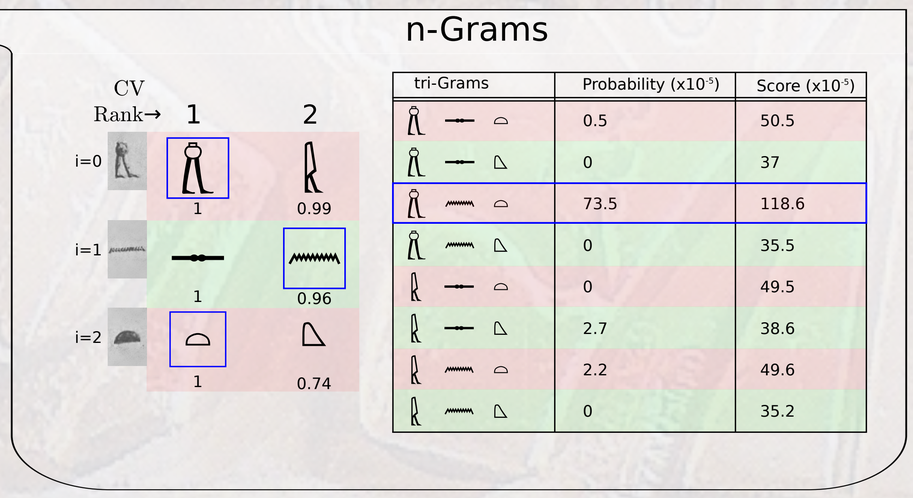




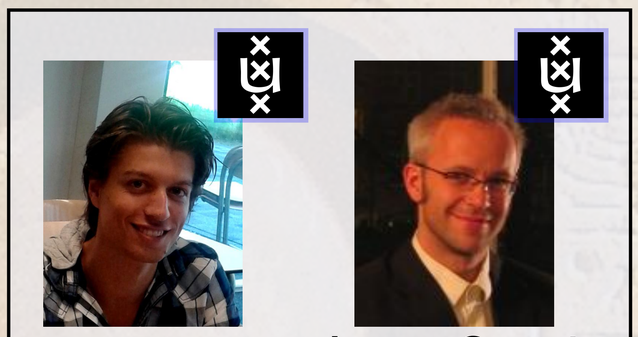








tri-Grams	Probability (x10⁻⁵)	Score (x10⁻⁵)
	0.5	50.5
	0	37
	73.5	118.6
	0	35.5
	0	49.5
	2.7	38.6
	2.2	49.6
	0	35.2



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Pipeline
Hieroglyphs are detected, matched to a database and ranked.
A language model is used to refine the proposed ranking.

Pre-processing
Individual Hieroglyph images are rescaled to 50x75, while synthesizing a plausible background. Descriptors are computed on responses of the Canny edge detector.

Descriptors
Five descriptors are implemented, along with three different matching schemes. The matching result is refined by two possible statistical language models.

Language Models
Two options are evaluated:
1. Word model: a dictionary-based approach where common words are matched using a look-up table
2. n-Gram model: sequential Hieroglyph co-occurrence frequencies are counted up to three subsequent glyphs (trigrams).
   In this example, the correct translation is ‘Unas’ which is the name of a Pharaoh.

Results
89% recognized from manually detected hieroglyphs and 70% recognized correctly with automatic detection.