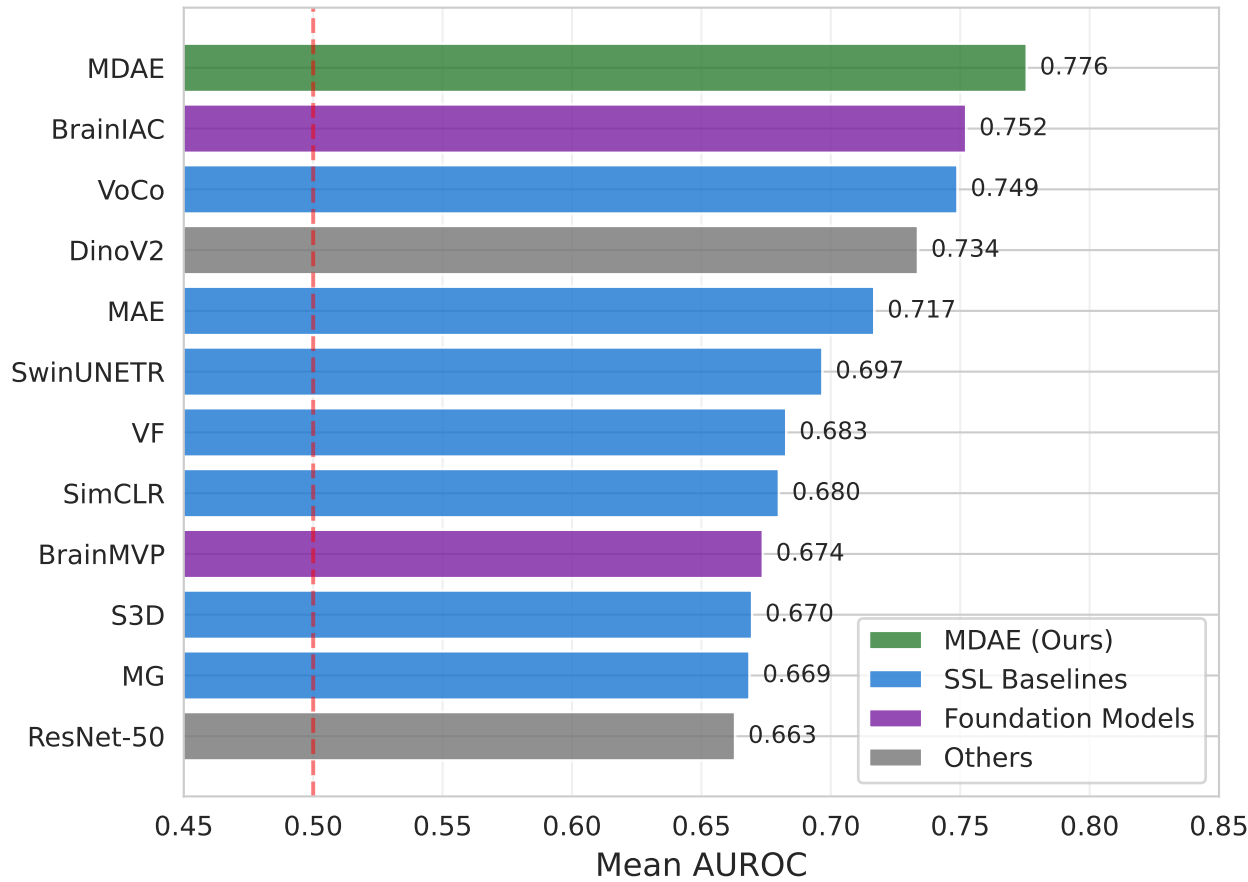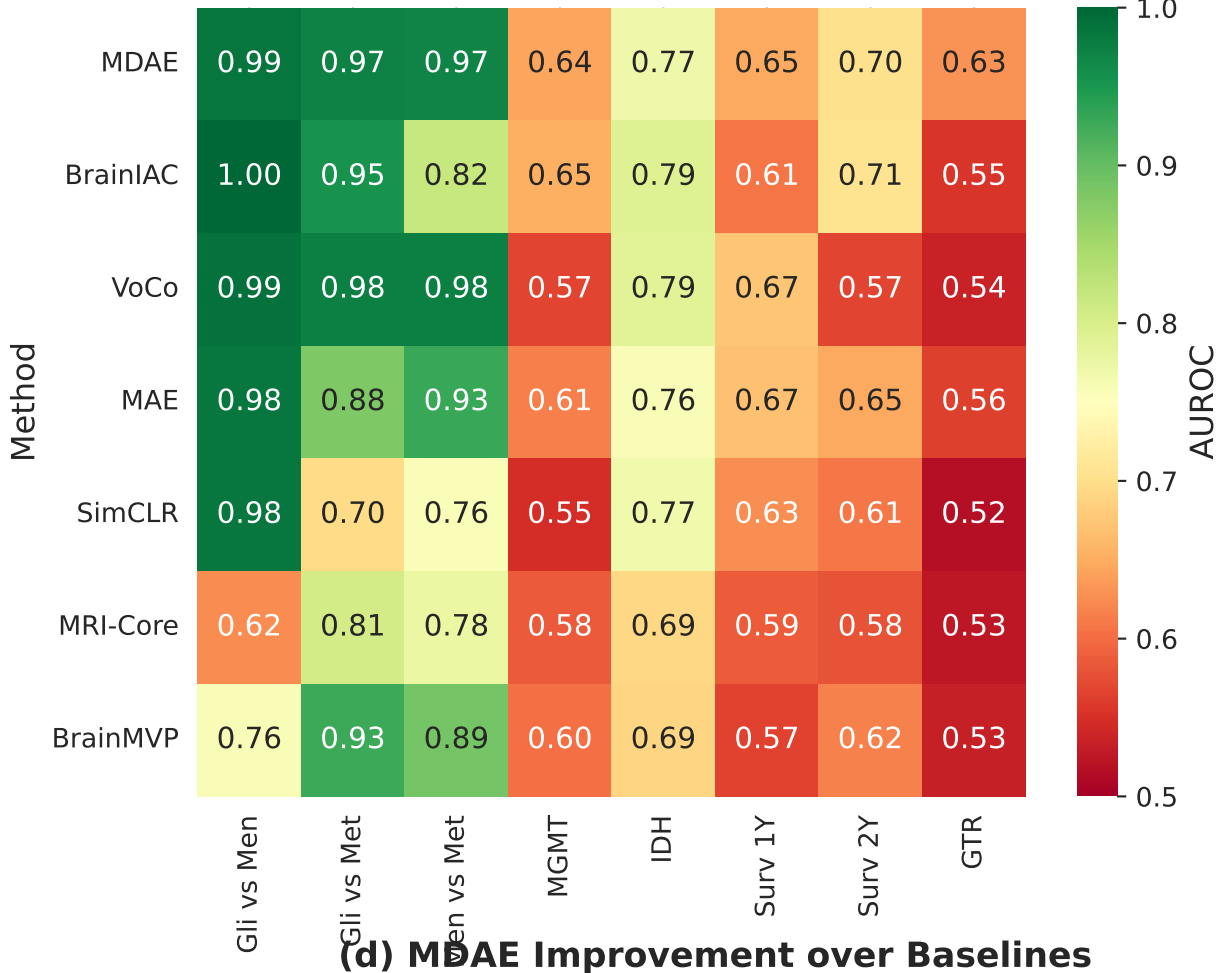MDAE Performance Analysis Across 15 Brain Tumor Classification Benchmarks

