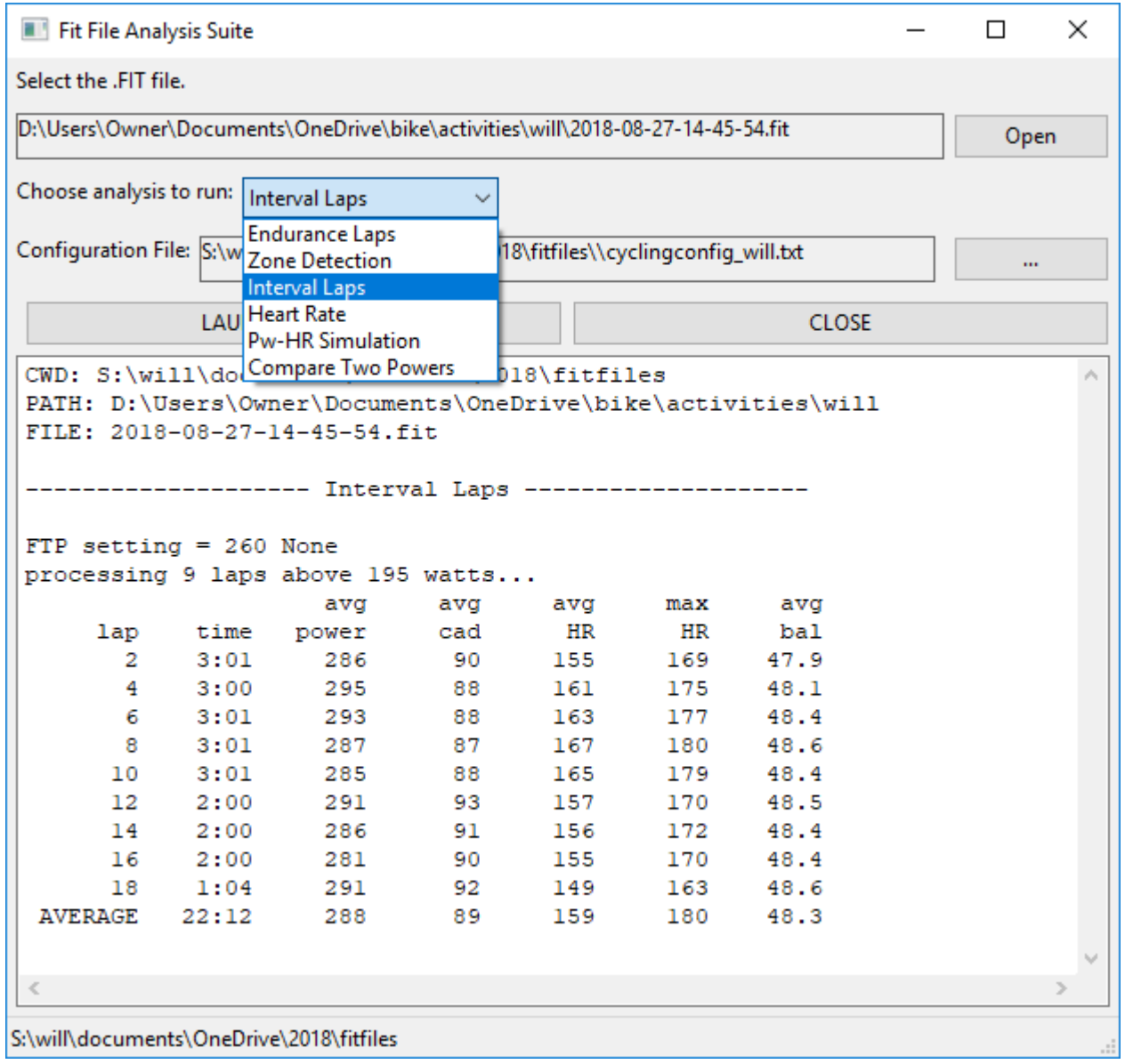
FitFiles

WH Spicher

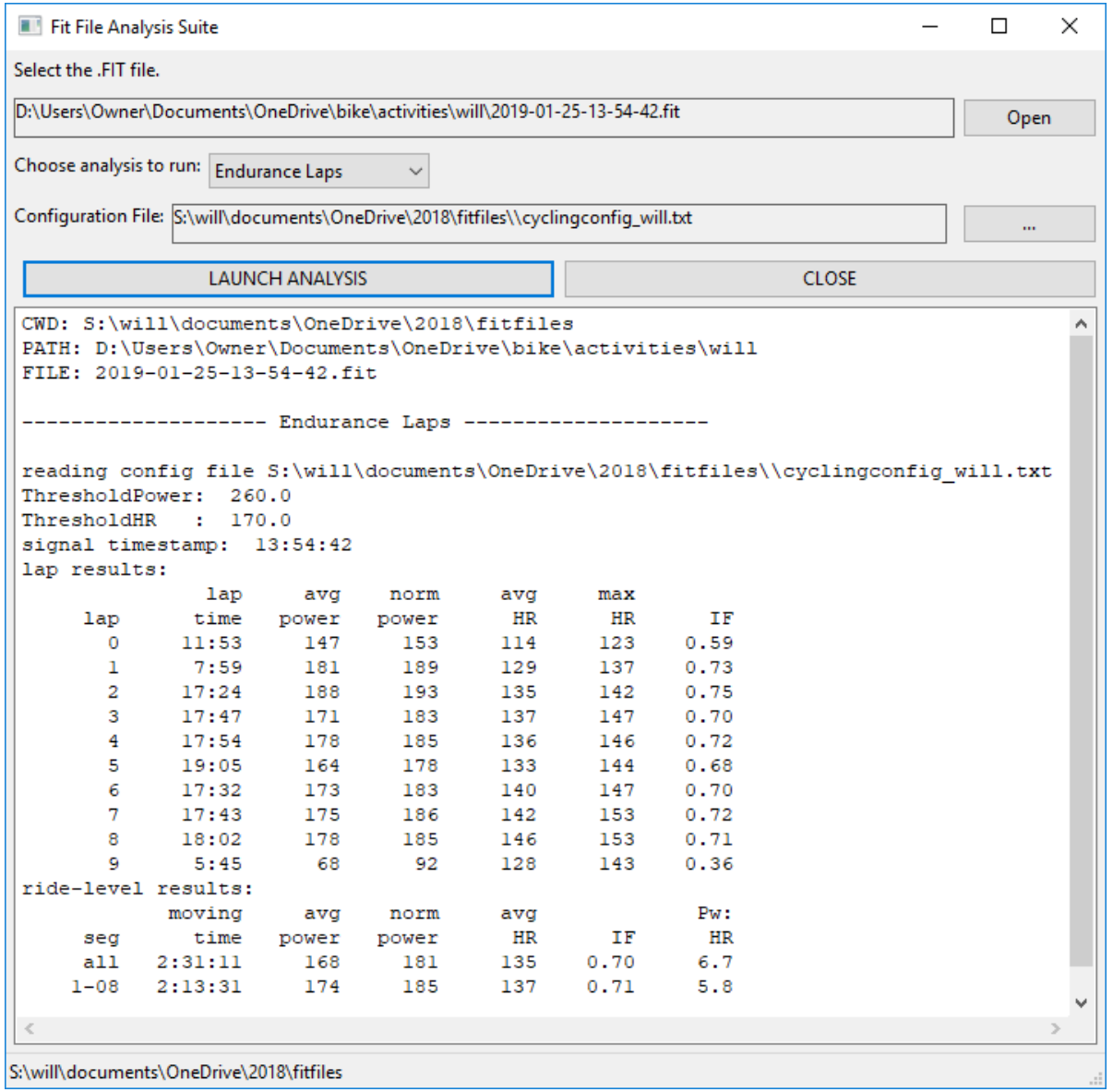
FitFiles Project

- Fast access to a suite of custom tools for analyzing cycling workouts.
- Drag-drop support for .FIT files.
- Formatted text output for copy-pasting into workout diary.
- Support for user-configuration files.
- Available on GitHub (user: guitarsenall)



