SPP 2024 draft

⊙ Rewrite Abstract

Main point: model classroom system for peer to peer learning based on monteroloa et al. Used PCA to transfer of knowledge. Analyzed/compared the efficiency of learning for different configurations of the initial spatial distribution of learned individuals.

Simplifications made

Difference with actual system: Binary instead of continuous (less granulated yung atin). Not yet considered directionality bias (non-isotropy), or the similarity effect (N/A for binary), or unlearning

Main conclusion: Inner corner is fastest learning. Reason: geometric

Add: Statement on how it compares w/ the data of Roxas et al. (2010)

or dimension ($L_1 \times L_2$ or $R \times C$) such
$M \times N$
feat size is $N = L_1 \times L_2$

Methodology

two-

We used a ~~2~~ dimensional binary probabilistic cellular automata (PCA) model to simulate the learning of students from peer-to-peer interactions in a classroom. The matrix $\underset{\sim}{M}$ ~~input parameters of~~ the PCA model include parameters (1) spread coefficient in a neighborhood which can be both isotropic (no orientation bias) and anisotropic (has orientation bias), (2) the size of the classroom, and (3) the initial position of the learned students. The initial positions chosen for the simulations are based on a previous study from (Roxas 2010), namely inner corner, outer corner, center, and random with the number of initial learned students being constantly 4. In the simulations ran for this experiment, only isotropic spreading was considered with coefficients between 0.1 to 1.0 with increments of 0.1. The classrooms were set to be squares with lengths 32, 64, and 128. This is not representative of reality and it was done because a classroom length of 8 (and corresponding size of 64) will not give much insight as the simulations would end too quickly and would not have yielded enough data points for analysis.

Use Math variables

or $n_0 = 4$

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new ft

$\underset{\sim}{M} = \begin{bmatrix} \lambda_1 \\ \cdots \end{bmatrix}$

Separate sections according to category of analysis

§1

From the simulations, we compared both the average number of generations it takes to saturate the classroom with learned students and the average learning rate across different configurations over 5 trials. The learning rate for each trial was obtained by fitting a power model to the first half of the data, which is often before the finite size effect starts to affect the simulation, and taking the exponent as the characteristic variable or growth rate (m) for that trial.

independent runs

§2

We also analyzed the dependence of the time to for the classroom to be saturated with learned students (n) on the class size. For each seating arrangement, we took

$$\underset{\sim}{M} := \begin{bmatrix} \lambda_1 & \lambda_2 & \lambda_3 \\ \lambda_4 & 0 & \lambda_5 \\ \lambda_6 & \lambda_7 & \lambda_8 \end{bmatrix}$$

in this work, $\lambda_i = \lambda \ \forall i = 1 \ldots 8$

$\lambda \in \{0.1, 0.5, 0.9\}$

representative learning coefficients, specifically 0.1, 0.5, and 0.9 to see how the class size and the learning coefficient affects the time to learn.

use T to imply relation to ~~time~~ (units: iteration)

