

Elements of a Presentation

- Clearly state the goal of the talk
- Provide detail to **understand** the gist
- Summarize results
- Remind and given additional links

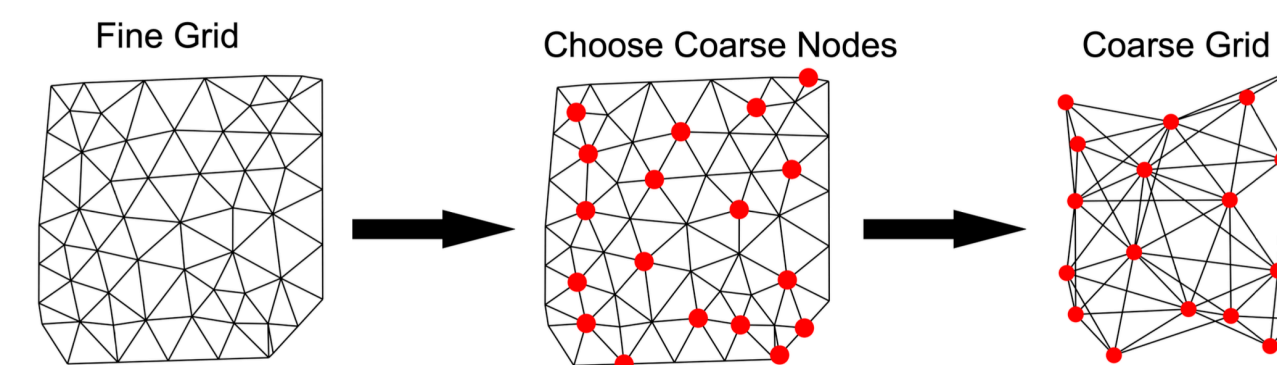
👉 **Pro tip:** show your main result first, slide 1

Coarsening problem

The efficiency of AMG solver depends on:

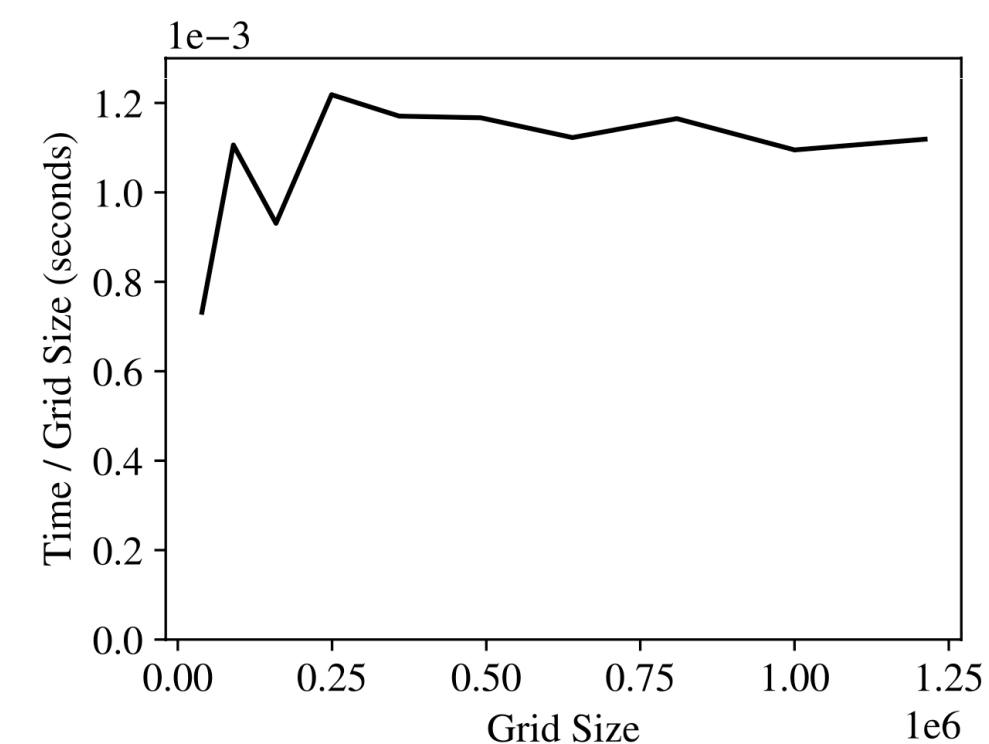
- The choice of restriction and interpolation operators [Luz et. al., ICML 2020]²
- The selection of the coarse grid [This paper]

Combined together → Fully learned AMG.

