Research Update

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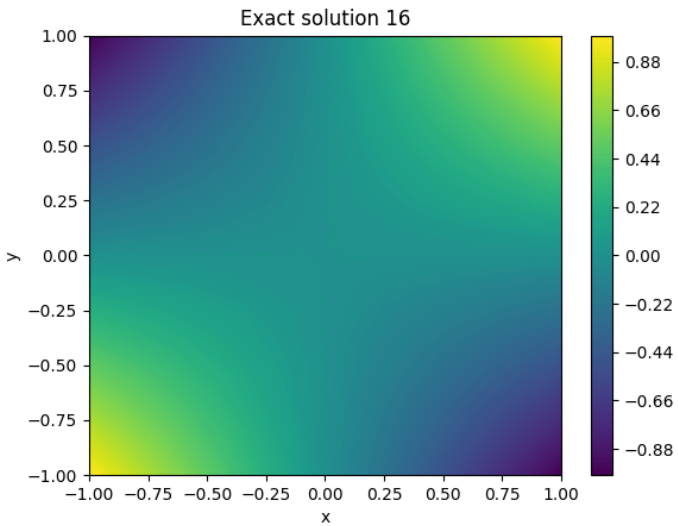
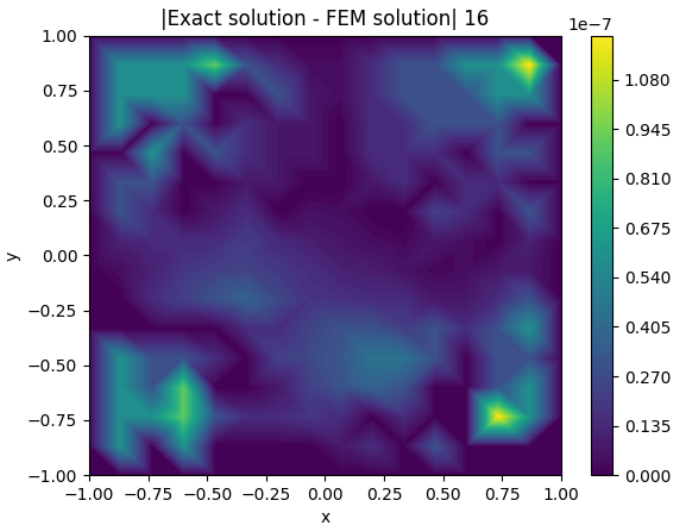
February 3, 2025

Poisson 2D: The example

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0 \qquad \forall -1 < x, y < 1$$

$$u(x, y) = xy \qquad \text{for } x \text{ or } y = \pm 1$$





Poisson 2D: Implementation

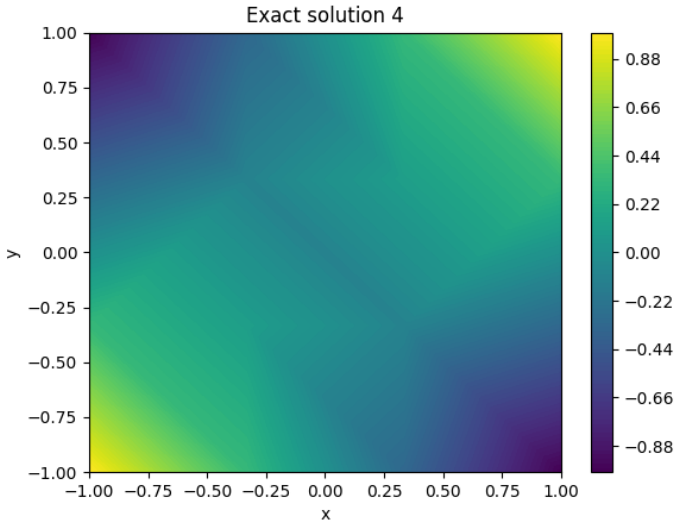
- Stiffness matrix K
- Consistent load vector f
- Adjacency matrix A
- Degree array d

