# Cell detection using StarDist

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A key feature of the QuPath cell detection algorithm is its ability to optionally expand the detected objects (usually nuclei) by a predefined value or until they touch a neighboring cell. This geometric approximation allows for the inference of the whole cell based solely on the nuclear signal.

This capability is also implemented in deep learning-based cell segmentation, which utilizes external software and is integrated as extensions (QuPath's term for plugins).

StarDist, developed by Martin Weigert and Uwe Schmidt, provides excellent 2D and 3D nuclei segmentation. It is available as a Python library and a Fiji plugin, and has also been incorporated into QuPath as an **extension**. StarDist includes a robust 2D pre-trained model and offers a comprehensive set of tools for retraining when needed.

## 1. Install StarDist Extension

- Find the jar file StarDist in the *Extensions* folder, drag & drop it into QuPath window.

- Choose to install in the *default* folder.

- Check the ***Extensions*** to verify that StarDist extension (0.4.0) is included.

## 2. Create Annotation

- Create Annotation of the whole image using ***Objects > Annotations > Create full image annotation*** (Ctrl+Shit+A)

## 3. Run StarDist

- StarDist cannot be run through QuPath GUI but only using a Script. For example, you can use ***Extensions > StarDist H&E nucleus detection script***
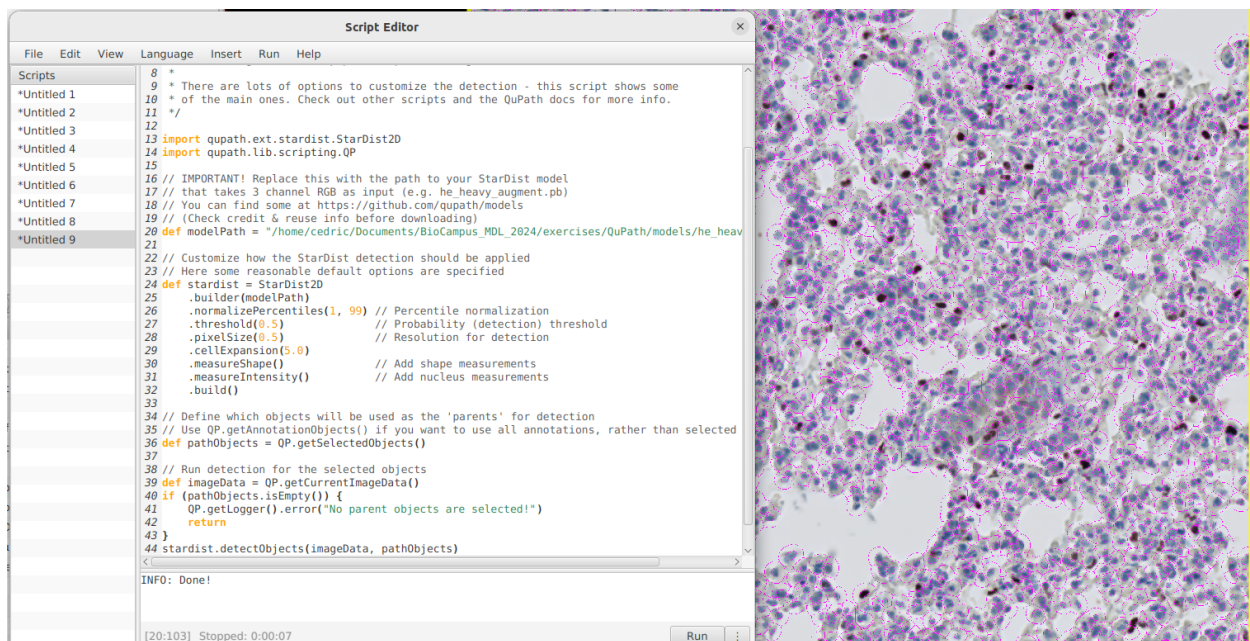
- Edit the path the to model file in the *models* folder.

- Click Run

Figure 1: Export measurements tool