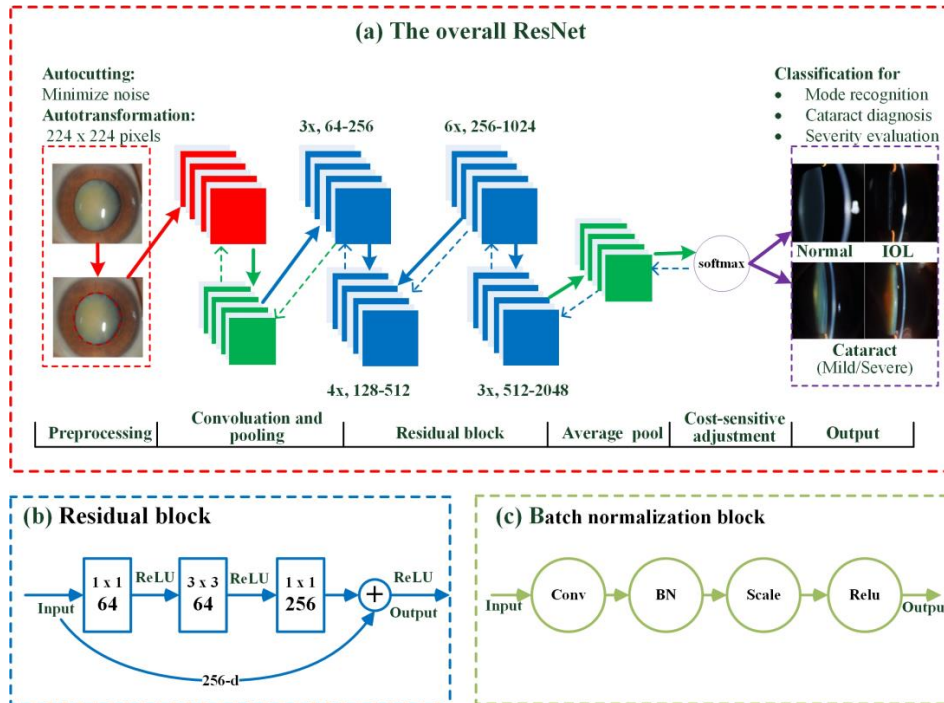


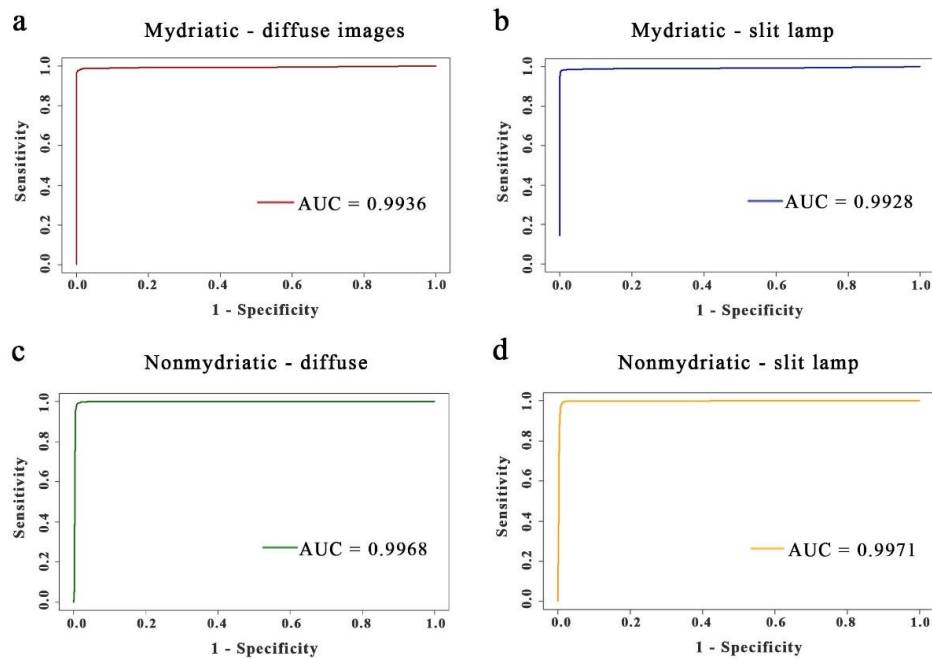
1 **Supplementary Figures**

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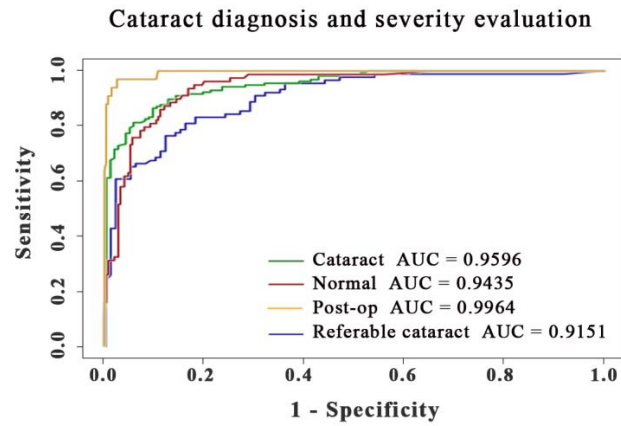
4 **Figure S1. The architecture of the ResNet method. a**, The overall architecture of the  
 5 ResNet model; this model consists of convolution layers, a max-pooling operation and  
 6 16 residual blocks, which are indicated by the red, green and blue rectangles,  
 7 respectively, followed by softmax and cost-sensitive adjustment layers. **b**, One unfolded  
 8 residual block. **c**, The BN and scale operations. ResNet, residual network; BN, batch  
 9 normalization; Conv, convolution operation; ReLU, rectified linear unit.

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11 **Figure S2. Receiver operating characteristic (ROC) curves and areas under the**  
12 **curve (AUCs) of the deep learning system for the detection of different capture**  
13 **modes. a, Mydriatic-diffuse images; b, mydriatic-slit lamp images; c, nonmydriatic-**  
14 **diffuse images; d, nonmydriatic slit lamp images.**  
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17 **Figure S3. Receiver operating characteristic (ROC) curves and areas under the**  
18 **curve (AUCs) of diagnostic performance in the cataract AI ambulatory site in a**  
19 **real-world tertiary referral pattern. a, Mydriatic-diffuse images; b, mydriatic-slit**  