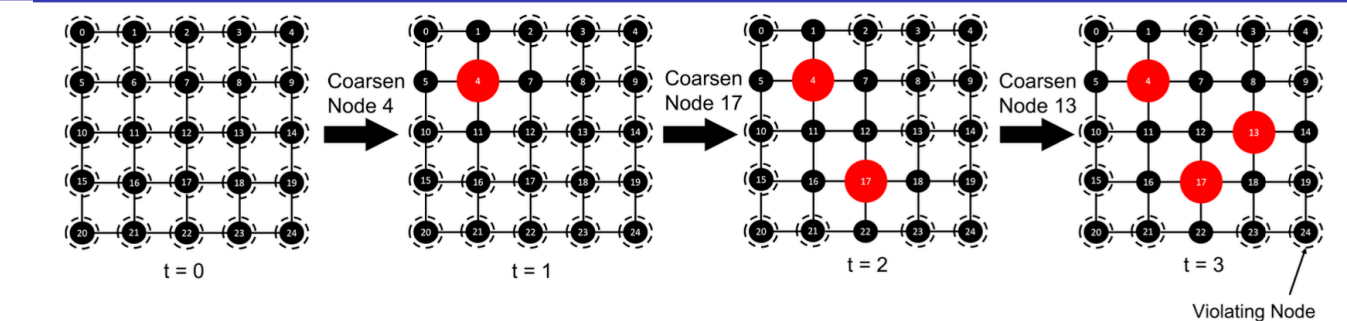


²Luz, I., Galun, M., Maron, H., Basri, R. and Yavneh, I., 2020, November. Learning algebraic multigrid using graph neural networks. In International Conference on Machine Learning (pp. 6489-6499). PMLR.

$O(N)$ in grid size



Our approach: coarsening as an RL problem



RL environment:

- **State space:** Coarse node indicator(f_i), Violation indicator(v_i)
- **Initial state:** No coarse nodes
- **Action space:** Choose a violating node to coarsen
- **Reward:** Negative of number of coarse nodes
- **Termination:** When there is no violating node

Theorem

An optimal agent for the environment described above will exactly solve the optimization problem.

Conclusions

We showed:

- Coarse-grid selection is learnable
- Guaranteed convergence
- Linear time complexity in the grid size
- Outperforming previous heuristic
- Scalable; small training examples and arbitrarily large test problems

Paper info:

- Taghibakhshi, A., MacLachlan, S., Olson, L. and West, M., 2021. Optimization-Based Algebraic Multigrid Coarsening Using Reinforcement Learning. NeurIPS 2021
- Paper preprint: <https://arxiv.org/pdf/2106.01854.pdf>
- Code for reproducing the results: https://github.com/compdyn/rl_grid_coarsen

Do's and Don'ts

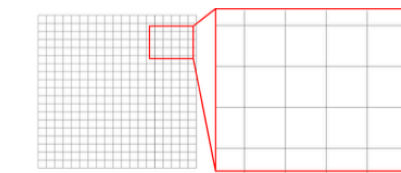
- In a talk, you should avoid using long sentences that the audience needs to read and instead use short, pithy statements that support your figures. Long sentences force the audience to read what you have on the screen instead of listening to your concise story. Slides with too much information also have this shortcoming, so avoid densely packed slides with algorithms, figures, mathematical expressions, and other details that muddle a short presentation.
- Avoid punctuation
- Outlines are bad
- Math is bad
- Use page numbers
- Cite papers on the slide (`\cite{}` is bad)
- `\caption{}` is bad
- Figures should be large, use thick lines, and use large fonts
- If the figure is not yours, **cite it**

👑 **Pro tip:** match your fonts

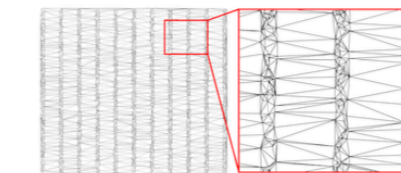
Test data

Test Set: Mesh families with very diverse and challenging attributes:

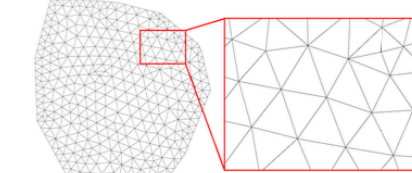
Structured: 18 structured grid with different sizes



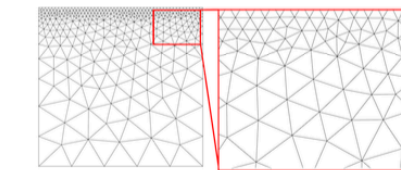
Aspect Ratio: 12 unstructured convex grid with different average mesh aspect ratio



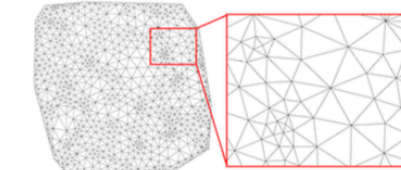
Different Size: 42 unstructured convex grids with varying grid size



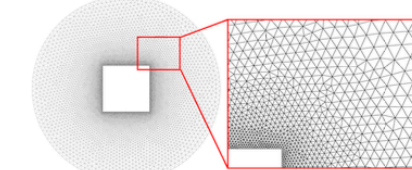
Graded Mesh: 12 unstructured grids with different convex shapes and graded meshes



