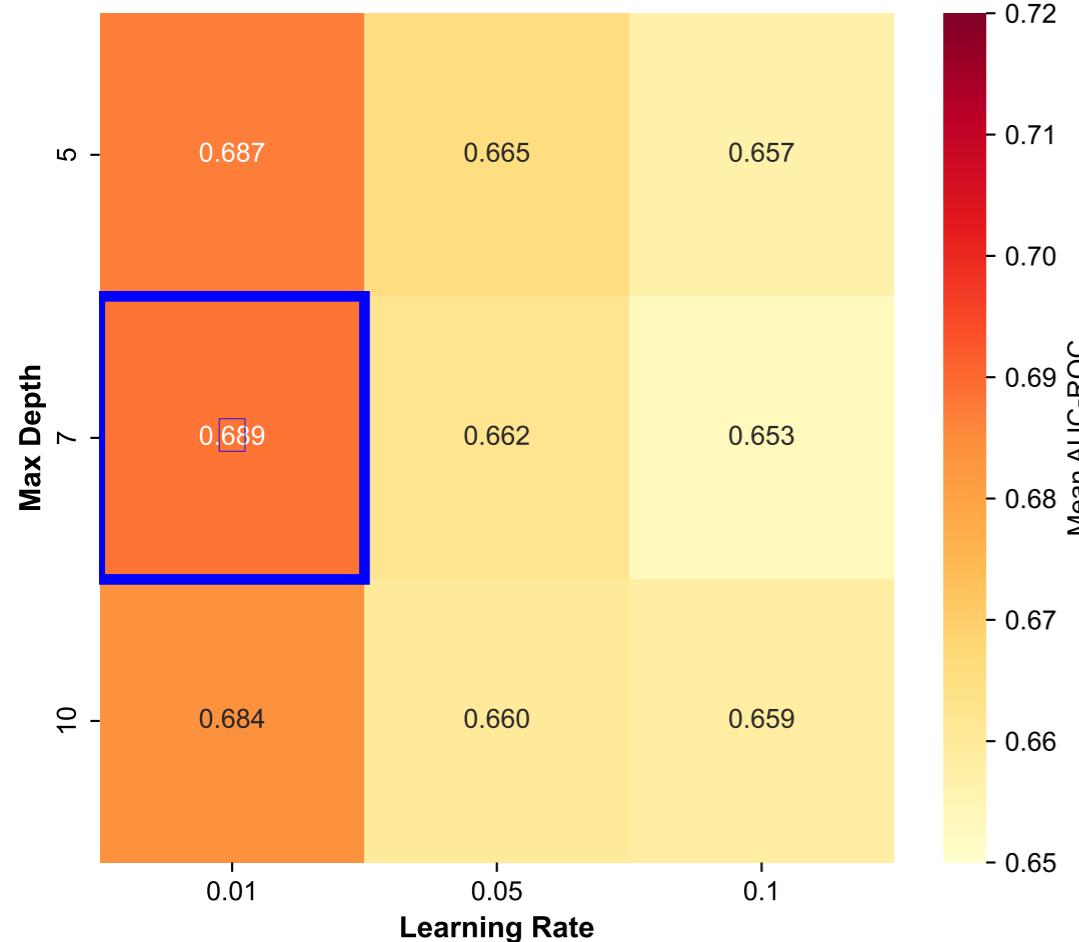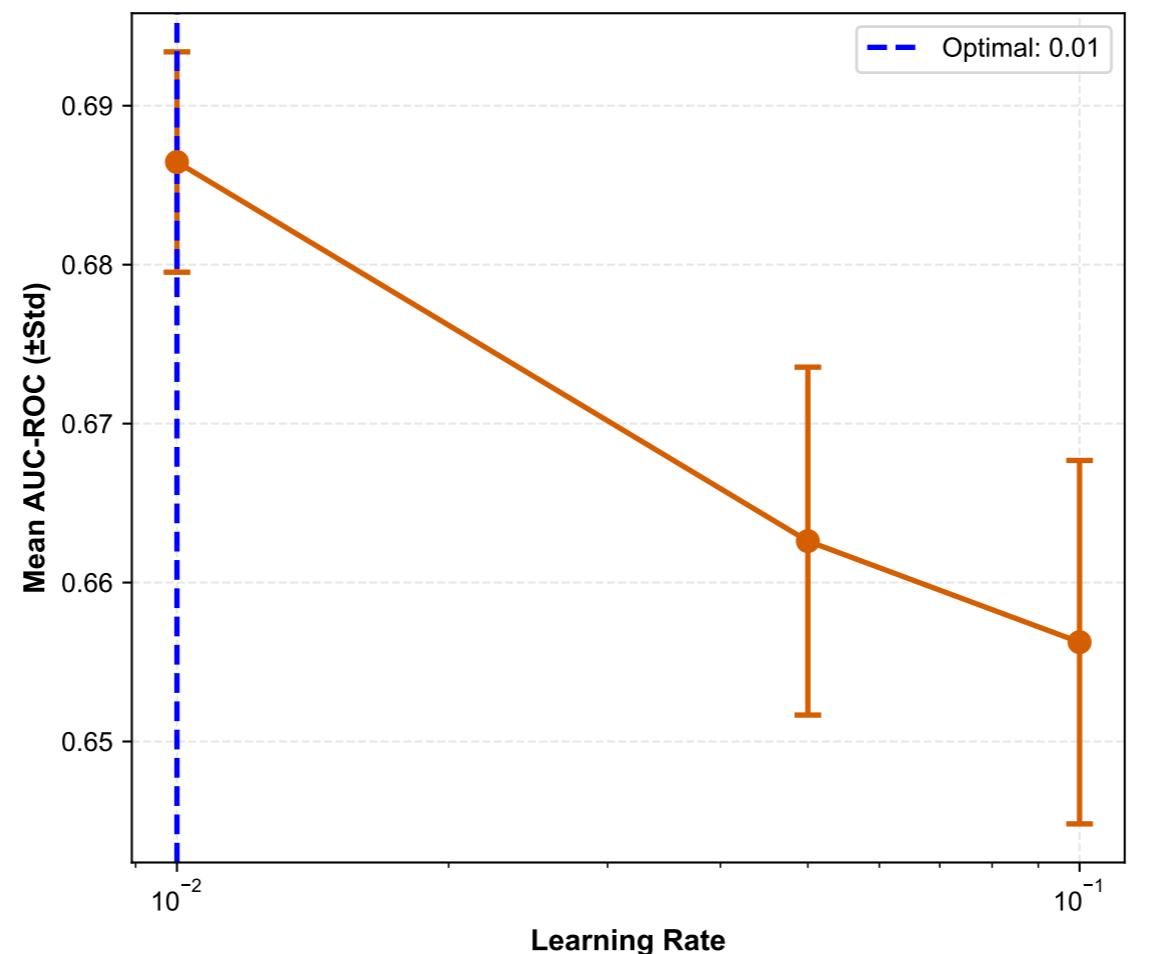**Hyperparameter Tuning: Systematic Grid Search Exploration**
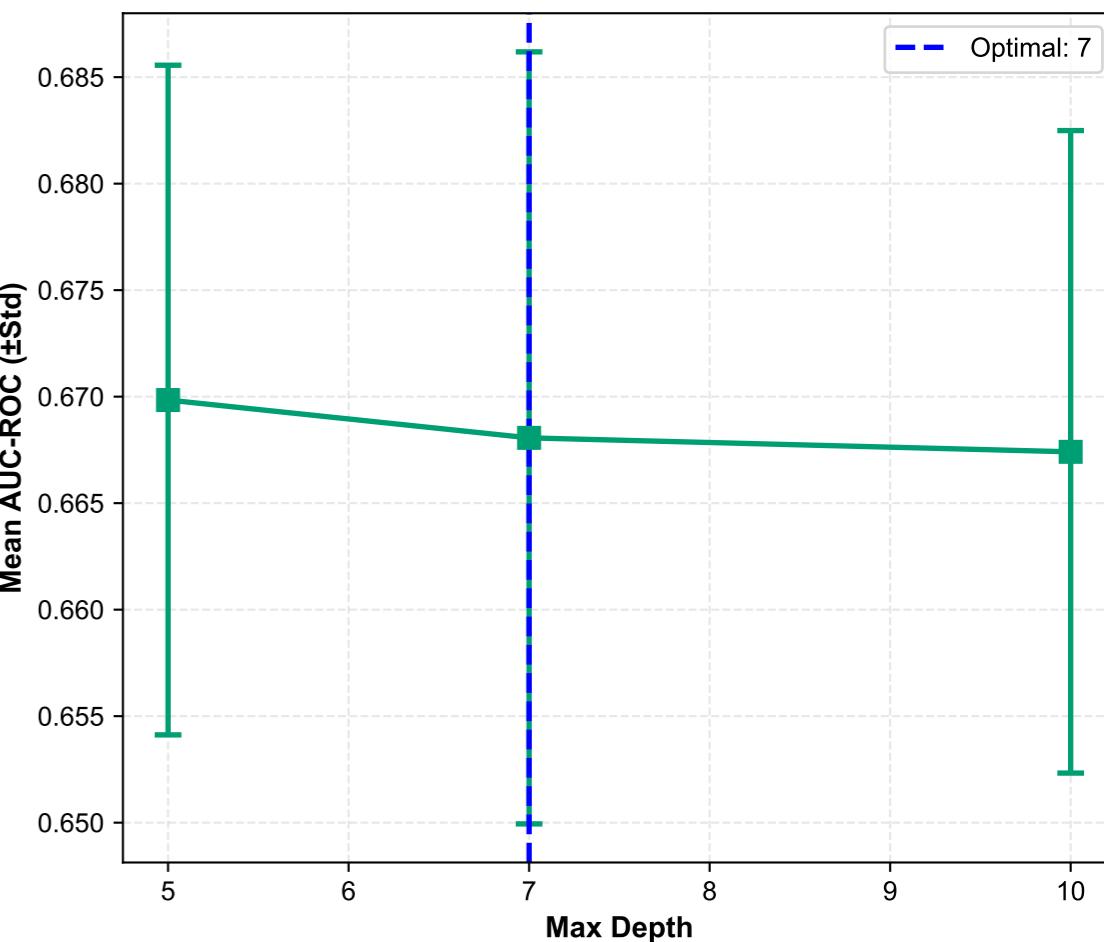
**Panel A: Learning Rate × Max Depth**
**Performance Landscape**

**Panel B: Learning Rate Sensitivity**
**Marginal Performance**

**Panel C: Max Depth Sensitivity**
**Marginal Performance**

GRID SEARCH SUMMARY:
• Total configurations tested: 3,888
• Hyperparameters tuned: 9 (learning_rate, max_depth, n_estimators, etc.)
• Best configuration: lr=0.01, depth=7, n=200
• Best AUC-ROC: 0.7003 ±0.1592
• Performance range: 0.6169 to 0.7003
• Key finding: Moderate learning rate (0.01) and depth (7) achieve optimal balance