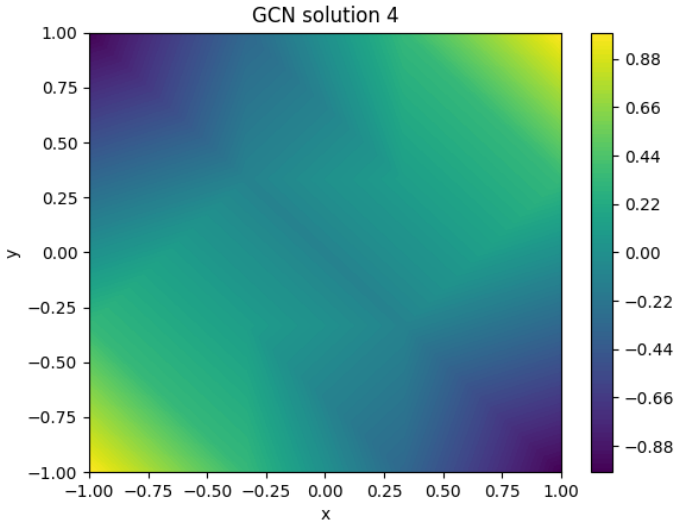
- GCN layers: 1, 10, 10, 1
- num fits: 10
- iters per fit: 100
- learning rate: 5×10^{-2}
- num check points: 5 per fit

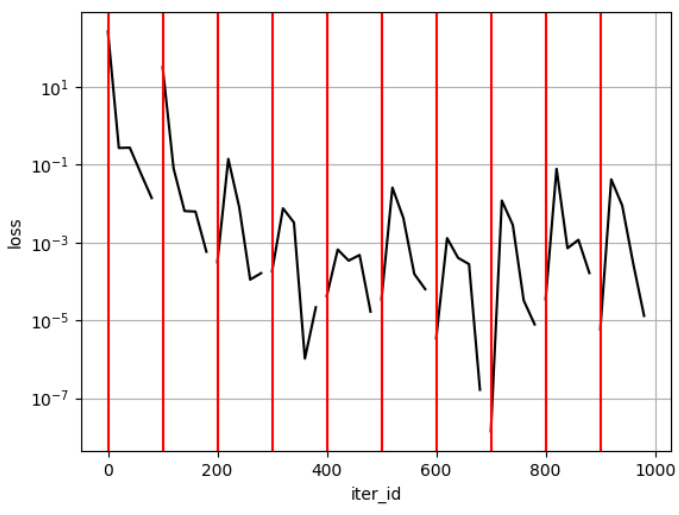
Algorithm

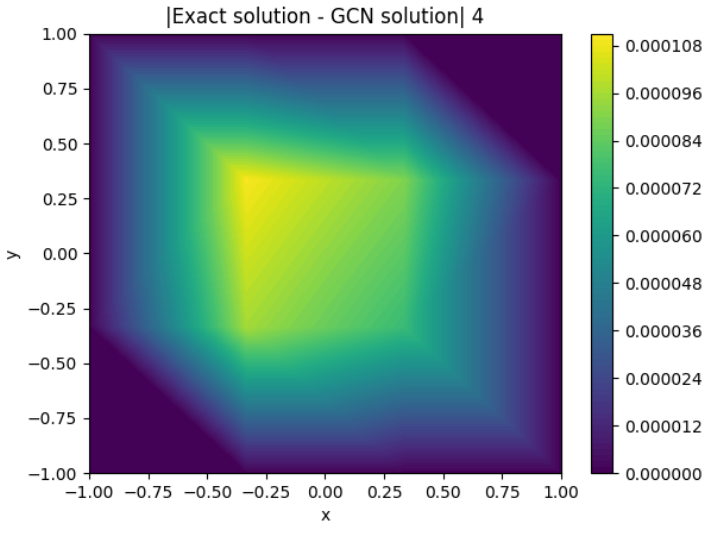
1. Choose random solution u
2. Initialise gcn
3. Fit gcn to the loss $|Kv - f|_2^2$ where $v = \text{gcn}(u, A, d)$
4. $u \leftarrow \text{gcn}(u, A, d)$
5. Go back to step 3 or terminate

