Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.
eFigure 1. Geographical Distribution of Centers and Included Cases

| No. | Province      | Cases |
|-----|---------------|-------|
| 1   | Chongqing     | 3,117 |
| 2   | Sichuan       | 573   |
| 3   | Shandong      | 438   |
| 4   | Jiangsu       | 278   |
| 5   | Gansu         | 256   |
| 6   | Jilin         | 240   |
| 7   | Hubei         | 214   |
| 8   | Beijing       | 205   |
| 9   | Guangdong     | 191   |
| 10  | Liaoning      | 93    |
| 11  | Heilongjiang  | 52    |
| 12  | Hunan         | 43    |
| 13  | Henan         | 38    |
| 14  | Ningxia       | 30    |
| 15  | Zhejiang      | 29    |
| 16  | Yunnan        | 28    |
|     | Total:        | 5,825 |

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eFigure 2. Study Flow Chart of Training Phase

Training Phase of SmartScan

Original Data
(Total 2927 examinations with 148,357,922 images)

Redundant image screening process

Preprocessed Data
(37,089,480 images)

Selected by endoscopists

Labeled Data
(757,770 representative images)

Training Dataset 1
(Inputting 608,263 SBCE images for training EfficientNet)

Training Dataset 2
(Inputting 149,507 SBCE images for training YOLONet)

SmartScan Assisted Reading (SSAR)
eFigure 3. Study Flow Chart of Validation Phase
eFigure 4. Capsule Endoscopy System and Software. (A) Hardware of Capsule Endoscopy; (B) Main Interface of software; (C) “SmartView” & “SmartFindings”.
**eFigure 5. Normal Images, Invalid Images, Findings-Typical Images, and Findings-Atypical Images**

| Invalid Images | In-vitro images, overexposed images, images with excessive luminal residue and/or bubbles |
|----------------|-----------------------------------------------------------------------------------|
| Normal Images  | Normal small bowel images without findings                                         |
| Findings-Typical Images | Images of findings with morphological characteristics, i.e.: blood, parasite, polyp, etc. |
| Findings-Atypical Images | Images of findings not easily recognisable, i.e.: subtle pattern(A, B), multiple findings in the same image(C, D), or finding mixed in bubbles or residue(E, F) |
**eFigure 6.** Flow Chart of *SmartScan* Inference System. (A) Flow Chart of *SmartScan* Inference System; (B) EfficientNet Network; (C) YOLO Network.
eFigure 7. The 17 Findings Detected by SmartScan Assisted Reading (SSAR)
eFigure 8. Missed Findings by Conventional Reading (CR) and *SmartScan*-Assisted Reading (SSAR)

| Category          | CR                                   | SSAR                                |
|-------------------|--------------------------------------|-------------------------------------|
| Protruding Lesions| ![Images of protruding lesions CR](image1) | ![Images of protruding lesions SSAR](image2) |
| Flat Lesions      | ![Images of flat lesions CR](image3)  | ![Images of flat lesions SSAR](image4)  |
| Mucosa            | ![Images of mucosa CR](image5)       | ![Images of mucosa SSAR](image6)     |
| Excavated Lesions | ![Images of excavated lesions CR](image7) | ![Images of excavated lesions SSAR](image8) |
| Content           | ![Images of content CR](image9)      | ![Images of content SSAR](image10)   |

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**eTable 1. Detailed Information of Patients in the Validation Set**

| Name of Hospital                                         | Number of included studies | Number of patients enrolled | Number of excluded cases |
|----------------------------------------------------------|----------------------------|-----------------------------|--------------------------|
| Chengdu Military Region General Hospital                 | 74                         | 80                          | 6                        |
| Henan Provincial People's Hospital                       | 38                         | 40                          | 2                        |
| Heilongjiang Provincial People's Hospital                | 27                         | 29                          | 2                        |
| Hubei Provincial People's Hospital                       | 190                        | 192                         | 2                        |
| West China Hospital                                     | 48                         | 49                          | 1                        |
| Bahun First Hospital of Jilin University                 | 179                        | 179                         | 0                        |
| PLA Air Force General Hospital                           | 30                         | 31                          | 1                        |
| The Second Affiliated Hospital of Lanzhou University      | 32                         | 34                          | 2                        |
| The First Affiliated Hospital of Lanzhou University       | 57                         | 70                          | 13                       |
| Daping Hospital, Army Medical Medical University         | 24                         | 24                          | 0                        |
| Xinqiao Hospital, Army Medical Medical University        | 994                        | 1023                        | 29                       |
| Nanchuan hospital                                        | 208                        | 223                         | 15                       |
| Southern Hospital                                        | 173                        | 174                         | 1                        |
| General Hospital of Nanjing Military Region              | 200                        | 272                         | 72                       |
| Ningxia Kangyuan anorectal Hospital                      | 11                         | 11                          | 0                        |
| Ningxia Medical University General Hospital              | 19                         | 19                          | 0                        |
| Qilu Hospital of Shandong Province, China                | 397                        | 456                         | 59                       |
| Sichuan Provincial People's Hospital                     | 28                         | 29                          | 1                        |
| Hospital of Southwest Medical University                 | 49                         | 56                          | 7                        |
| The first people's Hospital of Yunnan Province           | 23                         | 27                          | 4                        |
| The Second Affiliated Hospital of Zhejiang University     | 29                         | 29                          | 0                        |
| The Second Affiliated Hospital of Chongqing Medical University | 68                      | 76                          | 8                        |
| **Total**                                                | **2898**                   | **3123**                    | **225**                  |
**eTable 2. Demographics of Enrolled Subjects (N=2898)**