T

Results and Discussion

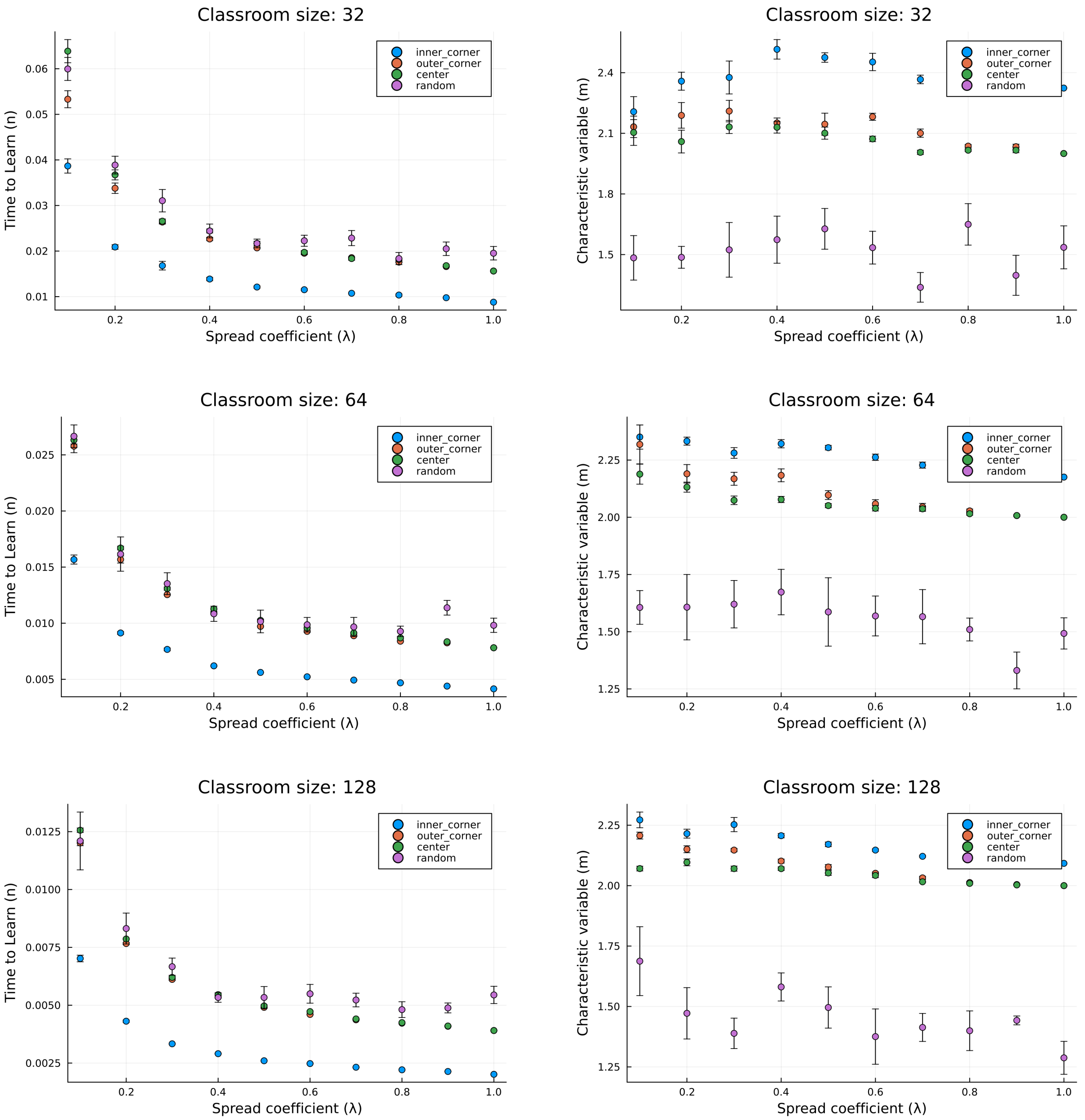
The data suggests that the time to learn ~~(n)~~ does not vary significantly between the outer corner, center, and random seat configurations across classroom sizes and spread coefficients. However, there is a significant difference between random when compared against the outer corner and inner corner seating arrangements. The inner corner seating arrangement consistently performs the best with the shortest time to saturate the classroom with learned students and the learning rate, while random generally performs the worst. These findings can be attributed to the simplicity of the model which lends itself to being heavily influenced by geometric factors. Analytically, the configurations' performance is dictated by the maximum distance of any point to an initially learned student. The outer corner and center seating arrangements perform very similarly because they are geometrically one circle expanding at a constant rate. In each of these two configurations, the maximum distance of any unlearned student to an initially learned student is the same at L*sqrt(2)/2. The inner corner seating arrangement performs the best because it minimizes this distance to L*sqrt(2)/4.

where $L_1 = L_2 = L$

defined? defined?

