

# Cell Segger v.1.0

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Cell Segger is a program to predict cell boundaries for cells in microscope images. It uses a pretrained UNet model to perform the prediction. In the version 1.0, only images in grayscale or color mode are accepted for an accurate prediction for them, for example, DIC and fluorescence microscope images; Images have single channel. Fluorescence images were usually captured in multi-channel mode and channels should be merged; The output image which is in binary contains predicted masks for cells in the input image; Together with output image, there will be a csv file named 'images.csv' which contains image metadata and run length encoded predicted masks, and a plain text file named 'welcome.txt' containing my greetings and contact information.

Cell Segger is currently deployed on a GPU workstation on Paperspace. Users can access Cell Segger in two ways: an API through the address '<http://64.62.255.225:8000/docs>' in any internet browser, and a streamlit interface through the address 'http://64.62.255.225:8501'.

## Cell Segger API

The Cell Segger API looks like the following.  
For single image prediction, use '/predict/single'; and batch prediction, use '/predict/batch'.

### 1. Cell Segger prediction on a single image.

Collapse the '/predict/single' tab, hit 'Try it out'. In the input\_mode field, fill 'L' for grayscale image, 'RGB' for color image. Upload image to the infile field. Hit 'Execute'.

The screenshot displays the FastAPI Swagger UI for the Cell Segger API. At the top, it shows 'FastAPI 0.100 OAS3' and a link to 'openapi.json'. Below this, the 'default' section lists two endpoints: 'GET / Root' and 'POST /predict/single Predict Single'. The 'POST /predict/batch Predict Batch' endpoint is also listed. The 'Schemas' section shows four schemas: 'Body\_predict\_batch\_predict\_batch\_post', 'Body\_predict\_single\_predict\_single\_post', 'HTTPValidationError', and 'ValidationError'. The 'POST /predict/single Predict Single' endpoint is expanded, showing the 'Parameters' section with a table for 'input\_mode' (string, query, required) and a value of 'L'. The 'Request body' section is set to 'multipart/form-data' and shows an 'infile' field (string, binary, required) with a 'Choose File' button and a file named 'SkBr3\_Phase\_E3\_2\_01d10h00m\_1.tif'. An 'Execute' button is present. The 'Responses' section shows a table with two entries: '200 Successful Response' and '422 Validation Error'. The 'Media type' is set to 'application/json'.

Name	Description
input_mode	string (query) required

Code	Description	Links
200	Successful Response	No links
422	Validation Error	No links

If the prediction is successful, the response code will be '200'. Hit 'Download file' to save the image containing the predicted masks to a local file.

Execute Clear

Responses

Curl

```
curl -X 'POST' \
  'http://64.62.255.225:8000/predict/single?input_mode=L' \
  -H 'accept: */*' \
  -H 'Content-Type: multipart/form-data' \
  -F 'infiles=SkBr3_Phase_E3_2_01d16h00m_1.tif;type=image/tiff'
```

Request URL

http://64.62.255.225:8000/predict/single?input\_mode=L

Server response

Code	Details
200	<p>Response body</p> <p><a href="#">Download file</a></p> <p>Response headers</p> <pre>content-disposition: attachment; filename=SkBr3_Phase_E3_2_01d16h00m_1_annotation.png content-length: 10372 content-type: image/png date: Fri, 09 Jun 2023 22:43:50 GMT server: uvicorn</pre>

Responses

Code	Description	Links
200	Successful Response	No links
422	Validation Error	No links

Media type

application/json

Example Value | Schema

```
{
  "detail": [
```

## 2. Cell Segger batch prediction

Collapse the '/predict/batch' tab, hit 'Try it out'. Upload images to the infiles fields. Hit 'Execute'.