20 **lamp images; c, nonmydriatic-diffuse images; d, nonmydriatic slit lamp images.**

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23 **Supplementary Tables**24 **Table S1. Demographics and summary of the Chinese Medical Alliance for**  
25 **Artificial Intelligence (CMAAI) datasets.**

<b>Demographics</b>	<b>Training set number (%)</b>	<b>Validation set number (%)</b>
<b>Total number of images</b>	30132	7506
<b>Total number of eyes</b>	23935	5036
<b>Total number of patients</b>	13036	3575
<b>Age, adults (&gt;18 years old)</b>	27930 (92.7)	7475 (99.6)
<b>Gender, Male</b>	15110 (54.1)	4201 (56.2)
<b>Datasets</b>		
ZOCES 2013-2016	29002	1130
ZOCES 2016-2017	0	5999
HZSP	101	34
EGES	574	191
GHMEP	284	95
SCGSP	171	57
<b>Capture modes</b>		
Mydriatic & diffuse	7990 (26.5)	1991 (26.5)
Mydriatic & slit lamp	7990 (26.5)	1991 (26.5)
Nonmydriatic & diffuse	6162 (20.4)	1533 (20.4)
Nonmydriatic & slit lamp	7990 (26.5)	1991 (26.5)
<b>Diagnosis</b>		
Normal	3618 (12.0)	890 (11.9)
Mild cataract	7817 (25.9)	2606 (34.7)
Severe cataract	7233 (24.0)	2384 (31.8)
Postoperative eye	5363 (17.8)	1620 (21.6)

26 **Footnotes:** ZOCES: Zhongshan Ophthalmic Center Eye Study; HZSP: Huazhong  
27 Screening Program; EGES: Eastern Guangdong Eye Study; GHMEP: Guangdong-  
28 Hong Kong-Marco Greater Bay Area Eye Project; SCGSP: Southern China Guangming  
29 Screening Program.

