Improving Embeddings Representations for Comparing Higher Education Curricula: A Use Case in Computing

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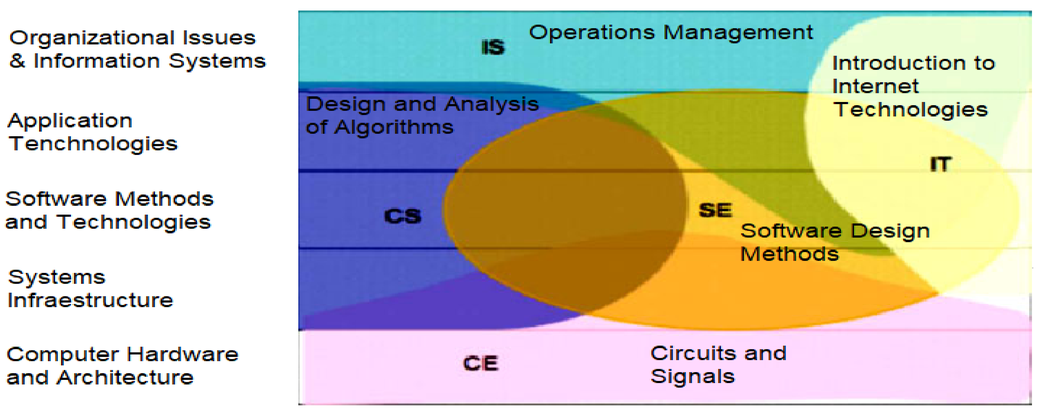
Motivation

- Several stakeholders in education **compare and assess curricula**, such as Governments aiming to **improve the competitiveness** of their local programs.
- To aid higher education stakeholders, we propose a method that **automatically compares curricula** and allows **human interpretability**.

Key idea



ACM/ IEEE STANDARD

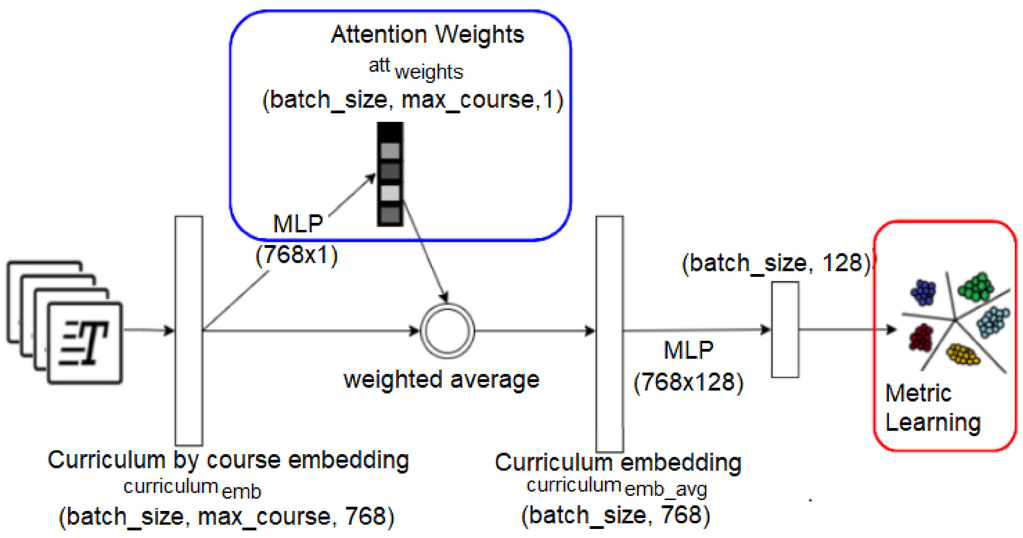
Dataset Collection

We consider five computing careers: Computer Science, Computer Engineering, Information Technology, Information Systems, and Software Engineering.