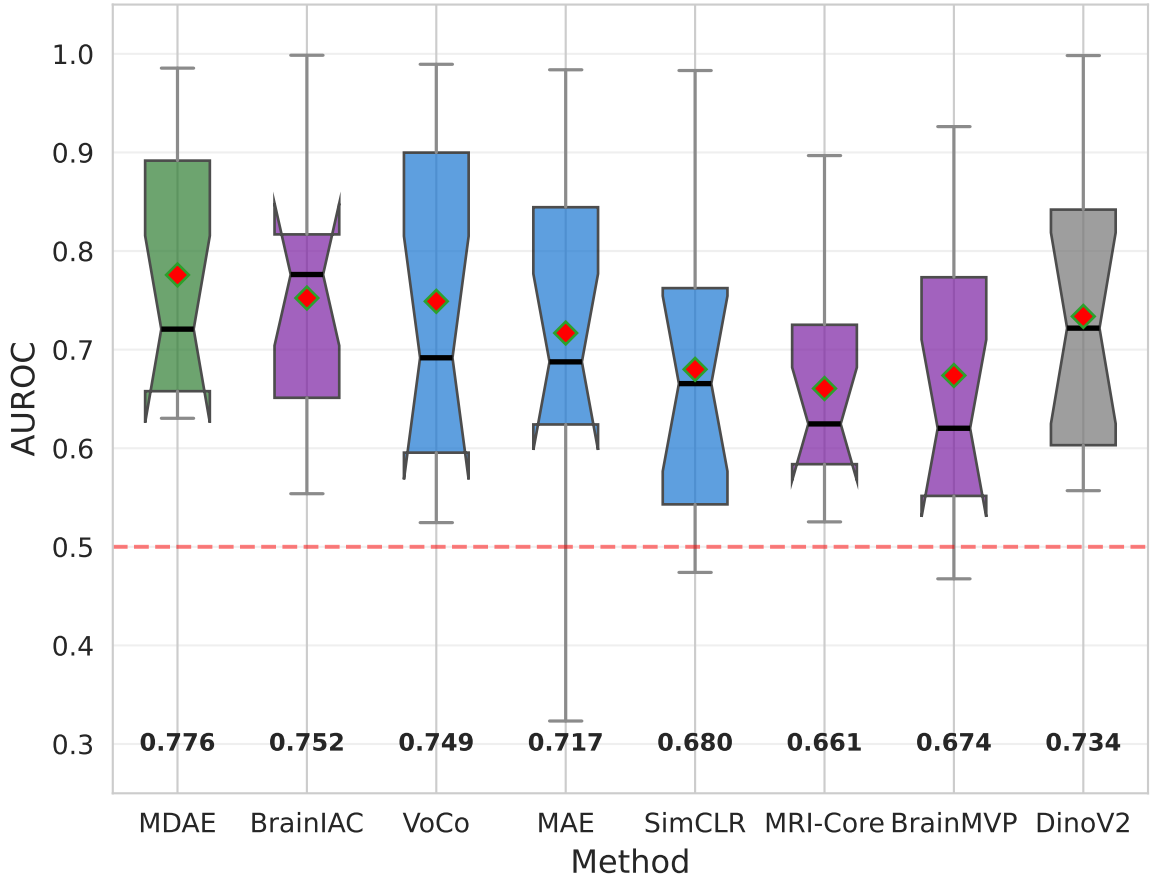**(a) Average Performance Across All Tasks**

