

**The interpretable CT-based vision transformer model for preoperative prediction of clear cell renal cell carcinoma SSIGN score and outcome**

**ELECTRONIC SUPPLEMENTARY MATERIAL**

**Table S1 CT scan parameters**

CT scanner	CT 256	CT 256	CT 128	CT 128	CT 64	CT 64	CT 64	CT 16	CT 16
Scanner model	Brilliance	Revolution	Somatom	Somatom	LightSpeed	Somatom	Discovery 750	Brilliance 16	Brightspeed 16
	iCT 256		Definition	Definition	VCT	Sensation 64			
				Flash					
Manufacturer	Philips	General	Siemens	Siemens	General	Siemens	General	Philips	General Electric
		Electric			Electric		Electric		
Gantry rotation time (s)	0.5	0.28	0.33	0.28	0.5	0.5	0.5	0.5	0.6
Tube voltage (kV)	120	120	120-	120	120	120	120	120	120
Tube current	250 mA	250-400 mA	200 mAs	Ref. 200 mAs	200 mA	200 mAs	200-400 mA	200 mAs	100-400 mA
		(automatic tube		(Care Dose			(automatic tube		
		current		4D)			current		
		modulation)					modulation)		
Detector collimation (mm)	0.625	0.625	0.6	0.6	0.625	0.6	0.625	0.75	0.625
Matrix	512×512	512×512	512×512	512×512	512×512	512×512	512×512	512×512	512×512
Pitch	0.915	0.992	1.0	1.0	0.984	1.0	1.375	1	1.375

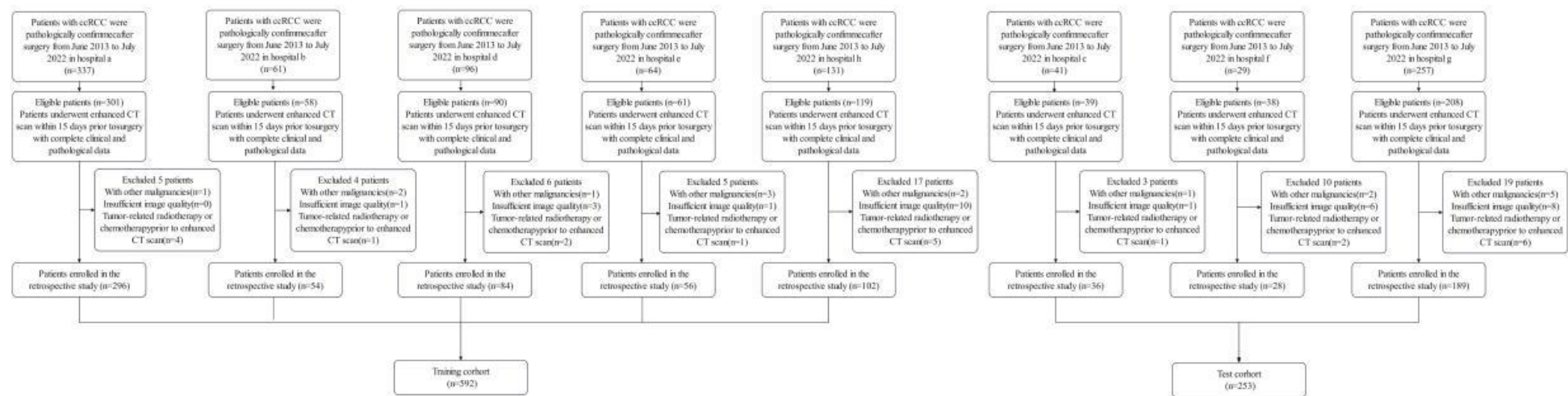
Slice thickness (mm)	5	5	5	5	5	5	5	5	5
Hospital	a, c	a, f	b, d	a, e, h	c	a, b	g	a	g

Note- s = second, kV = kilovolt, mA = milliampere, mm = milimetre. a, The Affiliated Hospital of Qingdao University; b, Fudan University Shanghai Cancer Center; c, Yantai Yuhuangding Hospital; d, Weifang People's Hospital; e, The Affiliated Hospital of Jining Medical College; f, The Affiliated Hospital of Shandong University of Traditional Chinese Medicine; g, Shandong Provincial Hospital Affiliated to Shandong First Medical University; h, Rizhao People's Hospital.

