

Installing LATTE

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1. What is LATTE?

LATTE is a quick and easy tool that can be used to help identify, vet and characterise signals in *TESS* lightcurves in order to weed out instrumental and astrophysical false positives. The code automatically downloads the data products for any chosen TIC ID and produces a number of diagnostic plots (outlined below) presented in a concise pdf report.

2. Installing LATTE

In order to use LATTE you need to use the *command line (via Terminal)* on your computer. To open command line:

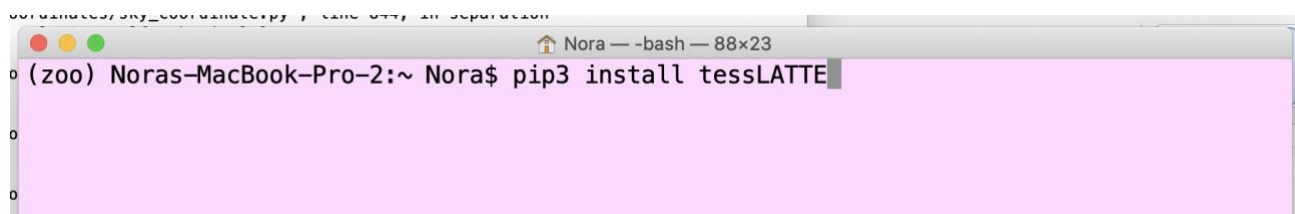
On a mac: *Applications > Utilities > Terminal*

On Linux: **ctrl+alt+T**



2.1. Using pip install (this is the easier way)


- Once the Terminal window is open, enter the command: **pip3 install tessLATTE**
- Some text will appear in the terminal – wait until it has finished running – LATTE should now be installed! (the final line in the Terminal should read something along the lines of “Successfully installed tessLATTE-1.0.2”).



2.2. Using Git

- Use the Terminal window to navigate to a folder on your computer where you want to install the LATTE. For example: `cd /nora/Documents/research/code/`
- Once you are there use the command: **git clone <https://github.com/noraeisner/LATTE.git>**
- Or download the zipped folder of the code directly from GitHub: <https://github.com/noraeisner/LATTE> under code > Download ZIP.

3. Running LATTE the first time

- Type this command into your Terminal window: **python3 -m LATTE** (if you  called LATTE you need to make sure that you are inside the LATTE folder that you just downloaded).
- The **first** time you run LATTE you will be prompted to enter a path (see image below). This is a path to the location on your computer where you will save all of the output plots and

reports. I would suggest making a folder somewhere called something along the lines of 'LATTE_output'. To get the path:

- **On a mac:** you can copy the folder that you just created, and paste it into the Terminal window. This should make the path appear in the Terminal. Alternatively you can simply drag and drop the folder into the Terminal.
- **On Linux:** On most linux systems you can drag and drop the folder into the Terminal window to make the path appear. Alternatively most file managers display the path directly in the file manager window.
- For both: make sure that there are no extra spaces before or after the path!
- If you later change your mind about the path (or location of that folder) you can change it by running this command: `python3 -m LATTE --new-path`

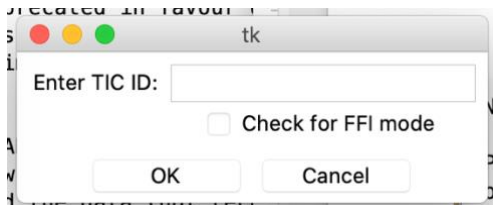
```
No output path has been set yet.

Please enter a path to save the files (e.g. ./LATTE_output or /Users/yourname/Desktop/LATTE_output) : █
```