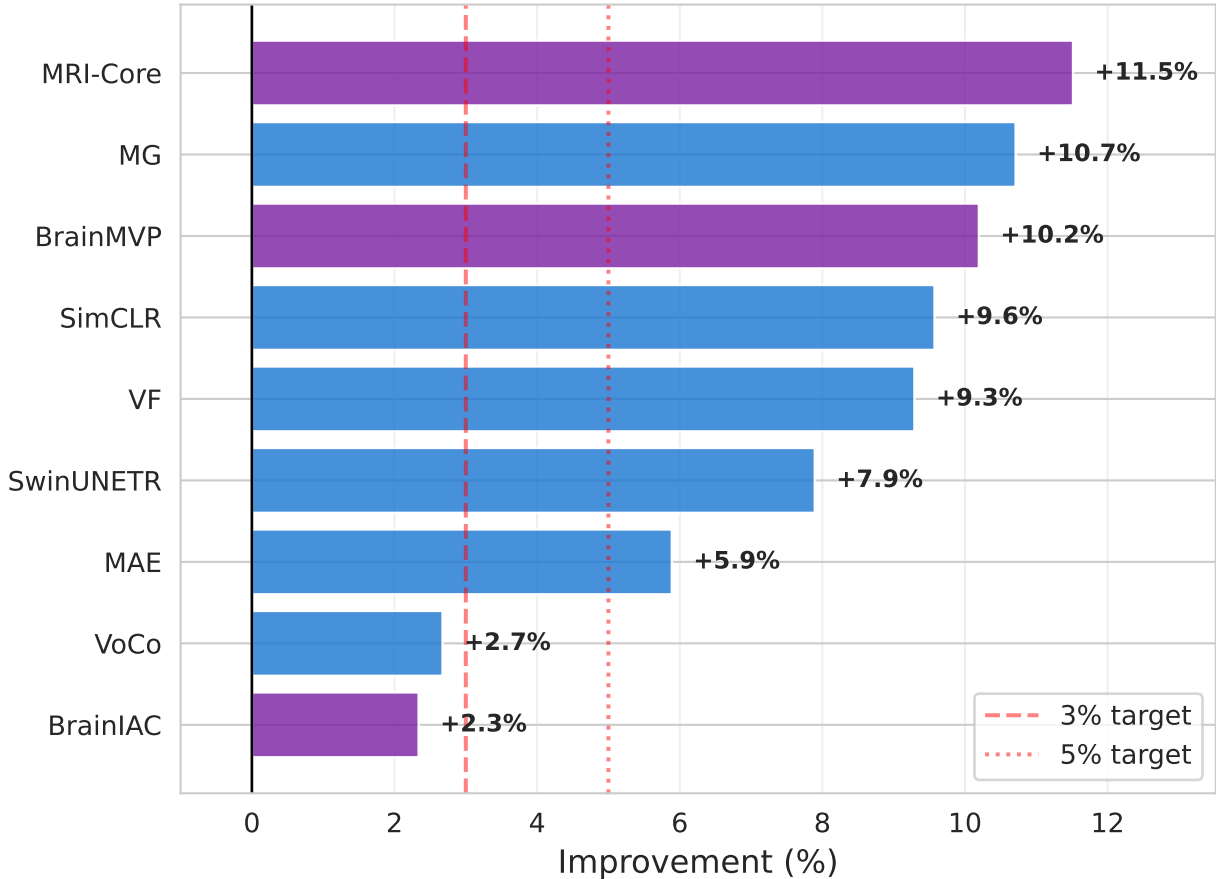| Method | Mean AUROC |
|---|---|
| MDAE | 0.776 |
| BrainIAC | 0.752 |
| VoCo | 0.749 |
| DinoV2 | 0.734 |
| MAE | 0.717 |
| SwinUNETR | 0.697 |
| VF | 0.683 |
| SimCLR | 0.680 |
| BrainMVP | 0.674 |
| S3D | 0.670 |
| MG | 0.669 |
| ResNet-50 | 0.663 |