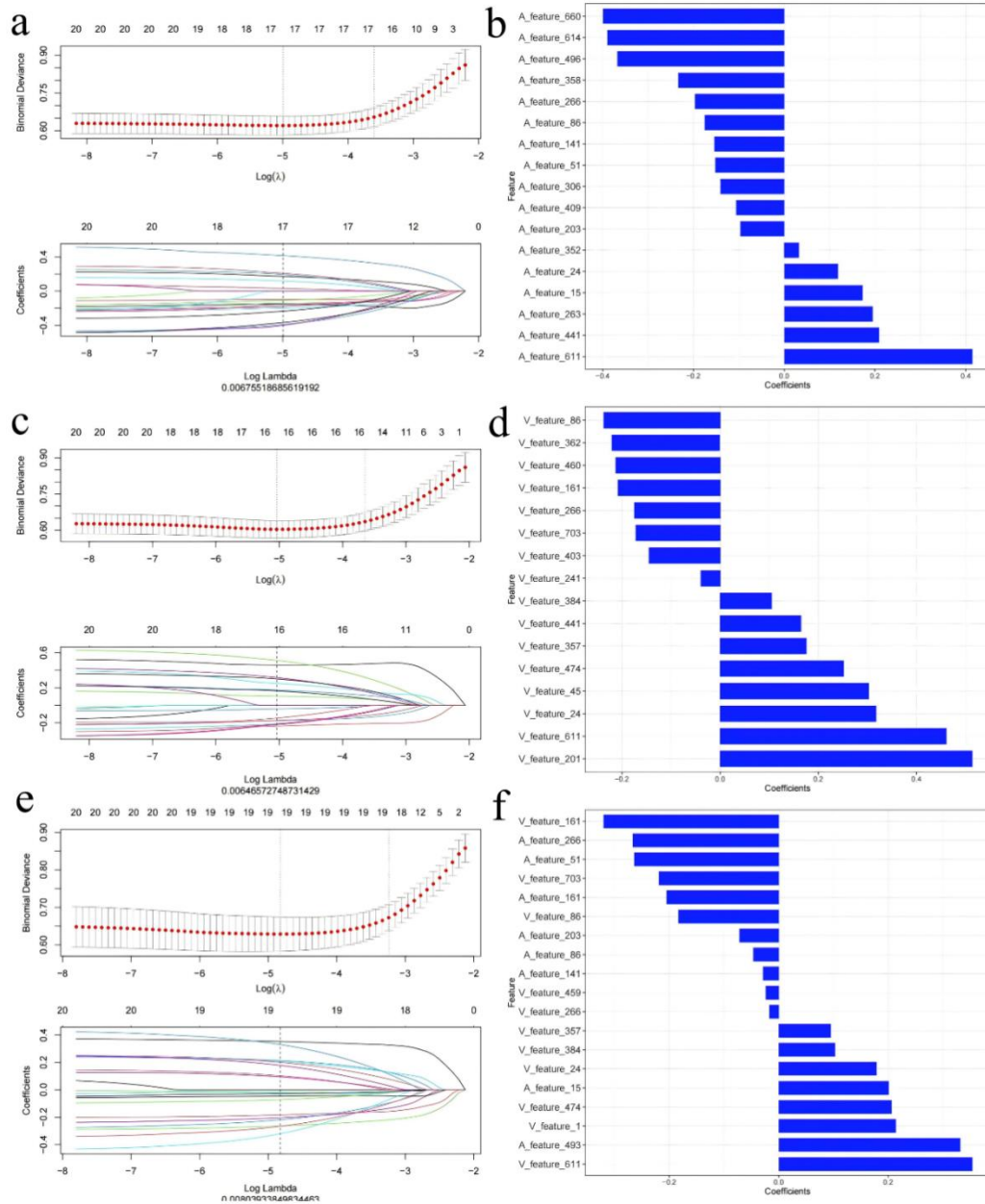
**Table S2 The hazard ratio (HR) estimates associated with progression-free survival stratified by ViT models in the clear cell renal cell carcinoma**

Model	Subgroup	Training cohort		Test cohort	
		HR	95% CI	HR	95% CI
CVM	Intermediate-to-high risk vs. low risk	3.991	2.454-6.490	2.589	0.869-7.709
RVM	Intermediate-to-high risk vs. low risk	5.123	2.435-10.778	3.195	1.627-6.272
CRVM	Intermediate-to-high risk vs. low risk	4.548	2.887-7.165	5.508	1.695-17.897

Note- CVM= cortical medullary phase (CMP) vision transformer feature model; RVM= renal parenchymal phase (RPP) vision transformer feature model; CRVM= CMP-RPP combined feature vision transformer model; CI= confidence interval.