POST /predict/batch Predict Batch

Parameters

Cancel Reset

Name Description

input\_mode <sup>required</sup> L

string (query)

Request body <sup>required</sup> multipart/form-data

infiles <sup>required</sup> array

Choose File SHSYSV\_Phase\_B10\_1\_00d08h00m\_3.tif

Choose File SkBr3\_Phase\_E3\_2\_01d16h00m\_1.tif

Choose File MCF7\_Phase\_F4\_1\_01d08h00m\_1.tif

Add string item

Execute Clear

Responses

Curl

```
curl -X 'POST' \
  'http://64.62.255.225:8000/predict/batch?input_mode=L' \
  -H 'accept: */*' \
  -H 'Content-Type: multipart/form-data' \
  -F 'infiles=SHSYSV_Phase_B10_1_00d08h00m_3.tif;type=image/tiff' \
  -F 'infiles=SkBr3_Phase_E3_2_01d16h00m_1.tif;type=image/tiff' \
  -F 'infiles=MCF7_Phase_F4_1_01d08h00m_1.tif;type=image/tiff'
```

Request URL

http://64.62.255.225:8000/predict/batch?input\_mode=L

After prediction is done, download the predicted image.

Execute Clear

Responses

Curl

```
curl -X 'POST' \
  'http://64.62.255.225:8000/predict/batch?input_mode=L' \
  -H 'accept: */*' \
  -H 'Content-Type: multipart/form-data' \
  -F 'infiles=SHSYSV_Phase_B10_1_00d08h00m_3.tif;type=image/tiff' \
  -F 'infiles=SkBr3_Phase_E3_2_01d16h00m_1.tif;type=image/tiff' \
  -F 'infiles=MCF7_Phase_F4_1_01d08h00m_1.tif;type=image/tiff'
```

Request URL

http://64.62.255.225:8000/predict/batch?input\_mode=L

Server response

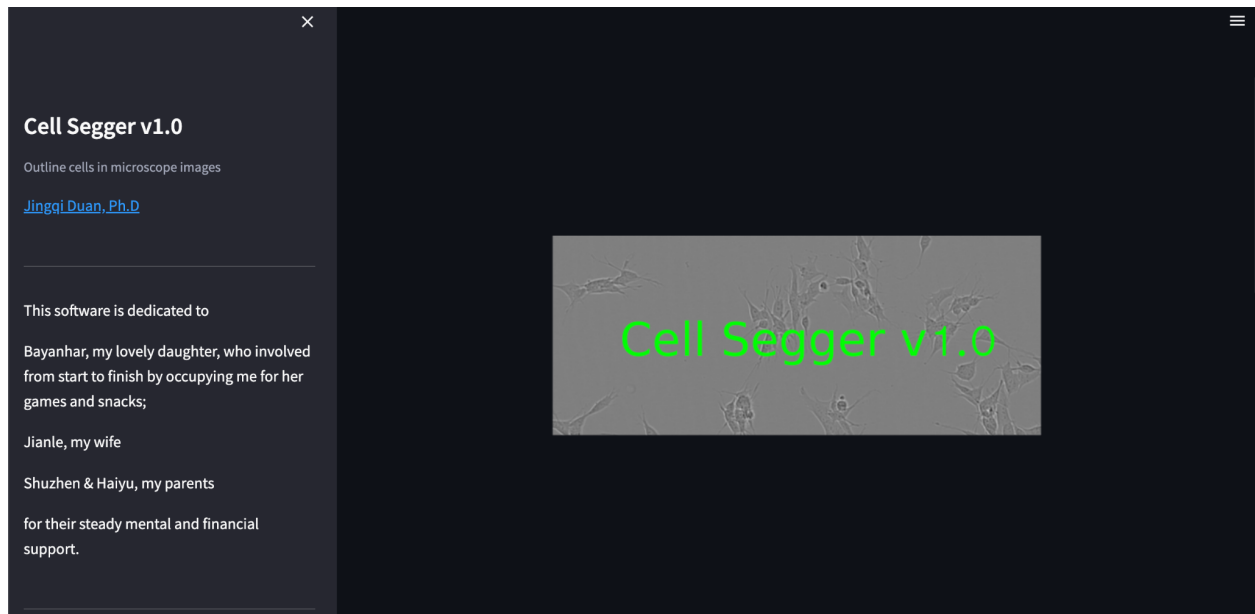
Code	Details
200	<p>Response body</p> <p><a href="#">Download file</a></p> <p>Response headers</p> <pre>content-disposition: attachment; filename="predictions.zip" content-length: 239806 content-type: application/x-zip-compressed date: Fri, 09 Jun 2023 22:47:04 GMT server: uvicorn</pre>

