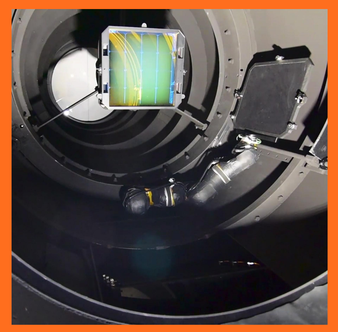
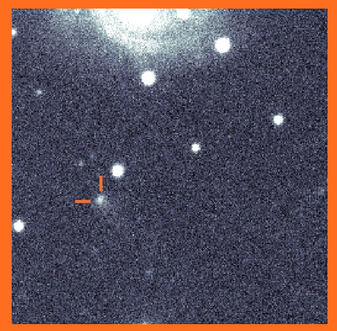
Tails: chasing comets with the Zwicky Transient Facility and deep learning

The **Zwicky Transient Facility (ZTF)** is a state-of-the-art robotic sky survey – performs accurate measurements of billions of astronomical objects and registers millions of transient events in the dynamic sky every night. We present **Tails**, a state-of-the-art framework for DL-assisted comet discovery with ZTF.



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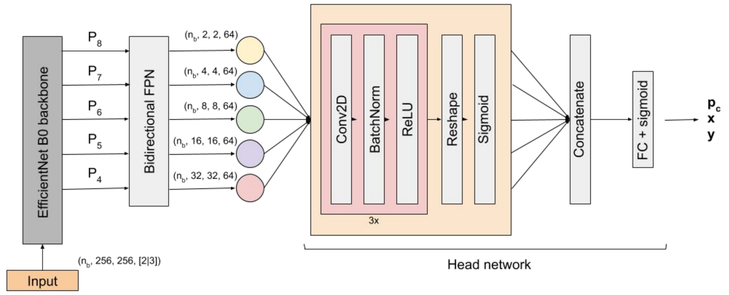
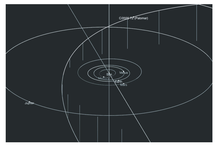
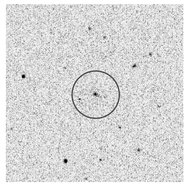
- Customized EfficientDet-based architecture capable of finding comets in single images in near real time, rather than requiring multiple epochs as with traditional methods



- Large, diverse training dataset; active learning
- >99% label prediction accuracy, 1-2 pix median positional RMSE w.r.t. JPL Horizons nucleus positions; production service up since 8/2020
- First DL-assisted comet discovery **C/2020 T2**; typical long-period comet; found on October 7, 2020

– Publication in prep. [Duev++]
– Source code will be publicly released once the paper is accepted / on arXiv

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