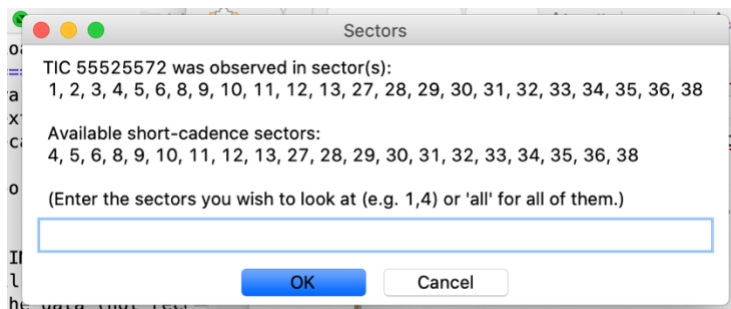
- Once you have entered the path, press enter.
- LATTE will then have to download some files. Make sure that you are connected to the internet so that all of the files can be downloaded. This will take a couple of minutes; however, this will only have to be run fully once and not every time you want to use LATTE!
- Once that completes, you are ready to go!!

4. Running LATTE

- To run LATTE, you always use the command: `python3 -m LATTE`
- This will make a box appear that prompts you to enter a TIC ID.



- Enter the TIC ID of a given target (e.g. '55525572').
- Next you will be prompted to enter a sector or multiple sectors that you want to look at.



ALL sectors

Short cadence sectors – choose a sector (or sectors) from this list.

- Enter the sector(s) that you want to look at (chosen from the bottom list), separated by commas (e.g. '8,9,10,11'). If you want to look at ALL of the available sectors, simply press enter/ the 'ok' button. The more sectors you select the longer the code will take to run!
- Once you have selected the sectors, the data will start to download...

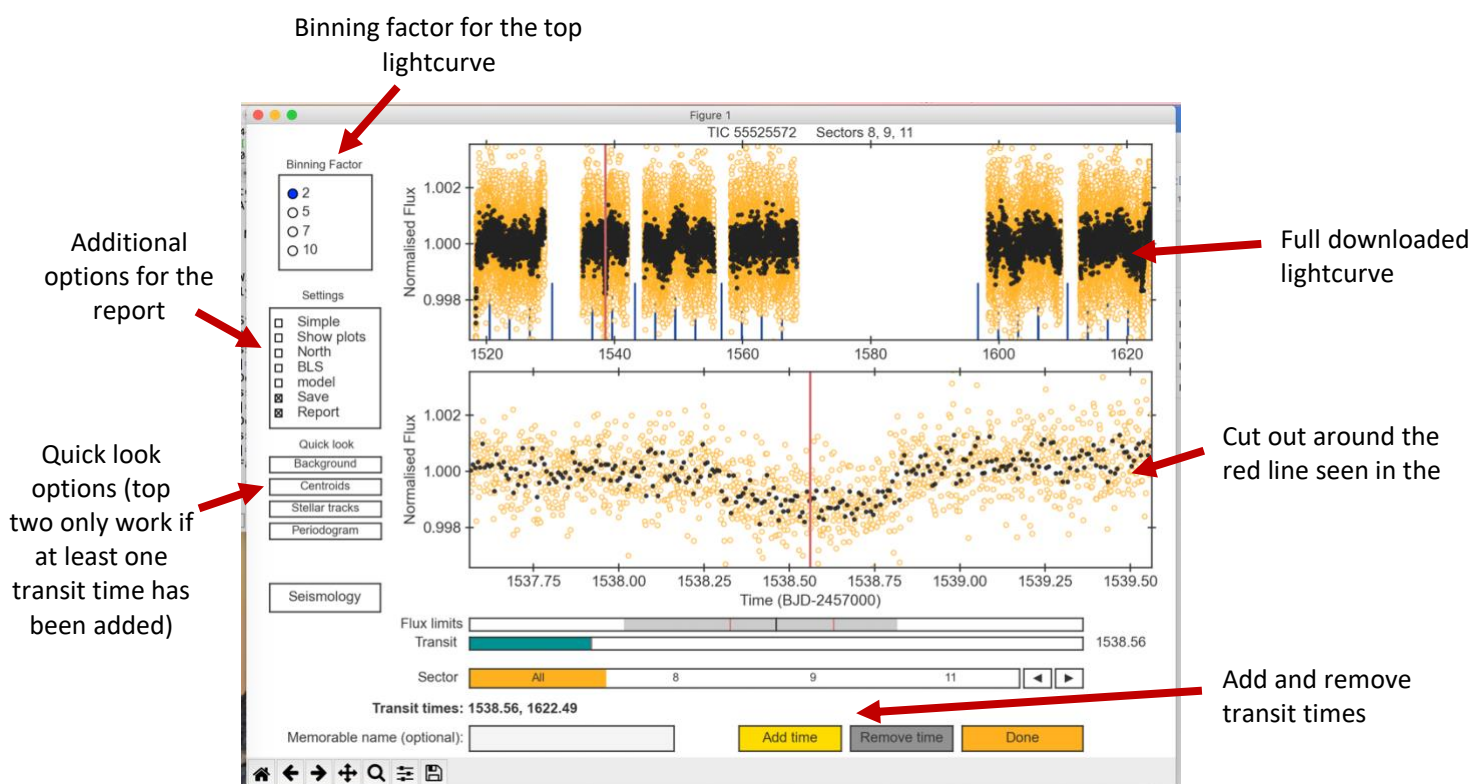
```

Will look at sector(s): 8, 9, 10, 11    (the files are opened but not stored locally)

Start lightcurve data download..... download_link
Downloading https://mast.stsci.edu/api/v0.1/Download/file/?uri=mast:TESS/product/te
ss201903216000-s0008-0000000055525572-0136-s_lc.fits
|=====| 1.8M/1.8M (100.00%)          5s
Downloading https://mast.stsci.edu/api/v0.1/Download/file/?uri=mast:TESS/product/te
ss2019058134432-s0009-0000000055525572-0139-s_lc.fits
|=====| 1.3M/1.8M (70.89%) ETA      1s
done
  