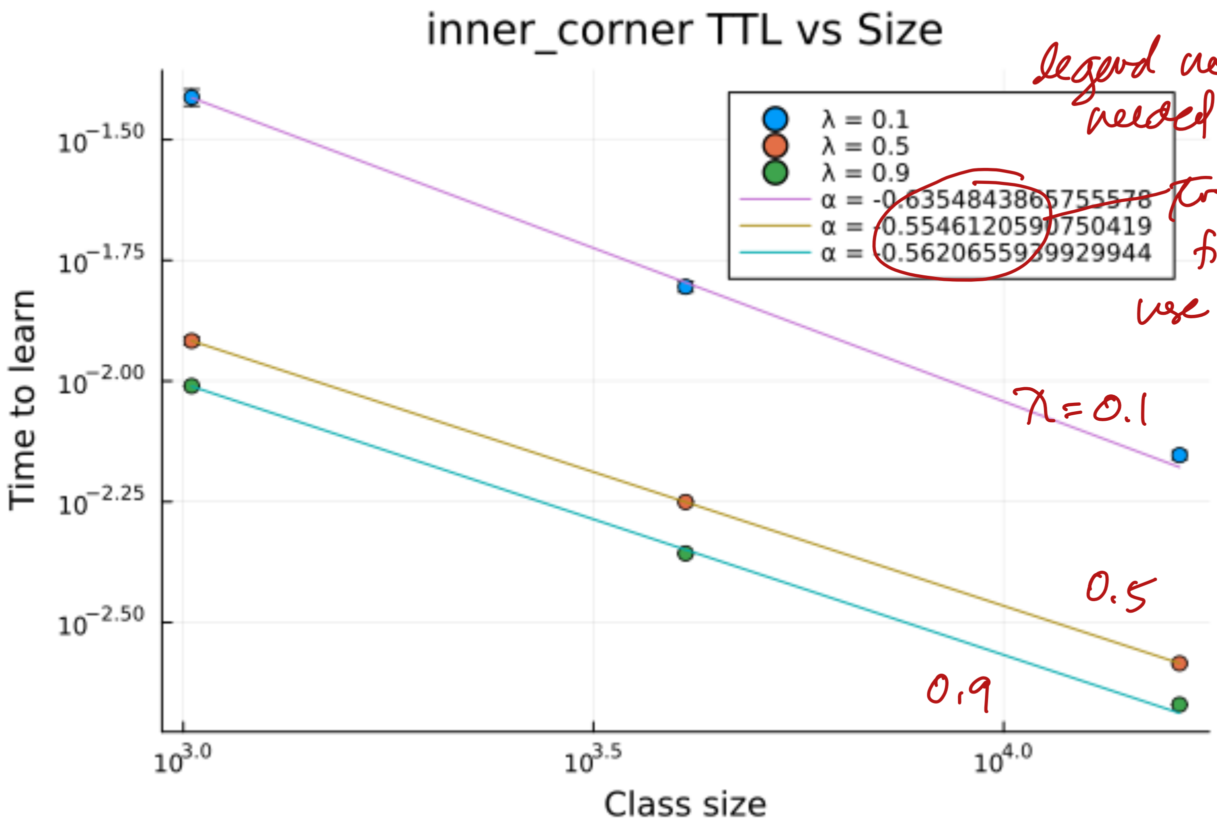
There is a noticeable spike in the characteristic variable vs spread coefficient graphs for each classroom size. (i don't know how to explain this one)

These results, however, do not agree with existing studies. In a similar study by Roxas et. al. (2010), they found that the outer corner configuration performed the best in reality. The difference in the results can once again be explained by the ~~simplicity of our system.~~ is expected due to the simplifications made They mentioned that there is a similarity effect that goes on in peer-to-peer learning wherein students of the the same aptitude level, regardless of their actual aptitude, learn better when seated together. The similarity effect has not yet been implemented in our system because this is not applicable to a binary system. The system being binary also introduces more granularity when compared to reality where aptitude is measured more continuously. This study also does not consider the non-isotropy or the presence of an orientation bias when it comes to the learning within each neighborhood. Non-isotropy in the system can stem from the fact (citation needed?) that students may prefer to interact with students beside them or in front of them instead of behind them out of convenience, possibly leading to more learning. This study also assumes that everyone is equally receptive to learning from their peers which may not be the case, so future models will/should take into account the non-uniformity of individuals' learning rates.



The linear plot on the log-log scale suggests that the relationship of the time to learn vs class size is dictated by a power law wherein it can be normalized so that the lines would collapse.

show



legend not needed

too many figures use 4SF.

(hindi ko pa nagagawang icollpase yung lines)

- use consistent color
- label directly into the plot since there's much space
- finalize in pptx or keynote or gslides