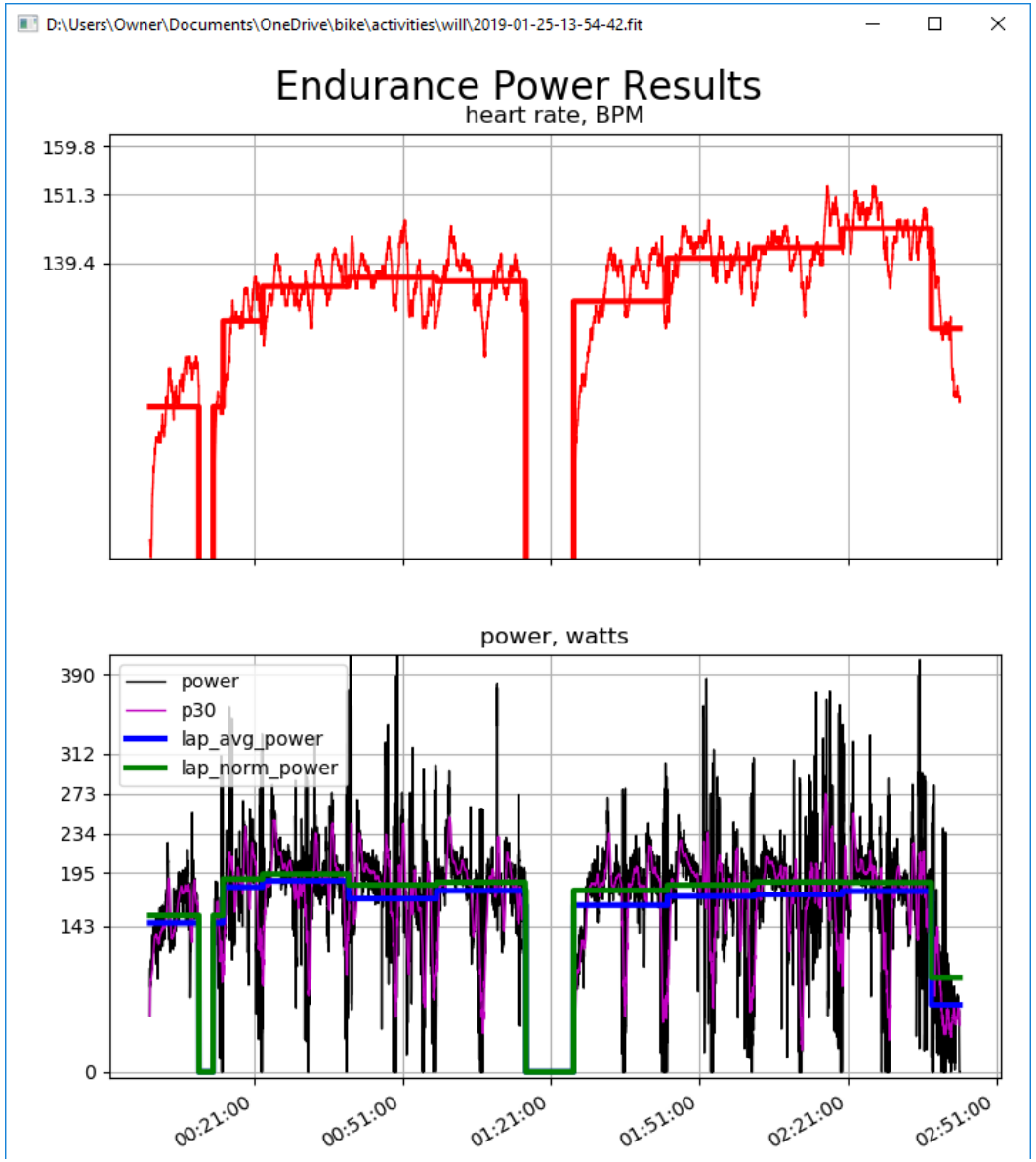
FitFiles: Endurance Summary

- Print lap statistics to show progress.
- Print results for whole ride and inner laps (assume first and last lap are warmup and cooldown).