	USA		LATAM	
Career	#Curr.	Avg. #courses	#Curr.	Avg. #courses
CS	100	48.38±25.82	18	69.00 ± 18.90
CE	98	53.71±22.10	-	-
IT	37	43.10±16.91	-	-
IS	34	40.38±15.60	-	-
SE	27	46.25±13.62	-	-
Total	296	49.67±33.69	18	69.00 ± 18.90

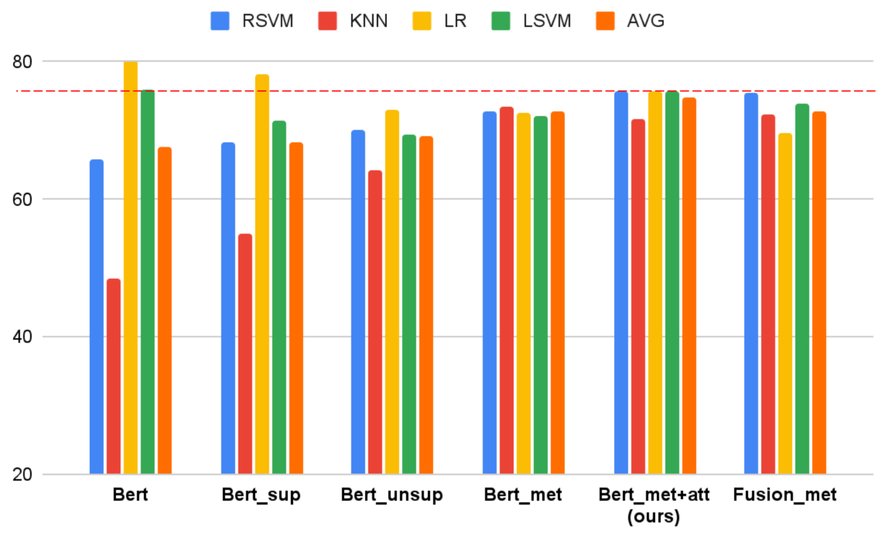
Approach

- **Course-Based attention**: Identifies the most and the least important courses following the intuition of core and elective courses.
- **Metric Learning**: Learns boundaries to form well-defined groups.



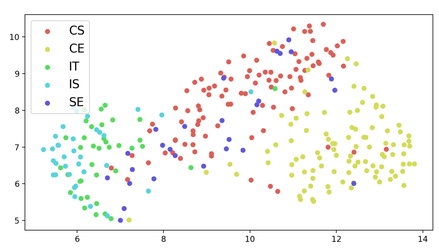
Quantitative Experiments

- Our approach $Bert_{met+att}$ outperforms competitive baselines.

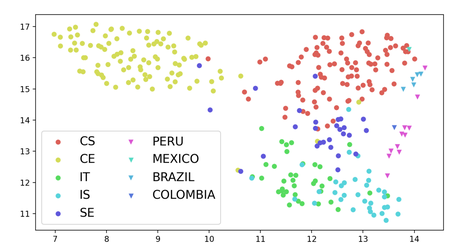


Embeddings Visualization

- Our approach separates computing programs more clearly than $Bert$.



(a) $Bert$

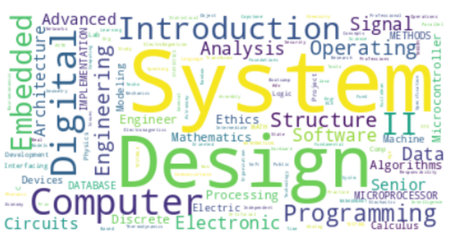


(b) $Bert_{met+att}$

Attention Weigths Visualization

- Our approach identifies core courses per computing career.

(a) CS



(b) CE

(c) IT

(d) IS

Contributions

- A novel dataset of US computing curricula and relevant programs from Latin America.
- An examination of attention, metric learning, and BERT modules to generate more an intuitive representation.
- An application that compares computing curriculum to international standards.