



**Figure S1** Single-site metastasis prognosis, missing data distribution and deep learning model training of PGM. (A) The ratio, overall survival and cancer-specific survival of patients with PGM who had different metastatic single sites. (B) The distribution of missing values prior to data imputation (red indicates the presence of missing values for the corresponding clinical feature). (C) Deep learning prognostic models' training curves. PGM, primary gastrointestinal melanoma.

**Table S1** Comparison of two cohorts of patients in the prognostic model

Clinical features	Discovery cohort, N=494	Validation cohort, N=124	P value
Age (year), median (IQR)	70.0 (59.0–79.0)	72.0 (62.0–80.0)	0.638 <sup>1</sup>
Race, n (%)			0.927 <sup>2</sup>
White	427 (87)	106 (85)	
Black	23 (5)	7 (6)	
Asian or Pacific Islander	37 (8)	10 (8)	
American Indian/Alaska Native	4 (1)	1 (1)	
Unknown	3	0	
Sex, n (%)			0.125 <sup>3</sup>
Female	273 (55)	78 (63)	
Male	221 (45)	46 (37)	
Site, n (%)			0.975 <sup>2</sup>
Anus, anal canal and anorectum	255 (52)	63 (51)	
Colon and rectum (excluding appendix)	169 (34)	46 (37)	
Esophagus	19 (4)	4 (3)	
Small intestine	21 (4)	6 (5)	
Stomach	17 (3)	3 (2)	
Others	13 (3)	2 (2)	
Stage, n (%)			0.030 <sup>3</sup>
Localized	158 (35)	26 (23)	
Regional	127 (28)	35 (31)	
Distant	162 (36)	53 (46)	
Unknown	47	10	
Tumor size (mm), median (IQR)	36.0 (20.0–50.0)	40.0 (25.0–56.0)	0.341 <sup>1</sup>
Unknown	175	45	
Regional nodes examined, median (IQR)	0.0 (0.0–1.5)	0.0 (0.0–0.3)	0.538 <sup>1</sup>
Unknown	31	4	
Regional nodes positive median (IQR)	1.0 (0.0–3.0)	2.0 (0.0–4.0)	0.135 <sup>1</sup>
Unknown	347	94	
Surgery, n (%)	324 (66)	79 (64)	0.695 <sup>3</sup>
Radiotherapy, n (%)	105 (21)	32 (26)	0.275 <sup>3</sup>
Chemotherapy, n (%)	64 (13)	16 (13)	0.988 <sup>3</sup>
Systemic therapy, n (%)	126 (26)	40 (32)	0.129 <sup>3</sup>
Months from diagnosis to treatment, median (IQR)	1.0 (0.0–1.0)	1.0 (0.0–1.0)	0.788 <sup>1</sup>
Unknown	70	12	
History of malignancy, n (%)	123 (25)	24 (19)	0.195 <sup>3</sup>
Number of metastatic sites, n (%)			0.042 <sup>2</sup>
No metastasis	352 (74)	72 (62)	
Single	71 (15)	27 (23)	
Two	39 (8)	15 (13)	
Unknown	19	7	
More than two	13 (3)	3 (3)	

<sup>1</sup>, Wilcoxon rank sum test; <sup>2</sup>, Fisher's exact test; <sup>3</sup>, Pearson's Chi-squared test. Missing values are not involved in the percentage calculation. IQR, interquartile range.

**Table S2** Numerical encoding of categorical clinical features

Clinical features	Numerical encoding
Sex	
Female	0
Male	1
Race	
White	0
Black	1
Asian or Pacific Islander	2
American Indian/Alaska Native	3
Site	
Anus, anal canal and anorectum	0
Colon and rectum (excluding appendix)	1
Esophagus	2
Small Intestine	3
Stomach	4
Others	5
Stage	
Localized	0
Regional	1
Distant	2
Surgery	
No	0
Yes	1
Radiotherapy	
No	0
Yes	1
Chemotherapy	
No	0
Yes	1
Systemic therapy	
No	0
Yes	1
History of malignancy	
No	0
Yes	1
Number of metastatic sites	
No metastasis	0
Single	1
Two	2
More than two	3

**Table S3** Mean and standard deviation of numerical clinical features in discovery cohort

Clinical features	Mean	Standard deviation
Age (years)	68.84	13.51
Tumor size (mm)	44.66	53.03
Regional nodes examined	3.58	7.92
Regional nodes positive	7.07	19.88
Months from diagnosis to treatment	0.80	0.97