Similarity versus Supervision: Best Approaches for HS Code Prediction

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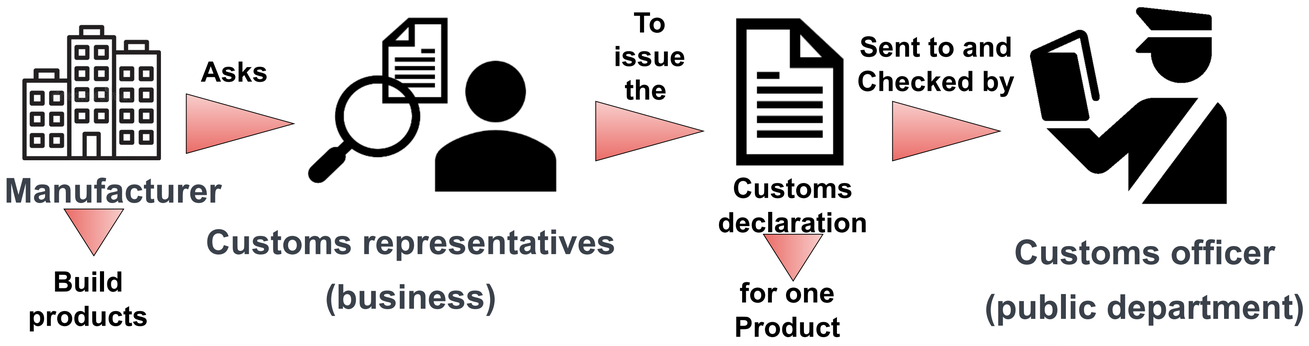
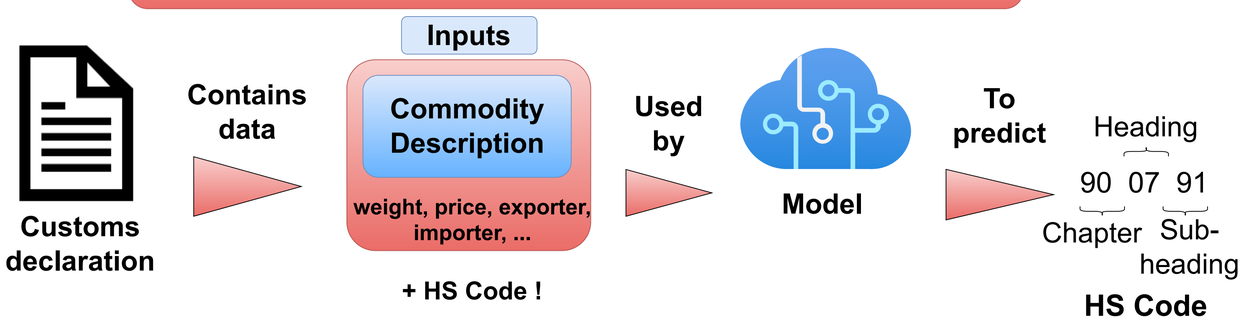
POLYTECH MONS