GCN run: 4×4 grid

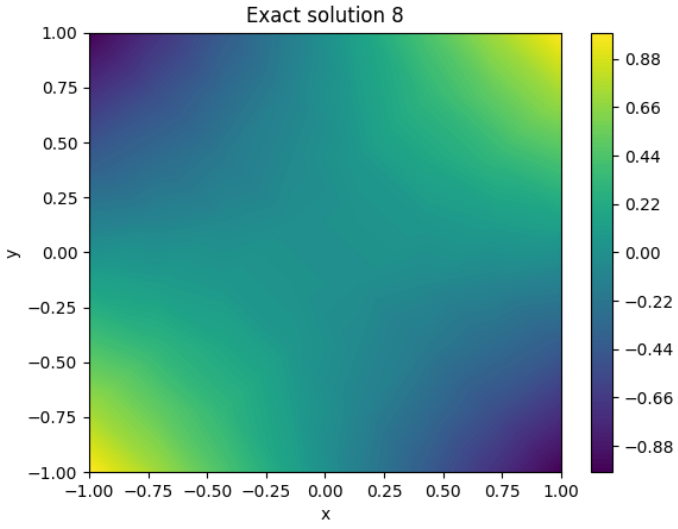


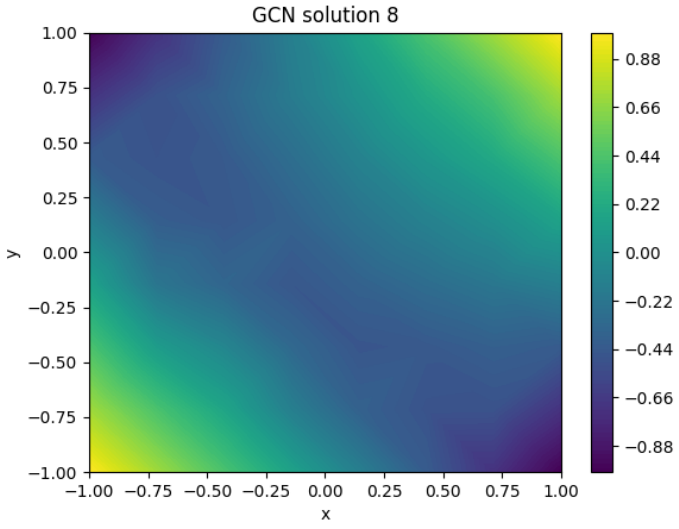


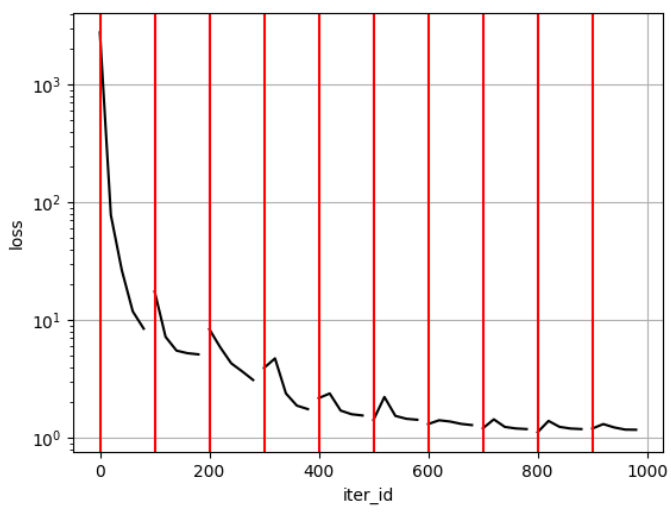


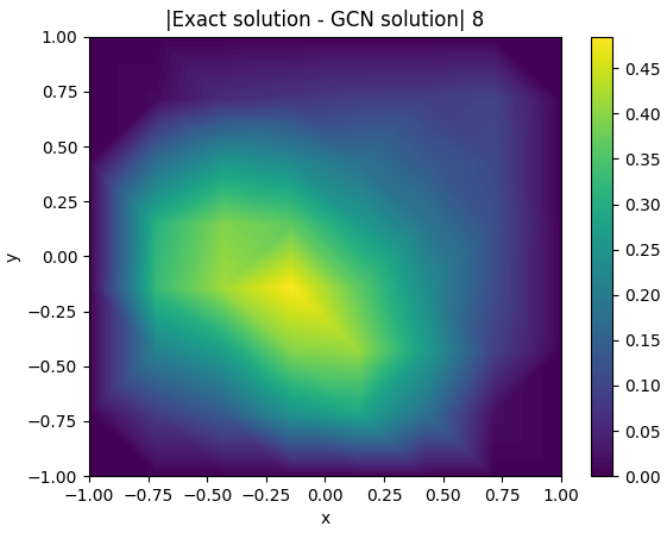


GCN run: 8×8 grid









GCN run: 16×16 grid