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34 **Table S2. Compositions of the training and validation datasets considering the**  
 35 **diseases and capture modes.**

<b>Images</b> (training/validation)		<b>Mydriatic &amp; diffuse</b>	<b>Mydriatic &amp; slit lamp</b>	<b>Nonmydriatic &amp; diffuse</b>	<b>Nonmydriatic &amp; slit lamp</b>
<b>Total</b>		7990/1991	7990/1991	6162/1533	7990/1991
<b>Normal</b>		661/200	352/60	771/200	1518/430
<b>Cataract</b>		1830/451	1830/451	1830/451	1830/451
<b>Pediatric cataract</b>					
<b>No VAO</b>		1060/11	/	/	/
<b>VAO</b>		1142/20	/	/	/
<b>Adult cataract</b>					
<b>Cataract diagnosis</b>	<b>Mild (Nuclear I-II)</b>	2456/600	2000/1000	1124/350	1540/300
	<b>No PCO/ACO</b>	/	3389/113	/	/
	<b>PCO/ACO</b>	/	2555/20	/	/
	<b>Severe (Nuclear III-V)</b>	2127/520	2000/1000	808/250	1167/250
<b>Post-op</b>		2131/500	1752/800	645/200	939/120
<b>PCO</b>					
<b>No VAO</b>		5479/125	/	/	/
<b>VAO</b>		4805/50	/	/	/

36 **Footnotes:** PCO: posterior capsular opacification; ACO: anterior capsular  
 37 opacification; VAO: visual axis opacity.

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40 **Table S3. Diagnostic performance of the cataract AI agent.**

	Index	Mydriatic & diffuse	Mydriatic & slit lamp	Nonmydriatic & diffuse	Nonmydriatic & slit lamp	
<b>Capture mode</b>	<b>AUC</b>	99.36% (99.12%, 99.61%)	99.28% (99.01%, 99.54%)	99.68% (99.49%, 99.88%)	99.71% (99.55%, 99.88%)	
	<b>ACC</b>	97.90% (97.54%, 98.21%)	97.90% (97.54%, 98.21%)	97.90% (97.54%, 98.21%)	97.90% (97.54%, 98.21%)	
	<b>SEN</b>	97.74% (96.99%, 98.35%)	95.98% (95.02%, 96.80%)	98.63% (97.91%, 99.15%)	99.40% (98.95%, 99.69%)	
	<b>SPE</b>	99.58% (99.37%, 99.74%)	99.89% (99.76%, 99.96%)	99.18% (98.92%, 99.39%)	98.55% (98.20%, 98.85%)	
<b>Cataract diagnosis</b>	<b>Normal</b>	<b>AUC</b>	99.67% (99.04%, 100%)	99.82% (98.93%, 100%)	99.26% (98.16%, 100%)	99.30% (98.57%, 100%)
		<b>ACC</b>	98.79% (98.18%, 99.24%)	98.88% (98.42%, 99.23%)	96.00% (94.11%, 97.42%)	94.81% (92.99%, 96.26%)
		<b>SEN</b>	93.00% (88.53%, 96.12%)	93.33% (83.80%, 98.15%)	88.00% (81.70%, 92.73%)	95.14% (92.34%, 97.15%)
		<b>SPE</b>	99.51% (99.03%, 99.79%)	99.00% (98.56%, 99.33%)	98.67% (97.12%, 99.51%)	94.52% (91.90%, 96.50%)
	<b>Cataract</b>	<b>AUC</b>	99.93% (99.81%, 100%)	99.96% (99.90%, 100%)	99.19% (98.29%, 100%)	99.38% (98.72%, 100%)
		<b>ACC</b>	98.68% (98.04%, 99.15%)	98.92% (98.46%, 99.26%)	94.33% (92.17%, 96.04%)	94.55% (92.70%, 96.04%)
		<b>SEN</b>	98.57% (97.69%, 99.18%)	98.85% (98.28%, 99.27%)	96.33% (93.53%, 98.16%)	93.14% (89.97%, 95.56%)
		<b>SPE</b>	98.86% (97.76%, 99.51%)	99.07% (98.18%, 99.60%)	92.33% (88.72%, 95.08%)	95.71% (93.31%, 97.44%)
	<b>Post-op</b>	<b>AUC</b>	99.93% (99.74%, 100%)	99.93% (99.78%, 100%)	98.99% (97.66%, 100%)	99.74% (98.69%, 100%)
		<b>ACC</b>	98.46% (97.78%, 98.98%)	99.41% (99.05%, 99.65%)	95.33% (93.33%, 96.88%)	99.22% (98.31%, 99.71%)
		<b>SEN</b>	98.60% (97.14%, 99.44%)	98.38% (97.24%, 99.13%)	90.67% (84.84%, 94.80%)	95.71% (87.98%, 99.11%)
		<b>SPE</b>	98.41% (97.58%, 99.01%)	99.81% (99.50%, 99.95%)	96.89% (94.84%, 98.29%)	99.57% (98.75%, 99.91%)

41 **Footnotes:** AUC: area under the receiver operating curve; accuracy (ACC) = (TP + TN) /  
42 (TP + TN + FP + FN); sensitivity (SEN) = TP / (TP + FN); specificity (SPE) = TN / (TN +  
43 FP); TP = true positive; TN = true negative; FP = false positive; FN = false negative.