| Demographics                      | Gender, No. (%) | **Age (y)** | **SB cleanliness, No. (%)** | **SB completion rate, No. (%)** | **Stomach transit time (min)** | **SB Transit Time (min)** | **Capsule working time (min)** |
|-----------------------------------|-----------------|-------------|-----------------------------|--------------------------------|-------------------------------|---------------------------|-------------------------------|
|                                   | Female          | Male        | Good                        | Medium                         | Good                          | Medium                    | Good                          |
| Gender, No. (%)                   | 1,133 (39.1)    | 1,765 (60.9)| 638 (22.0)                  | 1,584 (54.7)                  | 319 (11.01)                   | No                        | 2,579 (88.99)                |
| Age (y)                           |                 |             |                              |                               |                               |                           |                               |
| Mean ±SD                          | 49.76 ±15.49    |             |                              |                               |                               |                           |                               |
| Med (P25-P75)                     | 50 (39-62)      |             |                              |                               |                               |                           |                               |
| Med (Mix-Max)                     | 50 (5-93)       |             |                              |                               |                               |                           |                               |
| SB cleanliness, No. (%)           |                 |             |                              |                               |                               |                           |                               |
| Good                              |                 |             |                              |                               |                               |                           |                               |
| Mean ±SD                          | 53.13 ±58.85    |             |                              |                               |                               |                           |                               |
| Med (P25-P75)                     | 33.33 (13.43-72.63)|         |                              |                               |                               |                           |                               |
| Med (Mix-Max)                     | 33.33 (0.22-827.75)|         |                              |                               |                               |                           |                               |
| SB completion rate, No. (%)       |                 |             |                              |                               |                               |                           |                               |
| No                                |                 |             |                              |                               |                               |                           |                               |
| Mean ±SD                          | 299.89 ±128.41  |             |                              |                               |                               |                           |                               |
| Med (P25-P75)                     | 276.69 (221.0-365.98)|        |                              |                               |                               |                           |                               |
| Med (Mix-Max)                     | 276.69 (9.82-934.68)|        |                              |                               |                               |                           |                               |
| Capsule working time (min)        |                 |             |                              |                               |                               |                           |                               |
| Mean ±SD                          | 579.27 ±137.07  |             |                              |                               |                               |                           |                               |
| Med (P25-P75)                     | 600.0 (475.53-668.08)|        |                              |                               |                               |                           |                               |
| Med (Mix-Max)                     | 600.0 (35.35-1,054.50)|       |                              |                               |                               |                           |                               |
**eTable 3.** Comparison of 17 Types of Findings by Conventional Reading (CR) and SmartScan Assisted Reading (SSAR)

| Lesions              | CR Findings          | SSAR Findings         |
|----------------------|----------------------|-----------------------|
| **Protruding Lesions** | Venous structure    |                       |
|                      | Nodule               |                       |
|                      | Mass/Tumour          |                       |
|                      | Polyp(s)             |                       |
| **Flat Lesions**     | Angioectasia         |                       |
|                      | Plaque(red)          |                       |
|                      | Plaque(white)        |                       |
|                      | Red spot             |                       |
|                      | Abnormal villi       |                       |
| **Mucosa**           | Lymphangiectasia     |                       |
|                      | Erythematous         |                       |
|                      | Oedematous           |                       |
| **Excavated Lesions** | Erosion              |                       |
|                      | Ulcer                |                       |
|                      | Aphtha               |                       |
| **Content**          | Blood                |                       |
|                      | Parasite             |                       |
eTable 4. Sensitivity of Findings in Patients Conventional Reading (CR) and SmartScan Assisted Reading (SSAR) (N = 2898)

|               | CR % (95% CI)          | SSAR % (95% CI)        | P value |
|---------------|------------------------|------------------------|---------|
| Sens          | 88.05 (86.67-89.30)    | 98.80 (98.27-99.17)    | <0.001  |
| Spec          | 100.00 (99.20-100.00)  | 100.00 (99.20-100.00)  | 1.000   |
| +PV           | 100.00 (99.77-100.00)  | 100.00 (99.79-100.00)  | 1.000   |
| -PV           | 67.29 (64.07-70.36)    | 95.33 (93.31-96.78)    | <0.001  |
**eTable 5. Missed Findings by Conventional Reading (CR) and SmartScan Assisted Reading (SSAR)**