```

5. LATTE interface

- Once the data has been downloaded, an interface that looks like this will pop up:



- The top panel shows the full lightcurve while the bottom panel shows a cut-out around the red line.
- Move the location of the red line by clicking on the top or bottom lightcurve.
- Select the midpoint of a transit-like event, and click on the yellow 'add time' button.

- You can add as many transit times as you like, but if there are lots of transit like events I would recommend only marking around 3 or 4.
- Once you are happy with your selection of transit times, press the orange 'done' button and let the code do the rest.

5.1. Additional options on the interface

Binning Factor:

- change the binning of the top plot

Settings:

- **Simple:** only run the most basic diagnostic tests (background flux, centroid). This is for a very quick analysis.
- **Show Plots:** Display the plots after they are made. This slows down the code but allows you to see and analyse them as they are being made. Note: the next plot will only start generating once the one that has popped up has been closed!).
- **North:** Align all the images due North (this slows down the code).
- **BLS:** Run a Box-Least-Squares algorithm that searches for periodic signals in the lightcurve.
- **Save:** Save all the images (default this is already checked)
- **Report:** Generate a pdf file at the end of the code to summarise the findings (default this is already checked).

Quick look:

- Generate 'quick look' plots of the background flux and centroid positions around the time of any marked transit events. This function will not work if no transit events have been selected.
- Quick look of the stellar tracks and the periodogram.

6. Additional installation notes

- **!!!IMPORTANT!!!** Once a month new TESS data becomes available, so we need to download a new file. Whenever there is a new data release run the following line in the Terminal: **python -m LATTE --new-data**
- Every once in a while, a new version of LATTE will be released (these will fix bugs and add more features). To download the newest version run the following command in the Terminal: **pip install tessLATTE --upgrade**

7. Reading the LATTE report

- The final pdf summary report (and all the images of the individual figures) will be saved on your computer at the location where you set the path (back in step 3 of this manual).



- For more information on how to interpret these diagnostic plots, watch the corresponding Planet Hunters Coffee Chat videos at <https://www.youtube.com/planethunterscoffee>.

- The file "**How to make a LATTE**" gives short explanations of all of the diagnostic plots and provides '*good*' and '*bad*' examples for what we would expect a real planetary transit signal to look like.