Feedforward-Aided Course Designs for Similarity Search

Thomas Hütter and **Daniel Kocher**
University of Salzburg, Austria

2nd Int. Workshop on Data Systems Education (DataEd'23)
Seattle, WA, USA September 26, 2023

database research group

PARIS LODRON UNIVERSITÄT SALZBURG

FWF Österreichischer Wissenschaftsfonds

tdt

Introduction

Course Facts:

- *Similarity Search in Large Databases*
- 2.5 ECTS (≈ 62.5 hours), 20–30 Master's level students per year
- Distance measures, lower/upper bounds, and similarity indexes

[1] Bayardo et al. *Scaling up all pairs similarity search.* WWW 2007. https://doi.org/10.1145/1242572.1242591

Introduction

Course Facts:

- *Similarity Search in Large Databases*
- 2.5 ECTS (≈ 62.5 hours), 20–30 Master's level students per year
- Distance measures, lower/upper bounds, and similarity indexes

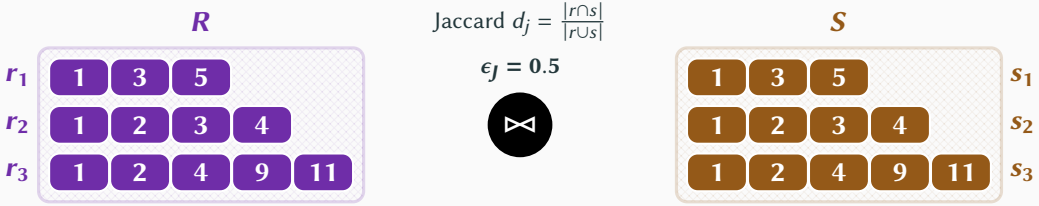
Learning by Design ■ Functional Artifact ■ Set Similarity Joins[1]

[1] Bayardo et al. *Scaling up all pairs similarity search.* WWW 2007. https://doi.org/10.1145/1242572.1242591

Set Similarity Joins

Given two collections R and S, a distance threshold ϵ under a function $d(.,.)$:

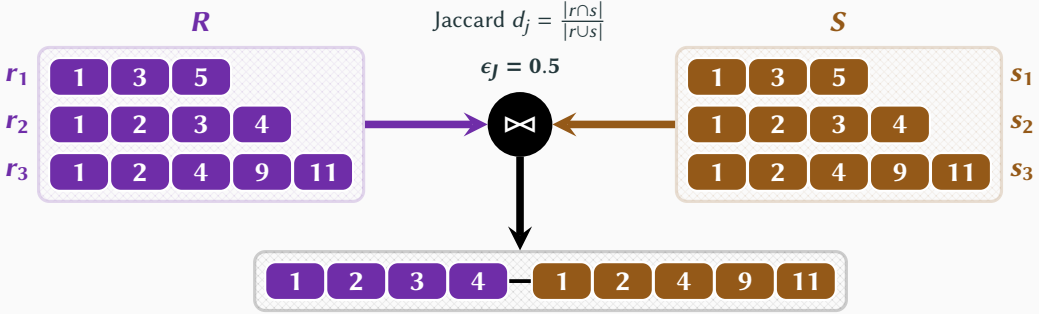
$$\{(r,s) \in R \times S \mid d(r,s) \leq \epsilon\}$$



Set Similarity Joins

Given two collections R and S, a distance threshold ϵ under a function $d(.,.)$:

$$\{(r, s) \in R \times S \mid d(r, s) \leq \epsilon\}$$



Course Design

Project-Based Learning (PBL)

Task-Based Learning (TBL)

Course Design

Project-Based Learning (PBL)

Task-Based Learning (TBL)

Course Design

Project-Based Learning (PBL)

Task-Based Learning (TBL)

Course Design

Project-Based Learning (PBL)

Task-Based Learning (TBL)

PBL vs. TBL – The Case for AllPairs[2]

