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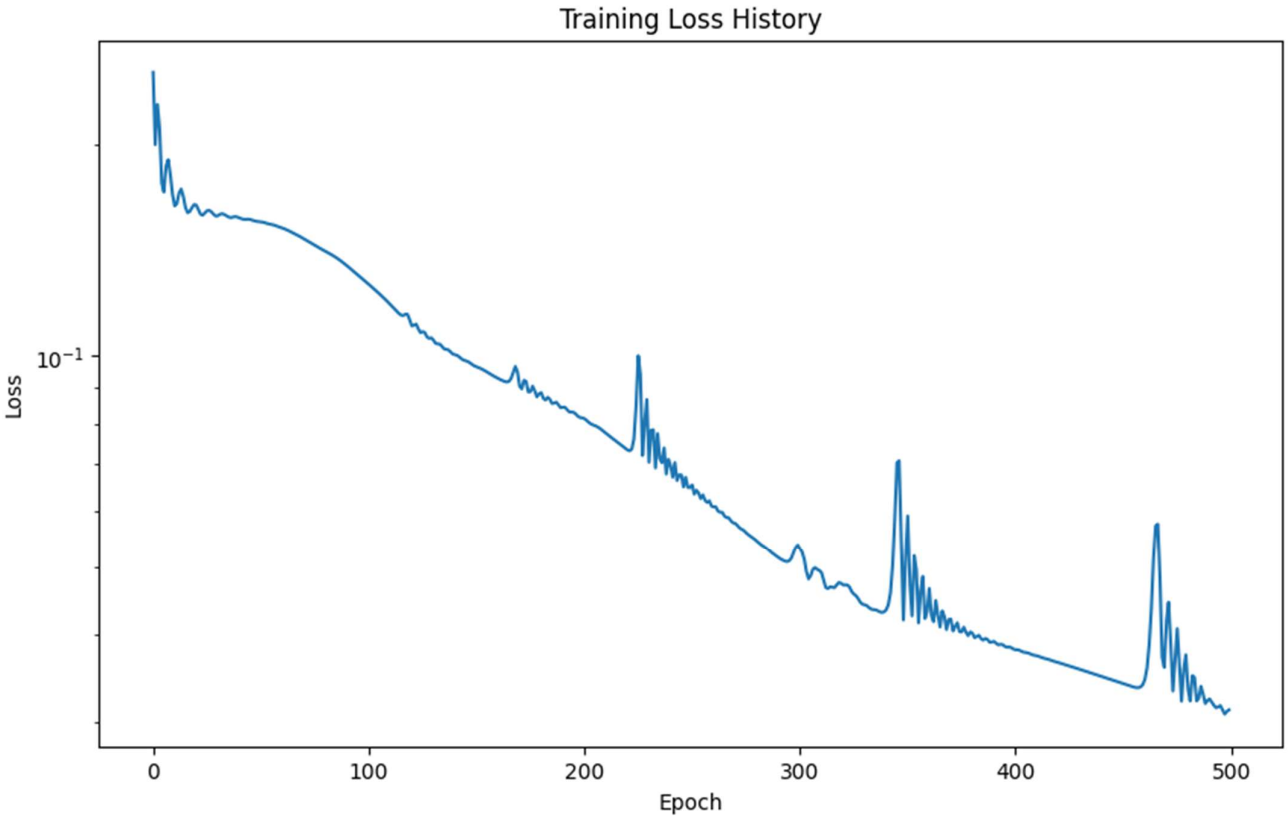
Solving 2D Wave Equation using Physics-Informed Neural Networks
Equation: ∂²u/∂t² = c²(∂²u/∂x² + ∂²u/∂y²)
Domain: x ∈ [0,1], y ∈ [0,1], t ∈ [0,1]
Initial Conditions:
u(x,y,0) = sin(πx)sin(πy)
∂u/∂t(x,y,0) = 0
Boundary Conditions: u(0,y,t) = u(1,y,t) = u(x,0,t) = u(x,1,t) = 0
============================================================

Epoch     0 - Loss: 2.5362e-01
