Machine Learning Classifier Files

## File: injlog\_events\_rec\_14-08-2024.dat

Created from the log distribution of the period of ~20K injections. This contains the result of the search and the calculated recovery of the injected period. TICs associated with known EBs and TOIs are not included in this list.

Column descriptions:

0 - pass through number (between 0 and 4)

1 - detrending window (2 or 5)

2 - analysis type (dn or dc)

3 - injection number

4 - period found from BLS

5 - T0 from BLS

6 - power from BLS

7 - transit durration from BLS

8 - transit depth from BLS

9 - S/N from BLS

10 - Depth test in the transit find routine, comparing the found event to the 2nd deepest event

11 - Depth test in the transit find routine, comparing the found event to the 3rd deepest event

12 - Stellar Mass

13 - Stellar Radius

14 - Reduced chi-squared for a trapezoidal model

15 - BIC(fourier model) - BIC(trapezoidal model)

16 - BIC(Ramp model +) - BIC(trapezoidal model)

17 - BIC(Ramp model -) - BIC(trapezoidal model)

18 - S/N from the shape test routine

19 - light curve noise

20 - Depth test in the shape test routine, comparing the found event the 2nd deepest event

21 - Depth test in the shape test routine, comparing the found event the 3rd deepest event

22 - value of minimum delta BIC

23 - Number of loops used for Fourier model

24 - Number of points in the light curve

25 - Number of data points in transit

26 - Fscale parameter — Multiplicative factor to fit scale the point-to-point photometric error to match the observation

27 - Photometric Error — constant for all data points

28 - Chi-squared of trapezoidal fit

29 - Chi-squared of Fourier fit

30 - Chi-squared of Ramp + fit

31 - Chi-squared of Ramp - fit

32 - Stellar TESS magnitude

33 - Stellar effective temperature

34 - Stellar Log(g)

35 - Injection number

36 - Injected Period

37 - Injected T0

38 - Injected S/N

39 - Recovery statistic of injected event

## File: injlog\_rec\_PC\_train\_14-08-2024.csv

Made with the log distribution of the period injections. This is the data set used as the training set in the random forest routine. These injections are a subset of the injlog\_events\_rec\_14-08-2024.dat. There are some real events in this data set. An attempt has been made to re-label the real events as “good”. There may still be data in this set that needs to be re-labeled.

Column descriptions:

0 - pass through number (between 0 and 4)

1 - detrending window (2 or 5)

2 - analysis type (dn or dc)

3 - injection number

4 - period found from BLS

5 - T0 from BLS

6 - power from BLS

7 - transit durration from BLS

8 - transit depth from BLS

9 - S/N from BLS

10 - Depth test in the transit find routine, comparing the found event to the 2nd deepest event

11 - Depth test in the transit find routine, comparing the found event to the 3rd deepest event

12 - Stellar Mass

13 - Stellar Radius

14 - Reduced chi-squared for a trapezoidal model

15 - BIC(fourier model) - BIC(trapezoidal model)

16 - BIC(Ramp model +) - BIC(trapezoidal model)

17 - BIC(Ramp model -) - BIC(trapezoidal model)

18 - S/N from the shape test routine

19 - light curve noise

20 - Depth test in the shape test routine, comparing the found event the 2nd deepest event

21 - Depth test in the shape test routine, comparing the found event the 3rd deepest event

22 - value of minimum delta BIC

23 - Number of loops used for Fourier model

24 - Number of points in the light curve

25 - Number of data points in transit

26 - Fscale parameter — Multiplicative factor to fit scale the point-to-point photometric error to match the observation

27 - Photometric Error — constant for all data points

28 - Chi-squared of trapezoidal fit

29 - Chi-squared of Fourier fit

30 - Chi-squared of Ramp + fit

31 - Chi-squared of Ramp - fit

32 - Stellar TESS magnitude

33 - Stellar effective temperature

34 - Stellar Log(g)

35 - Injection number

36 - Injected Period

37 - Injected T0

38 - Injected S/N

39 - Recovery statistic of injected event

40 - label: 0 (bad) or 1 (good)

41 - Classification Probability, number between 0 and 1

## File: TESS\_ML\_20240412.txt

Created from the linear distribution of ~20k injections. The data in this file is used to train the classifier. Columns in **bold** were used as features in the classifier: 6,7,8,9,14,15,16,17,18,19,20,21,22,23

Column descriptions:

0 - pass through number (between 0 and 4)

1 - detrending window (2 or 5)

2 - analysis type (dn or dc)

3 - injection number (a separate file is required to get the associated TIC)

4 - period found from BLS

5 - T0 from BLS

**6 - power from BLS**

**7 - transit durration from BLS**

**8 - transit depth from BLS**

**9 - S/N from BLS**

10 - Depth test in the transit find routine, comparing the found event to the 2nd deepest event

11 - Depth test in the transit find routine, comparing the found event to the 3rd deepest event