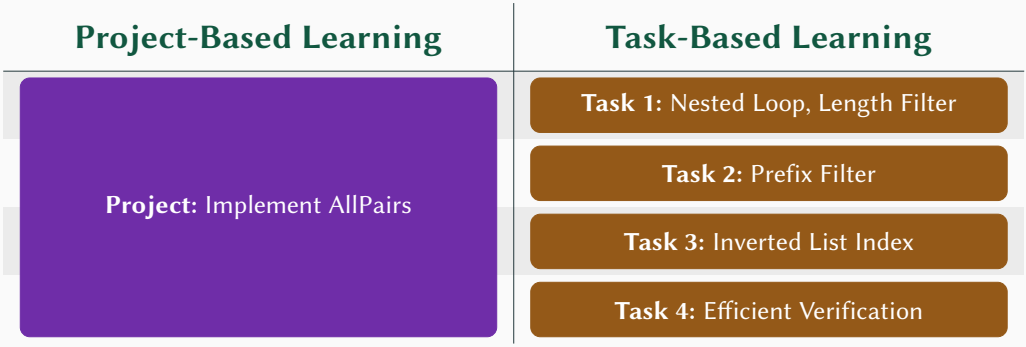


Figure 1: Implementation of the AllPairs[2] algorithm – PBL vs. TBL.

2 Bayardo et al. *Scaling up all pairs similarity search.* WWW 2007. https://doi.org/10.1145/1242572.1242591

Experiences

Auto-Grader System

Continuous and immediate **feedforward.**

Automated basis for **grading.**

Support for **heterogeneity.**

Motivation by (unexpected) competition.

Auto-Grader System

Continuous and immediate **feedforward.**

Automated basis for **grading.**

Support for **heterogeneity.**

Motivation by (unexpected) competition.

Take Away: An auto-grader system is indispensable.

Heterogeneous Groups

Accounting for **different backgrounds** is **challenging.**

Programming knowledge vs. conceptualization.

Students may **complement** each other's **strengths.**

Heterogeneous Groups

Accounting for **different backgrounds** is **challenging.**

Programming knowledge vs. conceptualization.

Students may **complement** each other's **strengths.**

Take Away: Heterogeneity is an opportunity.

Individualization & Group Size

Individual feedforward is good but **time-consuming.**

Scaling individual feedforward **to large groups is hard.**

Individualization & Group Size

Individual feedforward is good but **time-consuming.**

Scaling individual feedforward **to large groups is hard.**

Future Prospect: Extended diagnosis capabilities for auto-grader.

Student Evaluation

Various criteria: Degree of difficulty, relevance of topic, teaching material quality, …

Cohorts: 10–27 students

Scale: 1–7 (higher is better)

Student Evaluation

Various criteria: Degree of difficulty, relevance of topic, teaching material quality, …

Cohorts: 10–27 students **Scale:** 1–7 (higher is better)

Highlights

	Relevance	Goal	Overall	Support	Objectives	Material
PBL		↑ 1.4%		94%	85%	89%
TBL	↑ 8.3%		↑ 5.9%			

Conclusion

Two **feedforward-aided course designs** for **similarity search.**

Project-Based vs. **Task-Based Learning.**

Experiences for **both designs** in class.

Both designs are **suitable** for teaching **similarity search.**

Auto-grader and active **communication channels** are indispensible.

Feedforward-Aided Course Designs for Similarity Search

Questions?

thomas.huetter@plus.ac.at

dkocher@cs.sbg.ac.at

database research group

PARIS LODRON UNIVERSITÄT SALZBURG

FWF Österreichischer Wissenschaftsfonds

tdj

Credits

Icons (pictograms) made by

Uniconlabs	Afian Rochmah Afif	Vectors Tank	juicy_fish
Aswell Studio	Nhor Phai	Eucalyp	dDara
fjstudio	Iconjam	Chanut-is-Industries	Nualnoi Kinkaeo
Freepik	SBTS2018		

from https://www.flaticon.com