| Findings         | CR, No. | SSAR No. |
|------------------|---------|----------|
| **Protruding Lesions** |         |          |
| Venous structure | 111     | 8        |
| Nodule           | 152     | 21       |
| Mass/tumour      | 34      | 7        |
| Polyp(s)         | 90      | 17       |
| **Flat Lesions** |         |          |
| Angioectasia     | 25      | 4        |
| Plaque(red)      | 79      | 19       |
| Plaque(white)    | 158     | 30       |
| Red spot         | 89      | 12       |
| Abnormal villi   | 102     | 23       |
| **Mucosa**       |         |          |
| Lymphangiectasia | 261     | 22       |
| Erythematous     | 92      | 21       |
| Oedematous       | 44      | 14       |
| **Excavated Lesions** |     |          |
| Erosion          | 89      | 19       |
| Ulcer            | 45      | 19       |
| Aphtha           | 26      | 3        |
| **Content**      |         |          |
| Blood            | 47      | 8        |
| Parasite         | 10      | 3        |
**Table 6.** Reading Time and Number of Images by Conventional Reading (CR) and SmartScan Assisted Reading (SSAR)

|                          | CR                | SSAR              | P value | Difference between two readings |
|--------------------------|-------------------|-------------------|---------|---------------------------------|
| **SBCE Reading time (min)** |                   |                   |         |                                 |
| Mean (SD)                | 51.42(11.60)      | 5.37(1.51)        |         | 46.05(11.16)                    |
| Med (IQR)                | 50 (43-58)        | 5 (4-6)           | <0.001  | 45 (38-53)                      |
| Med (range)              | 50 (30-130)       | 5 (3-12)          |         | 45 (25-123)                     |
| **Number of SBCE Images** |                   |                   |         |                                 |
| Mean (SD)                | 27,910.83(12,882.89) | 779.17(337.18)  |         | 27,131.66(12,888.95)            |
| Med (IQR)                | 26,277 (19,218-35,673) | 861 (502-1,044) | <0.001  | 25,495 (18,398-34,905)          |
| Med (range)              | 26,277 (860.0-81,907) | 861 (101-1,554) |         | 25,495 (350-81,789)             |

a Comparison of reading time between CR and SSAR, non-parametric paired Wilcoxon rank sum test: \( Z=46.629 \), \( P<0.001 \)

b Comparison of the number of pictures between CR and SSAR, non-parametric paired Wilcoxon rank sum test: \( Z=46.625 \), \( P<0.001 \)
eTable 7. Clinical Diagnosis Based on the Findings of Combined Agreed Comparator

| Overall diagnosis (n=2,898) | n   | %    |
|---------------------------|-----|------|
| Abnormal                  | 1647| 56.83|
| Normal                    | 1251| 43.17|

| Abnormal Diagnosis (%) cases/2,898 | n   | %    |
|-----------------------------------|-----|------|
| Inflammation-all grades           | 905 | 31.23|
| Bleeding                          | 236 | 8.14 |
| Neoplasia                         | 450 | 15.53|
| Infection                         | 77  | 2.66 |
| Vascular abnormalities            | 501 | 17.29|
| Total                             | 2,169| -    |
**eTable 8. Different Studies of Artificial Intelligence Application in Capsule Endoscopy**

|                      | Present Study | Hou XH, et al. | Hiroaki S, et al. |
|----------------------|---------------|----------------|-------------------|
| **Learning Model Type** | CNN           | CNN            | CNN               |
| **Center Number (n)** | 51            | 77             | 3                 |
| **Total Image (n)**  | 295,314,067   | 113,426,569    | 48091             |
| **Total Patients (n)** | 5825         | 6970           | 385               |
| **Lesion types (n)**  | 17            | >10            | 5                 |
| **Training Dataset**  |               |                |                   |
| Images               | 148,357,922   | 158,235        | 30,584            |
| Patients             | 2927          | 1970           | 292               |
| **Evaluation Dataset** |              |                |                   |
| Images               | 146,956,145   | 113,268,334    | 17,507            |
| Patients             | 2898          | 5000           | 93                |
| **Reading Time in one case (min)** | | | |
| Conventional reading | 51.42±11.60   | 96.6 ± 22.53   | Unknown           |
| AI reading           | 5.37 ±1.51    | 5.9±2.23       | Unknown           |
| **Reduced Images in one case (n)** | | | |
| Conventional reading | 27,910.83±12,882.89 | 22,654 | Unknown |
| AI reading           | 779.17±337.18 | 578            | Unknown           |
| **Sensitivity%, 95% CI** | 98.80(98.27-99.17) | 99.90 (99.74-99.97) | 90.7 (90.0-91.4) |
| **Specificity%, 95% CI** | 100.0(99.20-100.00) | 100(99.72-100.00) | 79.8 (79.0-80.6) |