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45 **Table S4. Performance of the cataract AI agent for referable conditions regarding**  
 46 **disease severity and etiology.**

		AUC	ACC	SEN	SPE	
<b>Pediatric cataract</b>	<b>VAO</b>	100.00% (100.00%, 100.00%)	100.00% (88.78%, 100.00%)	100.00% (83.16%, 100%)	100.00% (71.51%, 100.00%)	
	<b>No VAO</b>	100.00% (100.00%, 100.00%)	100.00% (88.78%, 100.00%)	100.00% (71.51%, 100.00%)	100.00% (83.16%, 100.00%)	
<b>Adult cataract</b>	<b>MD</b>	98.84% (98.05%, 99.63%)	95.63% (94.26%, 96.75%)	94.04% (91.64%, 95.91%)	97.00% (95.30%, 98.21%)	
		<b>MS</b>	99.15% (98.68%, 99.63%)	95.05% (94.01%, 95.96%)	94.80% (93.24%, 96.09%)	95.30% (93.80%, 96.53%)
	<b>Nuclear (III-V)</b>	<b>ND</b>	93.28% (89.02%, 97.54%)	89.00% (84.90%, 92.31%)	88.67% (82.48%, 93.26%)	89.33% (83.26%, 93.78%)
		<b>NS</b>	98.38% (96.52%, 100%)	94.57% (91.65%, 96.70%)	94.00% (88.92%, 97.22%)	95.00% (91.00%, 97.58%)
	<b>MD</b>	98.84% (98.01%, 99.66%)	95.63% (94.26%, 96.75%)	97.00% (95.30%, 98.21%)	94.04% (91.64%, 95.91%)	
		<b>MS</b>	99.15% (98.67%, 99.63%)	95.05% (94.01%, 95.96%)	95.30% (93.80%, 96.53%)	94.80% (93.24%, 96.09%)
	<b>Nuclear (I-II)</b>	<b>ND</b>	93.28% (88.96%, 97.60%)	89.00% (84.90%, 92.31%)	89.33% (83.26%, 93.78%)	88.67% (82.48%, 93.26%)
		<b>NS</b>	98.38% (96.73%, 100%)	94.57% (91.65%, 96.70%)	95.00% (91.00%, 97.58%)	94.00% (88.92%, 97.22%)
	<b>No PCO/ACO</b>	94.88% (90.52%, 99.24%)	88.00% (82.24%, 92.42%)	95.20% (89.85%, 98.22%)	70.00% (55.39%, 82.14%)	
		<b>PCO/ACO</b>	94.88% (90.52%, 99.24%)	88.00% (82.24%, 92.42%)	70.00% (55.39%, 82.14%)	95.20% (89.85%, 98.22%)
	<b>Post-op PCO</b>	<b>VAO</b>	91.90% (83.48%, 100.00%)	89.47% (82.97%, 94.12%)	70.00% (45.72%, 88.11%)	92.92% (86.53%, 96.89%)
		<b>No VAO</b>	91.90% (83.48%, 100.00%)	89.47% (82.97%, 94.12%)	92.92% (86.53%, 96.89%)	70.00% (45.72%, 88.11%)

47 **Footnotes:** AUC: area under the receiver operating curve; accuracy (ACC) = (TP + TN)  
 48 / (TP + TN + FP + FN); sensitivity (SEN) = TP / (TP + FN); specificity (SPE) = TN /  
 49 (TN + FP); TP = true positive; TN = true negative; FP = false positive; FN = false  
 50 negative; VAO: visual axis opacity; PCO: posterior capsular opacification; ACO:  
 51 anterior capsular opacification; MD: mydriatic-diffuse; MS: mydriatic-slit lamp; ND:  
 52 nonmydriatic-diffuse; NS: nonmydriatic-slit lamp.

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