Epoch   250 - Loss: 6.5458e-02
25/25 ━━━━━━━━━━━━━━━━━━━━ 1s 19ms/step
```

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Global Error Metrics:
Relative L2 Error:   4.8894e-01
Max Absolute Error:  5.2820e-01
RMSE:                1.7424e-01
R-squared:           7.4754e-01
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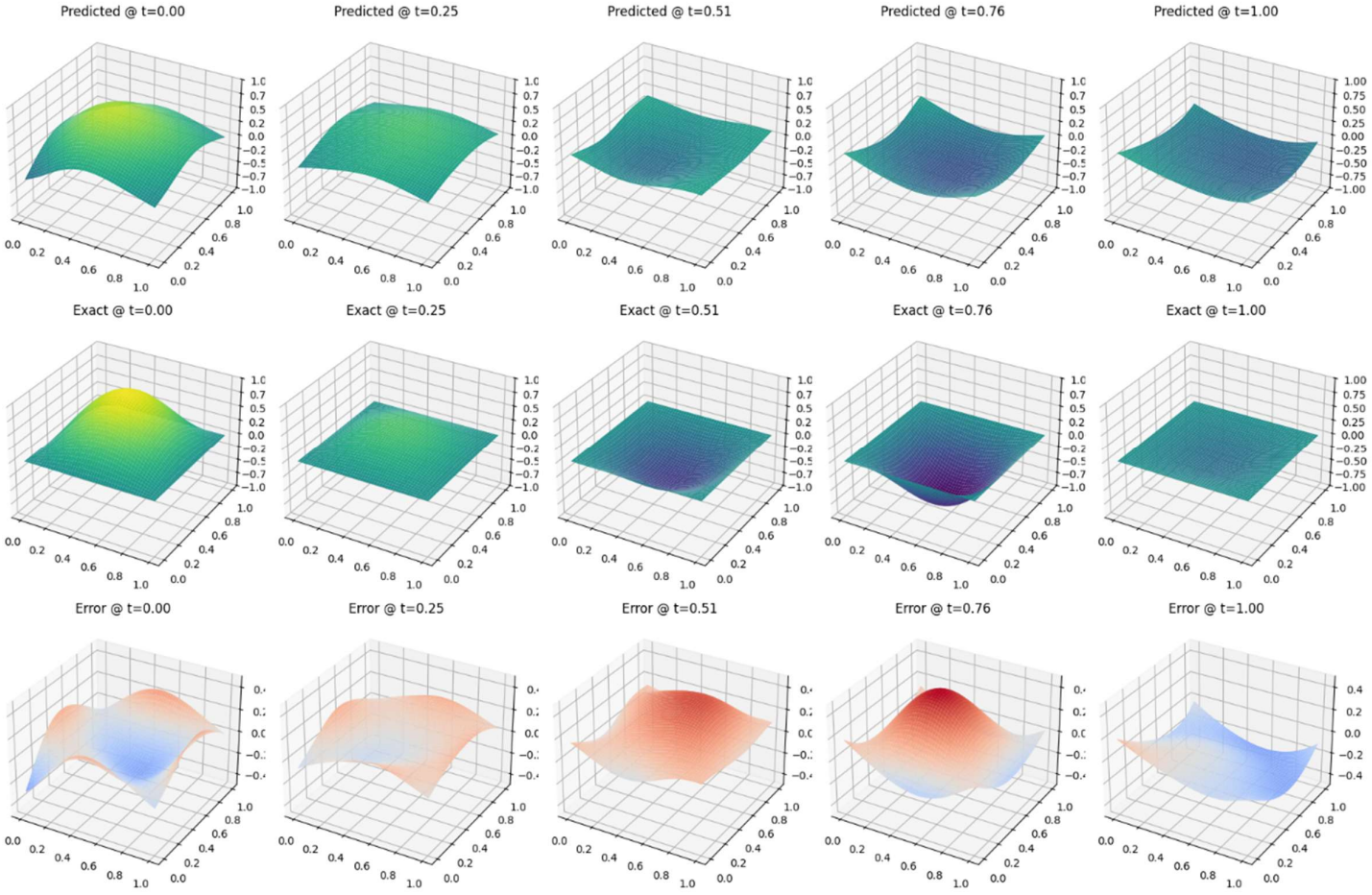
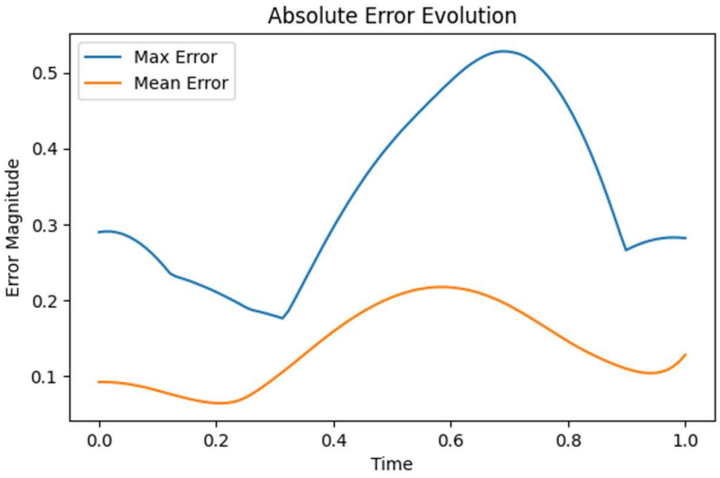
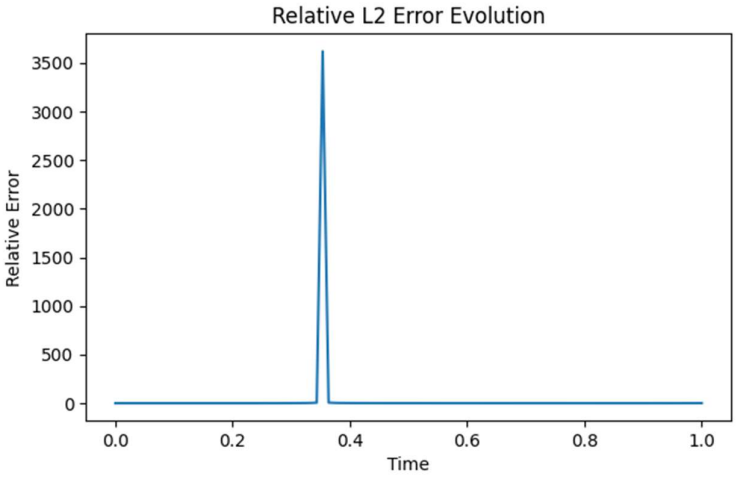