12 - Stellar Mass

13 - Stellar Radius

**14 - Reduced chi-squared for a trapezoidal model**

**15 - BIC(fourier model) - BIC(trapezoidal model)**

**16 - BIC(Ramp model +) - BIC(trapezoidal model)**

**17 - BIC(Ramp model -) - BIC(trapezoidal model)**

**18 - S/N from the shape test routine**

**19 - light curve noise**

**20 - Depth test in the shape test routine, comparing the found event the 2nd deepest event**

**21 - Depth test in the shape test routine, comparing the found event the 3rd deepest event**

**22 - value of minimum delta BIC**

**23 - Number of loops used for Fourier model**

24 - Number of points in the light curve

25 - Number of data points in transit

26 - Fscale parameter — Multiplicative factor to fit scale the point-to-point photometric error to match the observation

27 - Photometric Error — constant for all data points

28 - Chi-squared of trapezoidal fit

29 - Chi-squared of Fourier fit

30 - Chi-squared of Ramp + fit

31 - Chi-squared of Ramp - fit

32 - Stellar TESS magnitude

33 - Stellar effective temperature

34 - Stellar Log(g)

35 - Injection recovery: 0 = not recovered, 1 = recovered

36 - Transit Classification Probability. This is a number between 0 and 1, where 0.0 is bad and 1.0 is good

## FILE: TESS\_TOI\_PCs\_20240426\_recV2.csv

Classification of all events with S/N > 5.0 extracted from running BLS search on TICs associated with TOIs in the year 1 CVZ.

Column descriptions:

0 - pass through number (between 0 and 4)

1 - detrending window (2 or 5)

2 - analysis type (dn or dc)

3 - TIC

4 - period found from BLS

5 - T0 from BLS

6 - power from BLS

7 - transit durration from BLS

8 - transit depth from BLS

9 - S/N from BLS

10 - Depth test in the transit find routine, comparing the found event to the 2nd deepest event

11 - Depth test in the transit find routine, comparing the found event to the 3rd deepest event

12 - Stellar Mass

13 - Stellar Radius

14 - Reduced chi-squared for a trapezoidal model

15 - BIC(fourier model) - BIC(trapezoidal model)

16 - BIC(Ramp model +) - BIC(trapezoidal model)

17 - BIC(Ramp model -) - BIC(trapezoidal model)

18 - S/N from the shape test routine

19 - light curve noise

20 - Depth test in the shape test routine, comparing the found event the 2nd deepest event

21 - Depth test in the shape test routine, comparing the found event the 3rd deepest event

22 - value of minimum delta BIC

23 - Number of loops used for Fourier model

24 - Number of points in the light curve

25 - Number of data points in transit

26 - Fscale parameter — Multiplicative factor to fit scale the point-to-point photometric error to match the observation

27 - Photometric Error — constant for all data points

28 - Chi-squared of trapezoidal fit

29 - Chi-squared of Fourier fit

30 - Chi-squared of Ramp + fit

31 - Chi-squared of Ramp - fit

32 - Stellar TESS magnitude

33 - Stellar effective temperature

34 - Stellar Log(g)

35 - Transit Classification Probability. This is a number between 0 and 1, where 0.0 is bad and 1.0 is good

36 - Recovery of TOI. This is a number with 0 - 1, closer to 1 the better the recovery of the event.

37 - TOI number the event parameters was compared to for the recovery stat. For systems with multiple planets the highest value of the recovery stat (and associated TOI number) was saved.

## FILE: TESS\_CVZ\_003\_PCs\_20240412.txt

Classification of all events, with S/N > 5.0, extracted in part 3 of CVZ Year 1 data.

Column descriptions:

0 - pass through number (between 0 and 4)

1 - detrending window (2 or 5)

2 - analysis type (dn or dc)

3 - TIC

4 - period found from BLS

5 - T0 from BLS

6 - power from BLS

7 - transit durration from BLS

8 - transit depth from BLS

9 - S/N from BLS

10 - Depth test in the transit find routine, comparing the found event to the 2nd deepest event

11 - Depth test in the transit find routine, comparing the found event to the 3rd deepest event

12 - Stellar Mass

13 - Stellar Radius

14 - Reduced chi-squared for a trapezoidal model

15 - BIC(fourier model) - BIC(trapezoidal model)

16 - BIC(Ramp model +) - BIC(trapezoidal model)

17 - BIC(Ramp model -) - BIC(trapezoidal model)

18 - S/N from the shape test routine

19 - light curve noise

20 - Depth test in the shape test routine, comparing the found event the 2nd deepest event

21 - Depth test in the shape test routine, comparing the found event the 3rd deepest event

22 - value of minimum delta BIC

23 - Number of loops used for Fourier model

24 - Number of points in the light curve

25 - Number of data points in transit

26 - Fscale parameter — Multiplicative factor to fit scale the point-to-point photometric error to match the observation

27 - Photometric Error — constant for all data points

28 - Chi-squared of trapezoidal fit

29 - Chi-squared of Fourier fit

30 - Chi-squared of Ramp + fit

31 - Chi-squared of Ramp - fit

32 - Stellar TESS magnitude

33 - Stellar effective temperature

34 - Stellar Log(g)

35 - Transit Classification Probability. This is a number between 0 and 1, where 0.0 is bad and 1.0 is good