Responses

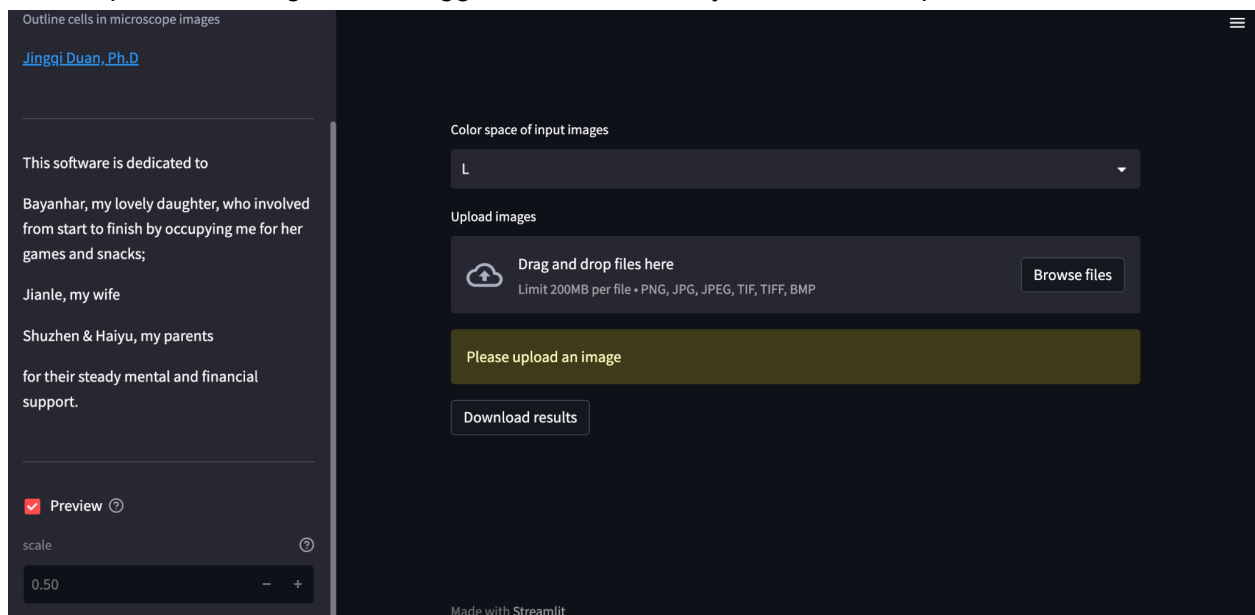
Code	Description	Links
200	Successful Response	No links
422	Validation Error	No links

## Cell Segger streamlit UI

The Cell Segger UI looks like the following.



If users want to preview the image and its predicted masks, check the 'Preview' radio. It will take extra time to display the result. Specify the color space of the input image from the drop down menu, upload the images, Cell segger will automatically start to do the prediction.



An example of a predicted result for a color image looks like the following. Users can download the results.

Outline cells in microscope images

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This software is dedicated to

Bayanhar, my lovely daughter, who involved from start to finish by occupying me for her games and snacks;

Jianle, my wife

Shuzhen & Haiyu, my parents

for their steady mental and financial support.

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☒ Preview ⓘ

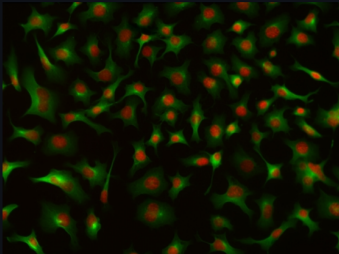
scale ⓘ

0.50 - +


Done!

Prediction took 0.03 min to complete.

### Original



### Predicted



Download results