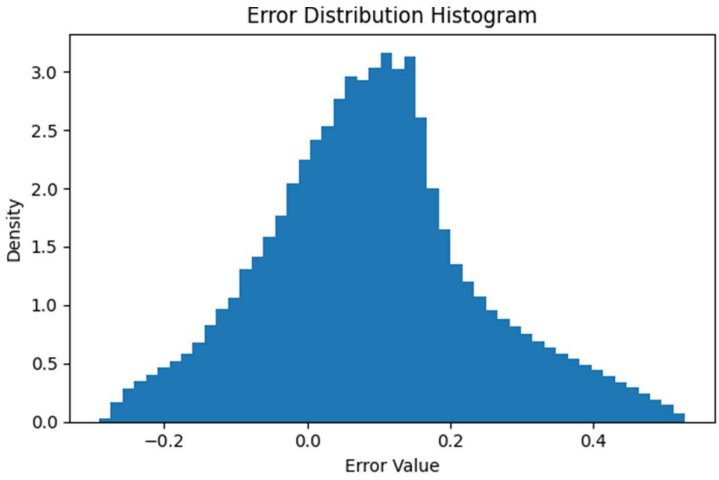
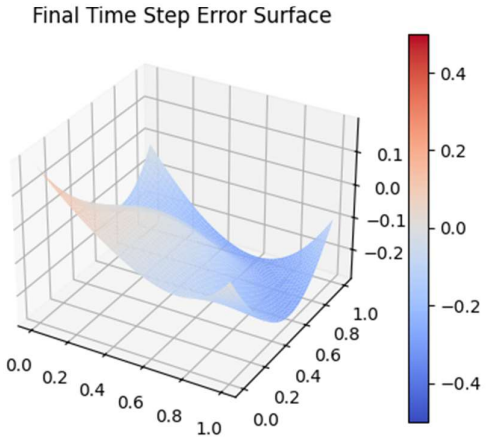
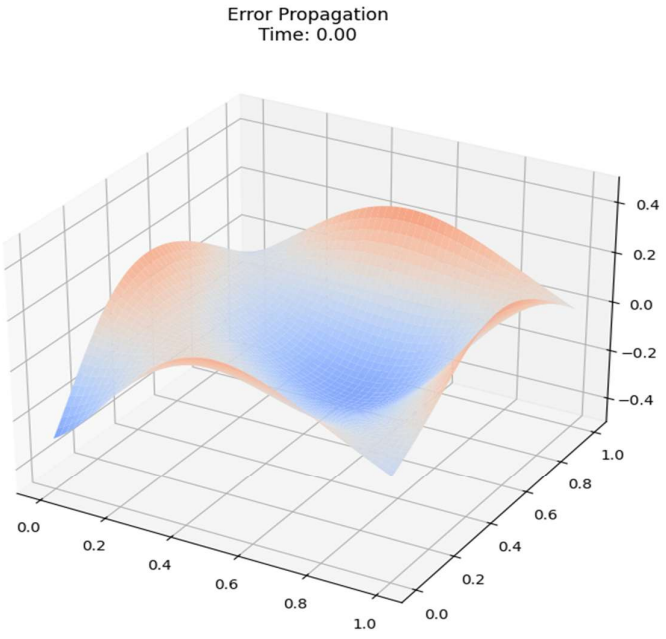

Predicted @ t=0.00
Predicted @ t=0.25
Predicted @ t=0.51
Predicted @ t=0.76
Predicted @ t=1.00
Exact @ t=0.00
Exact @ t=0.25
Exact @ t=0.51
Exact @ t=0.76
Exact @ t=1.00
Error @ t=0.00
Error @ t=0.25
Error @ t=0.51
Error @ t=0.76
Error @ t=1.00

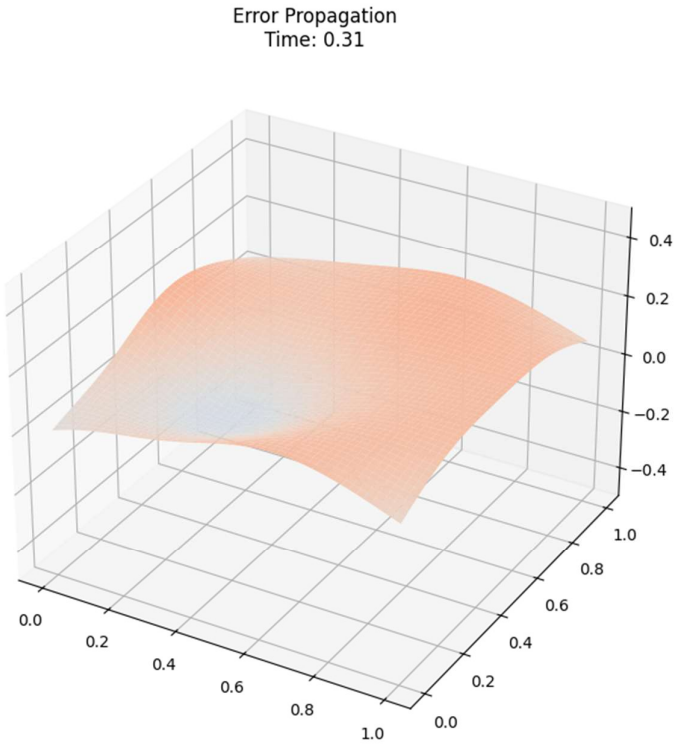

Absolute Error Evolution
Max Error
Mean Error
Error Magnitude