**Figure S1** The detailed recruitment pathway of patients from each center.



**Figure S2** The ViT features selection by using the LASSO regression model (a, cross-validation parameter selection process and the trajectory dynamics of each cortical medullary phase [CMP] features; b, the final selected CMP features; c, cross-validation parameter selection process and the trajectory dynamics of each renal parenchymal phase [RPP] features; d, the final selected RPP features; e, cross-validation parameter selection process and the trajectory dynamics of each CMP-RPP combined features; f, the final selected CMP-RPP combined features).

## Checklist for Artificial Intelligence in Medical Imaging (CLAIM): 2024 Update

Section / Topic	No	Item	Page / Line	No	NA
<b>TITLE / ABSTRACT</b>					
	<b>1</b>	Identification as a study of AI methodology, specifying the category of technology used (e.g., deep learning)	<b>1/1</b>		
<b>ABSTRACT</b>					
	<b>2</b>	Summary of study design, methods, results, and conclusions	<b>1/5</b>		
<b>INTRODUCTION</b>					
	<b>3</b>	Scientific and/or clinical background, including the intended use and role of the AI approach	<b>4/8</b>		
	<b>4</b>	Study aims, objectives, and hypotheses	<b>6/9</b>		
<b>METHODS</b>					
<i>Study Design</i>	<b>5</b>	Prospective or retrospective study	<b>6/16</b>		
	<b>6</b>	Study goal	<b>6/18</b>		
<i>Data</i>	<b>7</b>	Data sources	<b>7/2</b>		
	<b>8</b>	Inclusion and exclusion criteria	<b>6/20</b>		
	<b>9</b>	Data pre-processing	<b>8/15</b>		
	<b>10</b>	Selection of data subsets	<b>8/12</b>		
	<b>11</b>	De-identification methods	<b>8/7</b>		
	<b>12</b>	How missing data were handled			√
	<b>13</b>	Image acquisition protocol	<b>7/19</b>		
<i>Reference Standard</i>	<b>14</b>	Definition of method(s) used to obtain reference standard	<b>7/11</b>		
	<b>15</b>	Rationale for choosing the reference standard			√
	<b>16</b>	Source of reference standard annotations			√
	<b>17</b>	Annotation of test set			√
	<b>18</b>	Measures of inter- and intra-rater variability of features described by the annotators	<b>7/12</b>		

<i><b>Data Partitions</b></i>	<b>19</b>	How data were assigned to partitions	<b>7/3</b>		
	<b>20</b>	Level at which partitions are disjoint	<b>7/5</b>		
<i><b>Testing Data</b></i>	<b>21</b>	Intended sample size			√



Section / Topic	No.	Item	Page / Line	No	NA
<i>Model</i>	22	Detailed description of model	8/3		
	23	Software libraries, frameworks, and packages	8/10		
	24	Initialization of model parameters	8/18		
<i>Training</i>	25	Details of training approach			√
	26	Method of selecting the final model			√
	27	Ensembling techniques			√
<i>Evaluation</i>	28	Metrics of model performance	9/5		
	29	Statistical measures of significance and uncertainty	10/11		
	30	Robustness or sensitivity analysis	9/6		
	31	Methods for explainability or interpretability	9/11		
	32	Evaluation on internal data	9/7		
	33	Testing on external data	9/7		
	34	Clinical trial registration			√
<b>RESULTS</b>					
<i>Data</i>	35	Numbers of patients or examinations included and excluded	10/16		
	36	Demographic and clinical characteristics of cases in each partition	10/16		
<i>Model performance</i>	37	Performance metrics and measures of statistical uncertainty	11/4		
	38	Estimates of diagnostic performance and their precision	11/4		
	39	Failure analysis of incorrect results	15/11		
<b>DISCUSSION</b>					
	40	Study limitations	16/12		
	41	Implications for practice, including intended use and/or clinical role	16/3		
<b>OTHER INFORMATION</b>					

	<b>42</b>	Provide a reference to the full study protocol or to additional technical details	<b>11/3</b>		
	<b>43</b>	Statement about the availability of software, trained model, and/or data	<b>17/20</b>		
	<b>44</b>	Sources of funding and other support; role of funders	<b>18/3</b>		

\* Indicate page and/or line number for each checklist item that is present. NA = not applicable.