Legend: MDAE (Ours), SSL Baselines, Foundation Models, Others

**(b) Performance Heatmap (Selected Benchmarks)**

| Method | Gli vs Men | Gli vs Met | Men vs Met | MGMT | IDH | Surv 1Y | Surv 2Y | GTR |
|---|---|---|---|---|---|---|---|---|
| MDAE | 0.99 | 0.97 | 0.97 | 0.64 | 0.77 | 0.65 | 0.70 | 0.63 |
| BrainIAC | 1.00 | 0.95 | 0.82 | 0.65 | 0.79 | 0.61 | 0.71 | 0.55 |
| VoCo | 0.99 | 0.98 | 0.98 | 0.57 | 0.79 | 0.67 | 0.57 | 0.54 |
| MAE | 0.98 | 0.88 | 0.93 | 0.61 | 0.76 | 0.67 | 0.65 | 0.56 |
| SimCLR | 0.98 | 0.70 | 0.76 | 0.55 | 0.77 | 0.63 | 0.61 | 0.52 |
| MRI-Core | 0.62 | 0.81 | 0.78 | 0.58 | 0.69 | 0.59 | 0.58 | 0.53 |
| BrainMVP | 0.76 | 0.93 | 0.89 | 0.60 | 0.69 | 0.57 | 0.62 | 0.53 |

**(c) Performance Distribution Across Tasks**

| Method | AUROC |
|---|---|
| MDAE | 0.776 |
| BrainIAC | 0.752 |
| VoCo | 0.749 |
| MAE | 0.717 |
| SimCLR | 0.680 |
| MRI-Core | 0.661 |
| BrainMVP | 0.674 |
| DinoV2 | 0.734 |

**(d) MDAE Improvement over Baselines**

| Method | Improvement (%) |
|---|---|
| MRI-Core | +11.5% |
| MG | +10.7% |
| BrainMVP | +10.2% |
| SimCLR | +9.6% |
| VF | +9.3% |
| SwinUNETR | +7.9% |
| MAE | +5.9% |
| VoCo | +2.7% |
| BrainIAC | +2.3% |

Legend: 3% target, 5% target

MDAE Mean AUROC: 77.6%
Avg. improvement over SSL: 7.7%
Avg. improvement over FM: 8.0%