Time

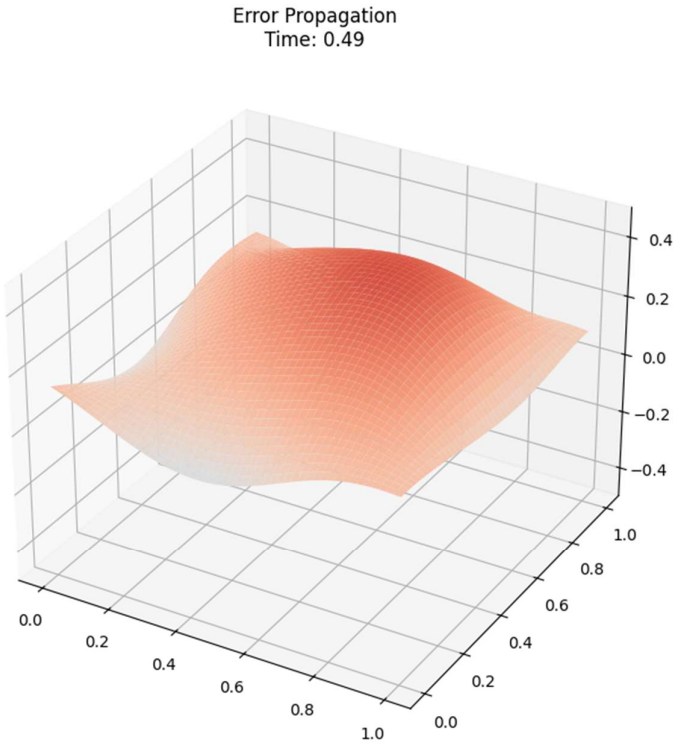

Relative L2 Error Evolution
Relative Error
Time


Error Distribution Histogram
Density
Error Value


Final Time Step Error Surface


Error Propagation
Time: 0.00


Error Propagation
Time: 0.31
0.4
0.2
0.0
−0.2
−0.4
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.2
0.4
0.6
0.8
1.0


Error Propagation
Time: 0.49
0.4
0.2
0.0
−0.2
−0.4
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.2
0.4
0.6
0.8
1.0