FitFiles: Endurance Summary

- Plot heart rate with grids at zone boundaries and lap averages.
- Plot raw and 30-second-average power with lap averages and grids at zone boundaries.



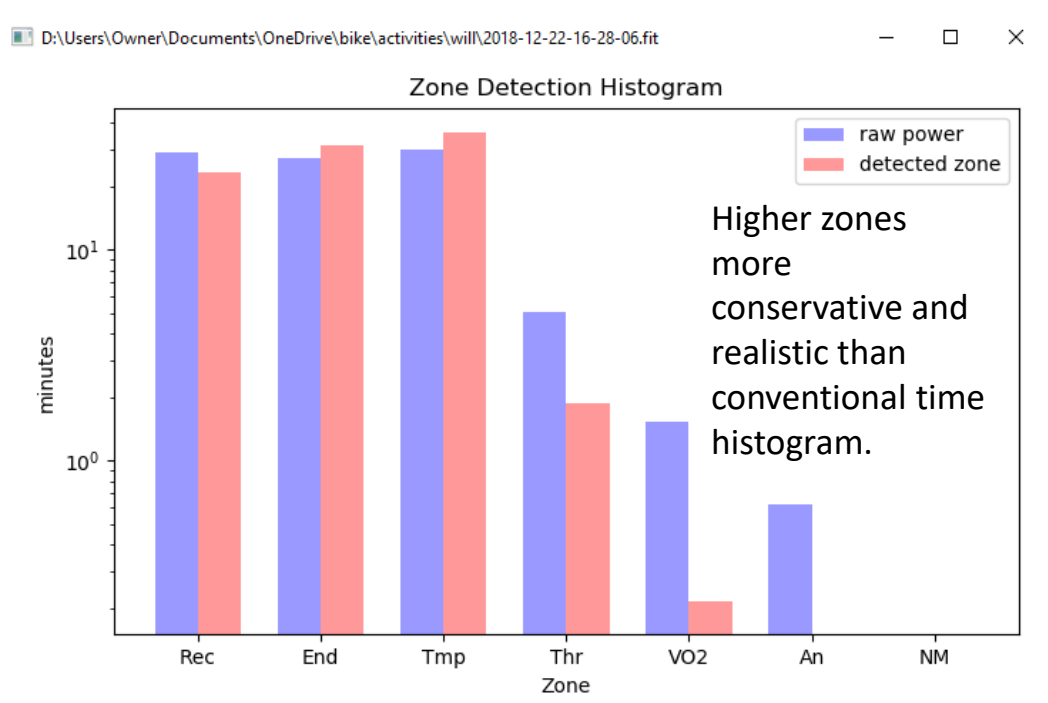
FitFiles: Zone Detection Analysis

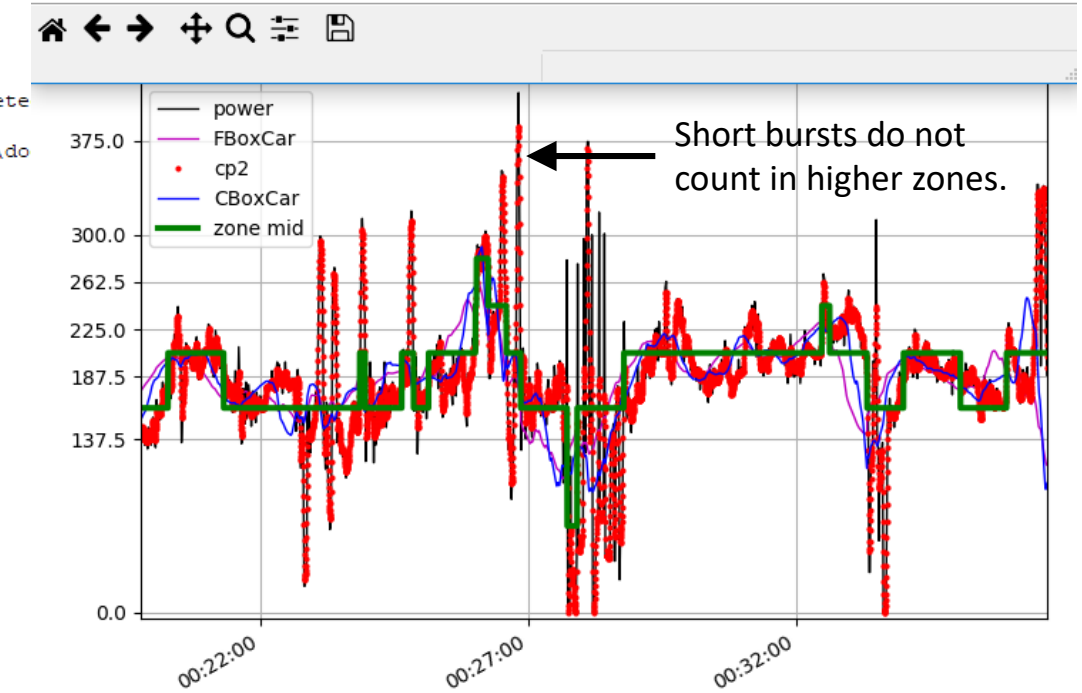
A better way of measuring time spent in power zones.
Innovation: To my knowledge, no one else offers this feature.