e-Origin

00 - THE CONTEXT

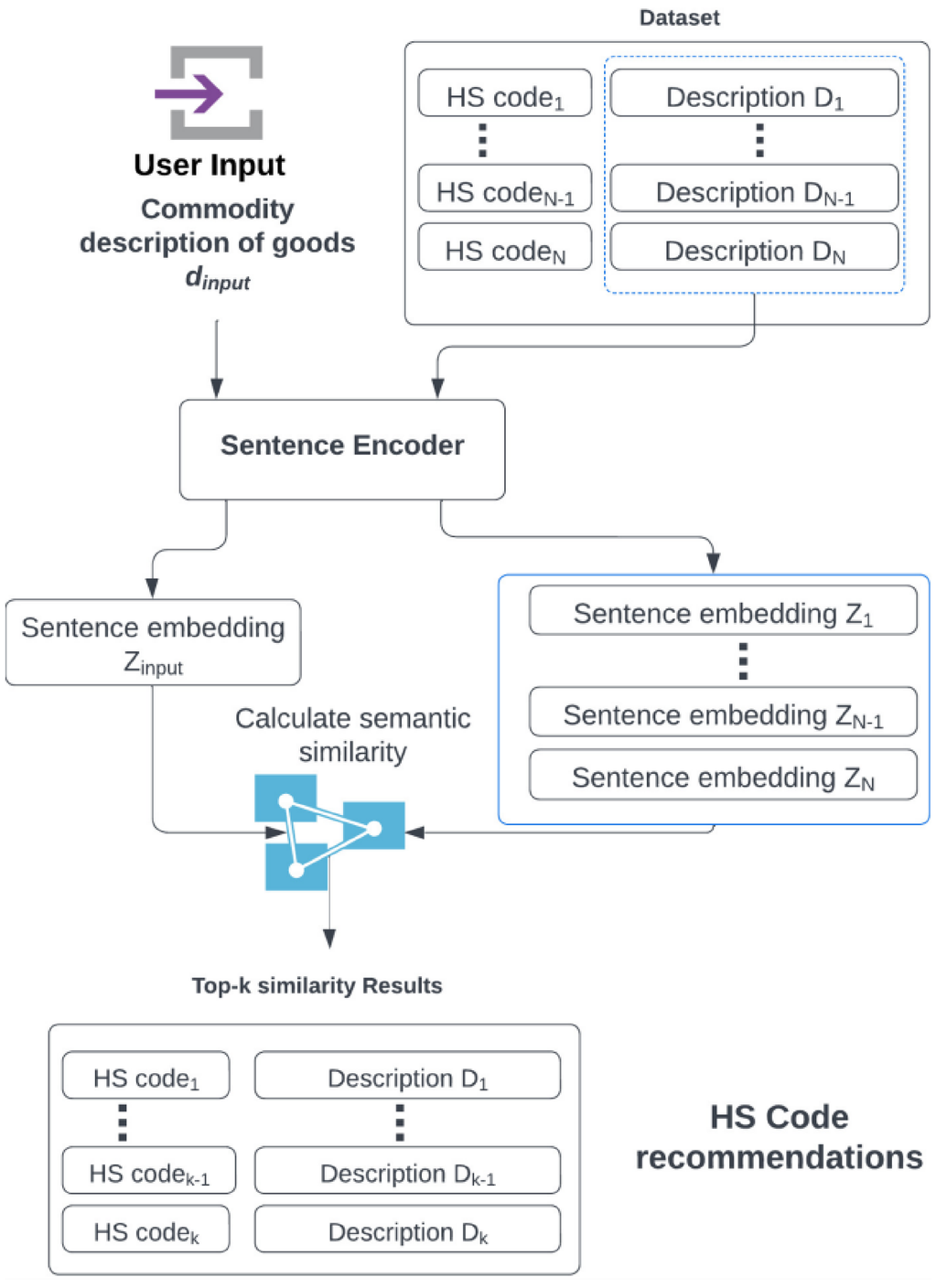


01 - THE TASK

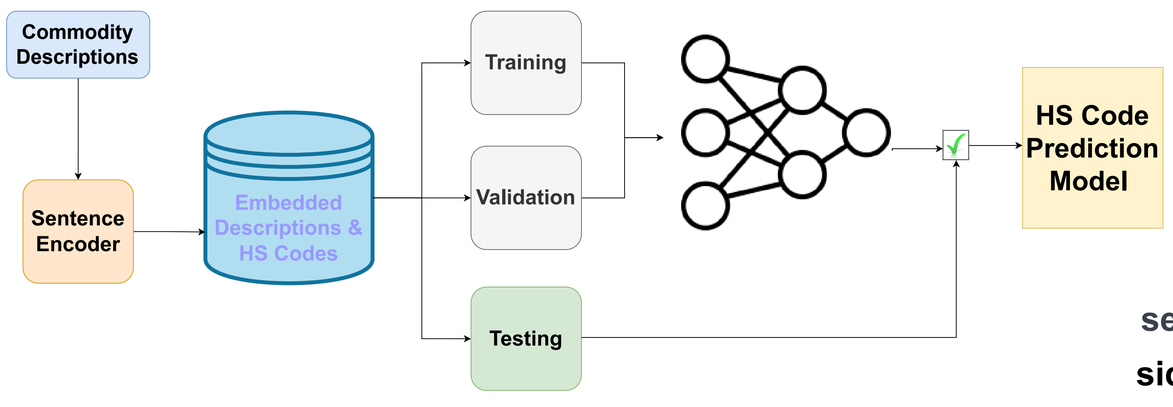


02 - THE APPROACHES

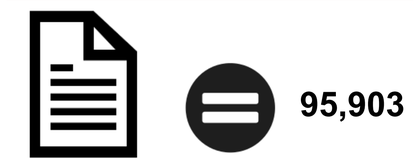
02.1 - SIMILARITY-BASED APPROACH



02.2 - SUPERVISION-BASED APPROACH



03 - DATASETS



04 - RESULTS

04.1 - SIMILARITY-BASED

# of digits	Top-k k=1	Top-k k=3	Top-k k=5	Model	Metric
6	**0,647**	0,900	0,956	MiniLM[3]	Chebyshev
	0,644	**0,910**	**0,961**	MiniLM[4]	Euclidean
	0,644	0,908	**0,961**	MiniLM[4]	Minkowski
8	**0,621**	0,878	0,950	DistilUSE[5]	Manhattan
	0,620	**0,889**	**0,952**	MiniLM[4]	Euclidean
	0,620	0,887	0,951	MiniLM[4]	Minkowski
10	**0,621**	0,883	0,947	DistilRoberta[6]	Manhattan
	0,618	0,880	0,947	MiniLM[7]	Manhattan
	0,617	**0,890**	**0,948**	MPNet[8]	Cosine

Table 1: Top-1, top-3, and top-5 accuracy of the semantic similarity-based approach with respect to the sentence embedding model and distance metric used.

- **Top-1 vs. Top3: many HS codes can be linked to one description**
- **<u>Resilience</u> to HS code complexity (HS6 to HS10)**
- **<u>Recommendation for each HS code</u> available**

04.2 - SUPERVISION-BASED

# of digits	Min. data / class	# of classes	Top-k k=1	Top-k k=3	Top-k k=5	Model
6	600	13	0.838	0.930	0.933	MiniLM[3]
	400	34	0.575	0.649	0.718	
	50	209	0.302	0.319	0.330	
8	600	13	0.844	0.885	0.918	MiniLM[9]
	400	33	0.633	0.662	0.664	
	50	209	0.282	0.294	0.316	
10	600	13	0.895	0.926	0.928	MiniLM[3]
	400	32	0.629	0.703	0.710	
	50	209	0.336	0.353	0.364	

Table 2: Top-1, top-3, and top-5 accuracy of supervised models with respect to the minimum number of samples per class.

- **<u>Performance drops with fewer min. samples per class</u>**
- **30% top-1 acc. for 209 classes ----- Similarity : 60% top-1 for 1,196 classes**
- **Added difficulty : Handling out-of-distribution classes**

06 - CONCLUSION

<u>Similarity-based approach</u> : MPNet achieves 89% and 94.8% top-3 and top-5 acc. across 1,196 classes for HS10 prediction

<u>Supervised-based approach</u> : worse performance + not scaling well with classes + not handling out-of-distribution classes

07 - CONTACT DETAILS

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