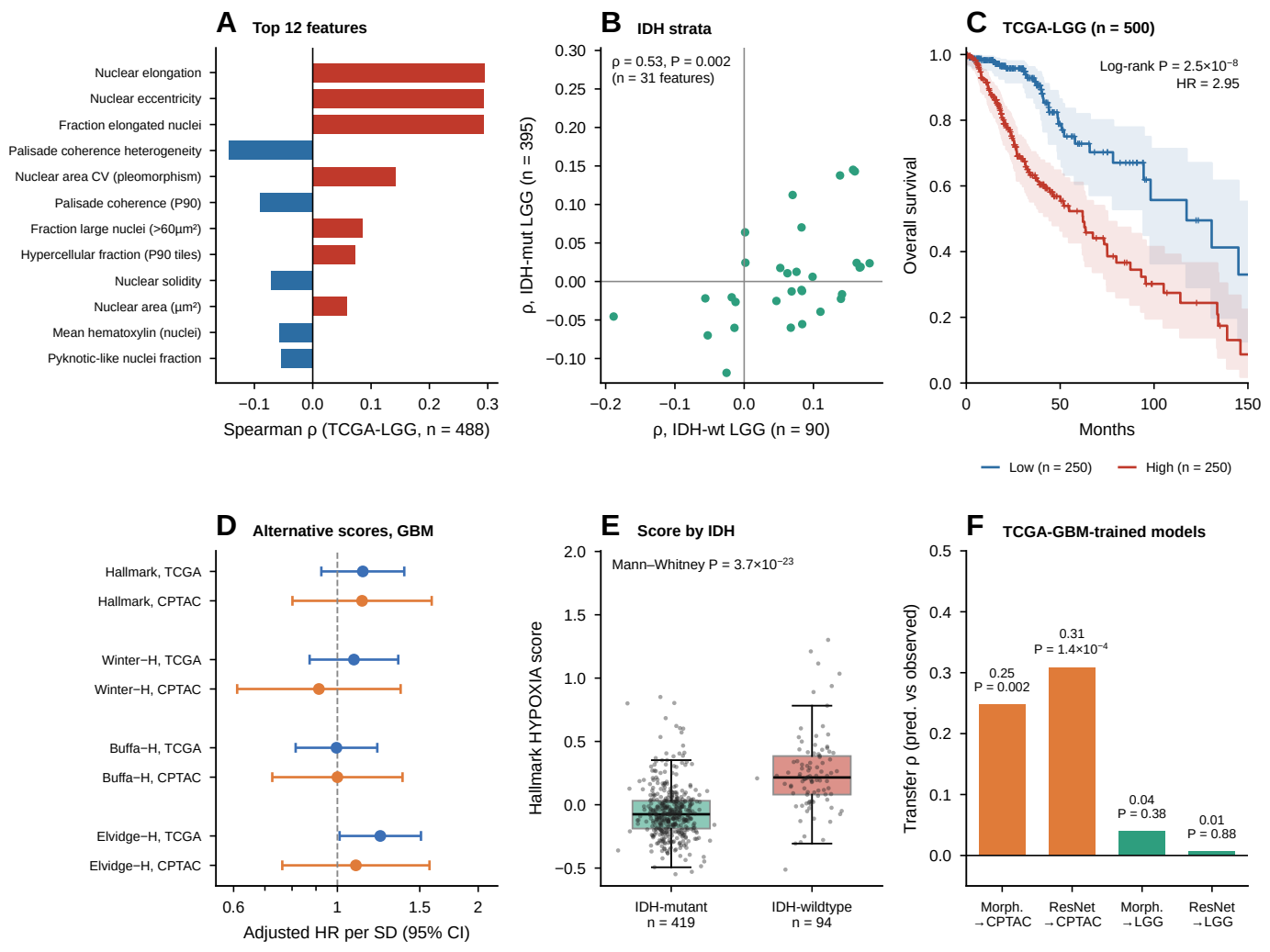

A
Top 12 features
Nuclear elongation
Nuclear eccentricity
Fraction elongated nuclei
Palisade coherence heterogeneity
Nuclear area CV (pleomorphism)
Palisade coherence (P90)
Fraction large nuclei (>60μm²)
Hypercellular fraction (P90 tiles)
Nuclear solidity
Nuclear area (μm²)
Mean hematoxylin (nuclei)
Pyknotic-like nuclei fraction
−0.1
0.0
0.1
0.2
0.3
Spearman ρ (TCGA-LGG, n = 488)
B
IDH strata
ρ = 0.53, P = 0.002
(n = 31 features)
ρ, IDH-mut LGG (n = 395)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.2
−0.1
0.0
0.1
ρ, IDH-wt LGG (n = 90)
C
TCGA-LGG (n = 500)
Log-rank P = 2.5×10⁻⁸
HR = 2.95
Overall survival
1.0
0.8
0.6
0.4
0.2
0.0
0
50
100
150
Months
Low (n = 250)
High (n = 250)
D
Alternative scores, GBM
Hallmark, TCGA
Hallmark, CPTAC
Winter−H, TCGA
Winter−H, CPTAC
Buffa−H, TCGA
Buffa−H, CPTAC
Elvidge−H, TCGA
Elvidge−H, CPTAC
0.6
1
1.5
2
Adjusted HR per SD (95% CI)
E
Score by IDH
Mann–Whitney P = 3.7×10⁻²³
Hallmark HYPOXIA score
2.0
1.5
1.0
0.5
0.0
−0.5
IDH-mutant
n = 419
IDH-wildtype
n = 94
F
TCGA-GBM-trained models
Transfer ρ (pred. vs observed)
0.5
0.4
0.3
0.2
0.1
0.0
0.25
P = 0.002
0.31
P = 1.4×10⁻⁴
0.04
P = 0.38
0.01
P = 0.88
Morph.
→CPTAC
ResNet
→CPTAC
Morph.
→LGG
ResNet
→LGG