- Attaining a power zone should require more than spending one second at that power. Model as a state machine with transitions based on rules regarding time spent in new zone.
- Formatted print of histogram for training diary.

```
-------------------- Zone Dete

reading config file S:\will\do
ThresholdPower:  260.0
ThresholdHR   :  170.0
Power Zone Histogram:
    Zone 1:  0:26:58 (28%)
    Zone 2:  0:39:57 (42%)
    Zone 3:  0:25:53 (27%)
    Zone 4:  0:00:33 ( 0%)
    Zone 5:  0:00:00 ( 0%)
    Zone 6:  0:00:00 ( 0%)
    Zone 7:  0:00:00 ( 0%)
     total:  1:33:23
```

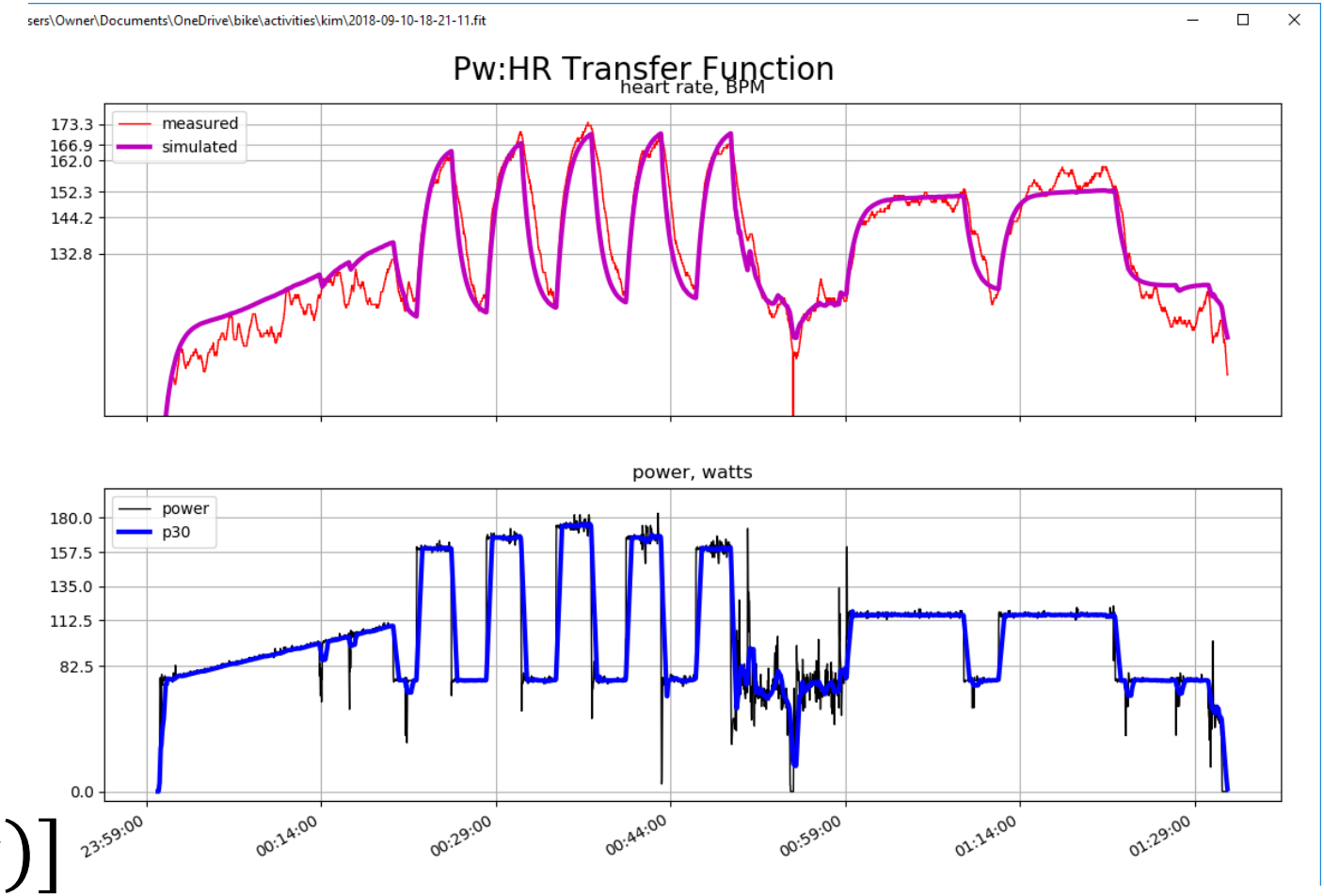




Heartrate Simulation

Predict heartrate from power based on a first-order, linear ODE. Four parameters:

- Time constant: how quickly HR rises in response to power.
- Functional Threshold Power (FTP): Max power sustainable for one hour.
- Functional Threshold Heartrate (FTHR): Average heartrate during FTP.
- Drift rate. Cardiac drift proportional to fatigue (BPM/TSS).



$$\frac{dH}{dt} = \frac{1}{\tau}\left[H_T(p) + H_D F - H(t)\right]$$

- $\frac{dH}{dt}$: Heartrate derivative at t
- τ: Time constant
- $H_T(p)$: Heartrate target: function of power at t
- $H_D F$: Heartrate drift-rate times fatigue (TSS at t)
- $H(t)$: Heartrate at t

Inspired by treadmill-control research:

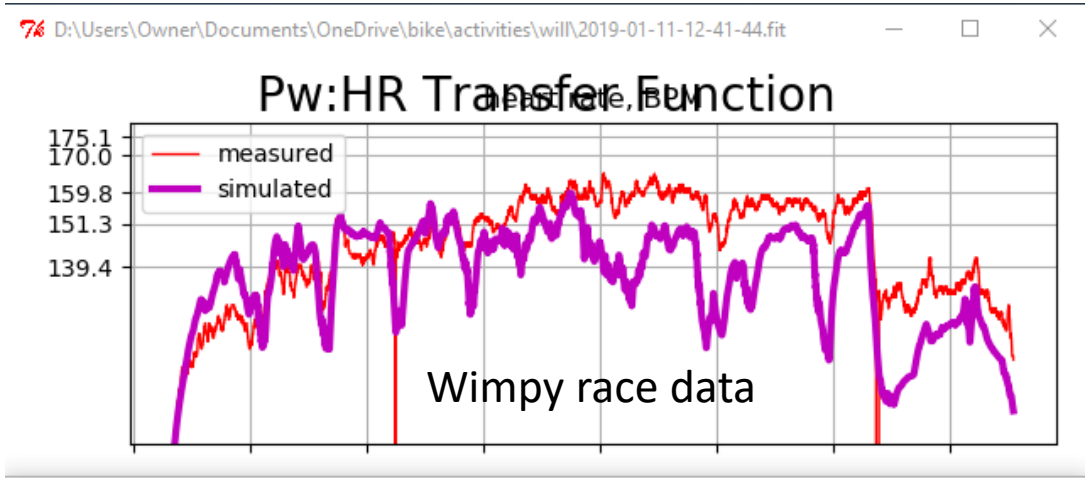
$$H(s) = \frac{k}{\tau s + 1} P(s)$$

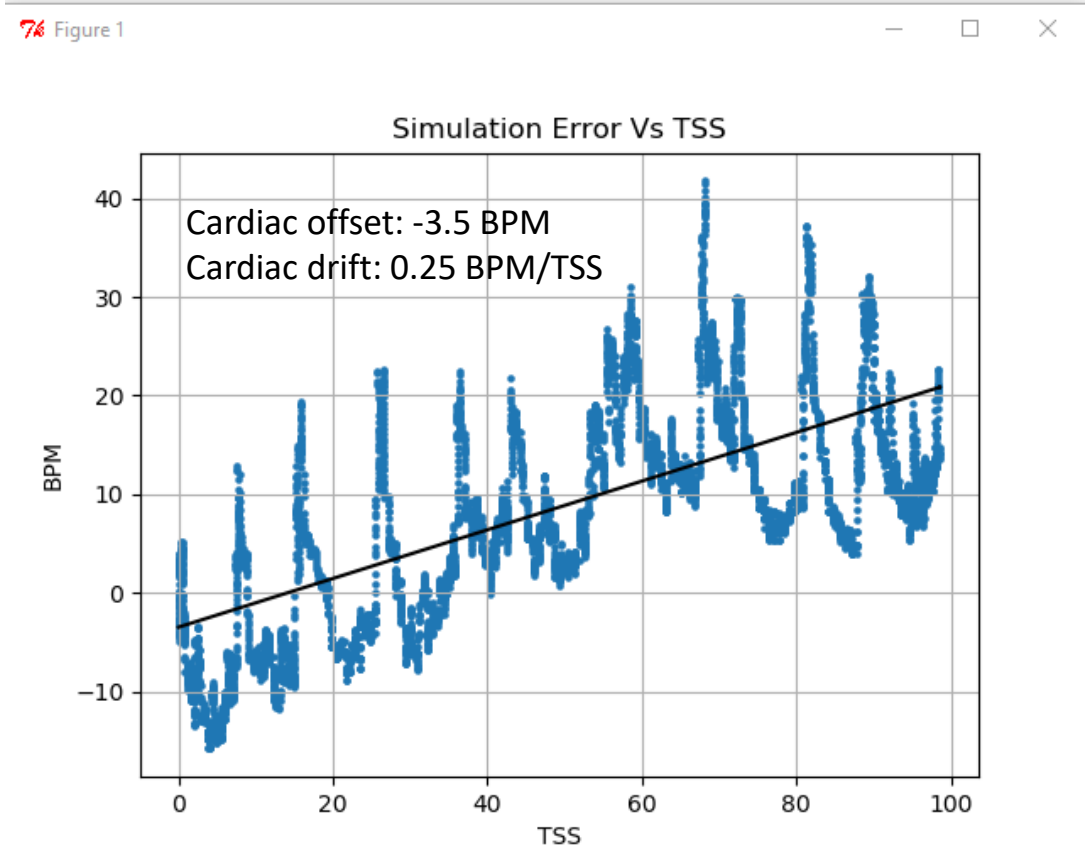
Heartrate Simulation

Provides a better estimate for two useful metrics which used to require a structured workout:

- Cardiac offset: How much higher or lower than normal is heartrate for a given workout?
- Cardiac drift:
  - Now modeled as proportional to fatigue (BPM/TSS) rather than a percentage over duration.
  - Available for ANY workout (e.g., racing); structured endurance workout not necessary.

Innovation: To my knowledge, no one else offers this feature.





Heartrate Simulation

Also provides for going the other way—simulating power from heart rate!

- Estimate work, intensity, and TSS for workouts that lack a power signal.

Innovation: To my knowledge, no one else offers this feature.