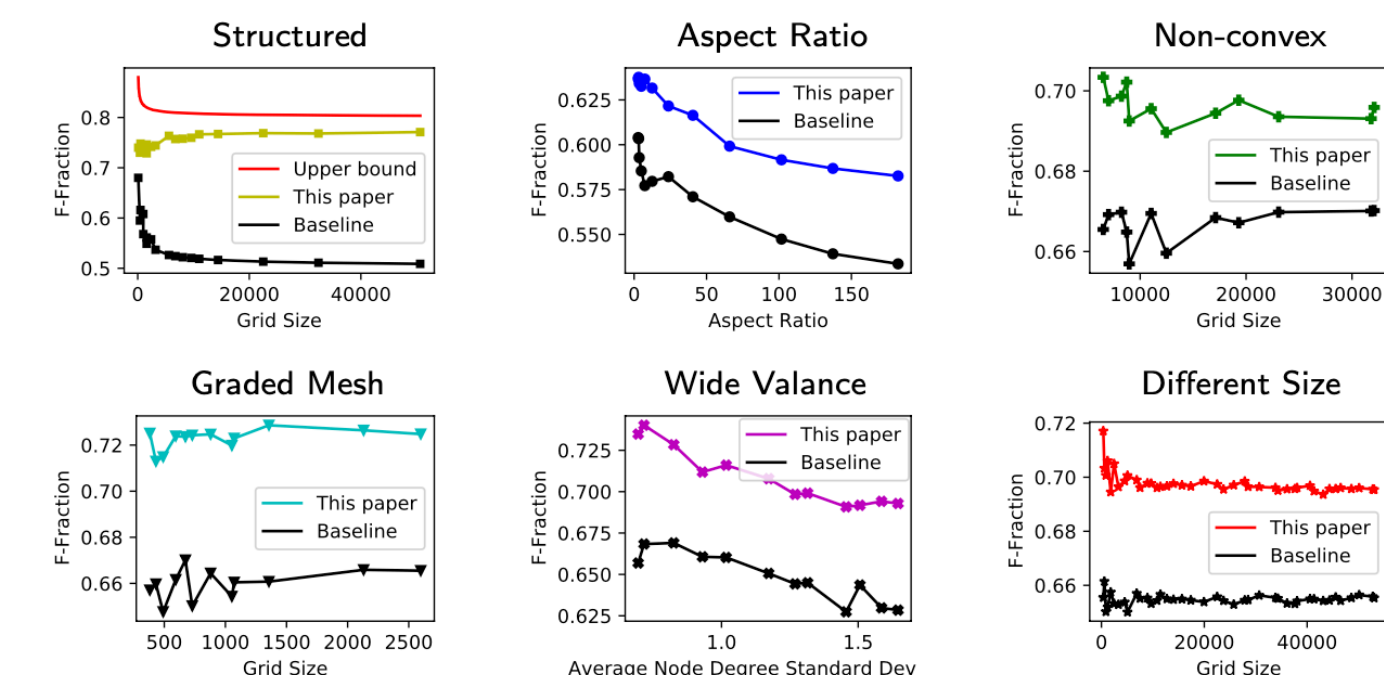
Wide Valance: 12 unstructured convex grids with different average node degree STD



Non-convex: 12 unstructured non-convex grids



Taghibakhshi et. al. Optim. Based AMG using RL 10 / 13
Quality of solution: higher F-Fraction is better



Golden Rule

<15 minutes

Stay on time



Date/Time

M 11/27: 11:00--11:15

M 11/27: 11:20--11:35

M 11/27: 11:40--11:55

M 11/27: 12:00--12:15

W 11/29: 11:00--11:15

W 11/29: 11:20--11:35

W 11/29: 11:40--11:55

W 11/29: 12:00--12:15

M 12/06: 11:00--11:15

M 12/06: 11:20--11:35

M 12/06: 11:40--11:55

M 12/06: 12:00--12:15

W 12/08: 11:00--11:15

W 12/08: 11:20--11:35

W 12/08: 11:20--11:35

👉 Pro tip: at most one slide per minute

👉 Pro tip: use your phone timer

Presentation Rubrics

- 60% of course grade
- prj00: description and feedback (5/60)
- prj01: title and references (5/60)
- prj02: goals and workflow (5/60)
- prj03: training and preliminary results (5/60)
- prj04: summary of model, loss, training (5/60)
- prj05: feedback exchange (5/60)
- prj06: slide structure with at least one start/middle/end slide (5/60) (0—6, **due Wednesday 11/08**)
- prj07: final slide deck (**due Monday 11/27, 11am**) (30/60)

- **Presentation clarity:**
 - Are you on time?
 - Do you follow the Do's and Don'ts?
 - Did you provide the audience with the right level of detail?
- **Presentation scope:**
 - Did you meet your quick goal?
 - Did you start your middle goal?
 - Did you acknowledge your stretch goal?
- Clear statement of the problem (mathematically)
- Precise definition of the NN architecture
- Definition of loss, training, and testing
- Citations
- Lessons learned: what worked and what did not
- Future work (if you were to keep working on this project)
- (Groups) Statement of contributions and both present