

Cattle farms in North America house hundreds of cattle. Automatic recognition can help monitor their food and water intake, behavior patterns, interactions with peers, detect diseases and much more. **In a typical farm, cows are added and removed every few days.** We present a system for automatic recognition of cows while tackling the following challenges.

Challenges

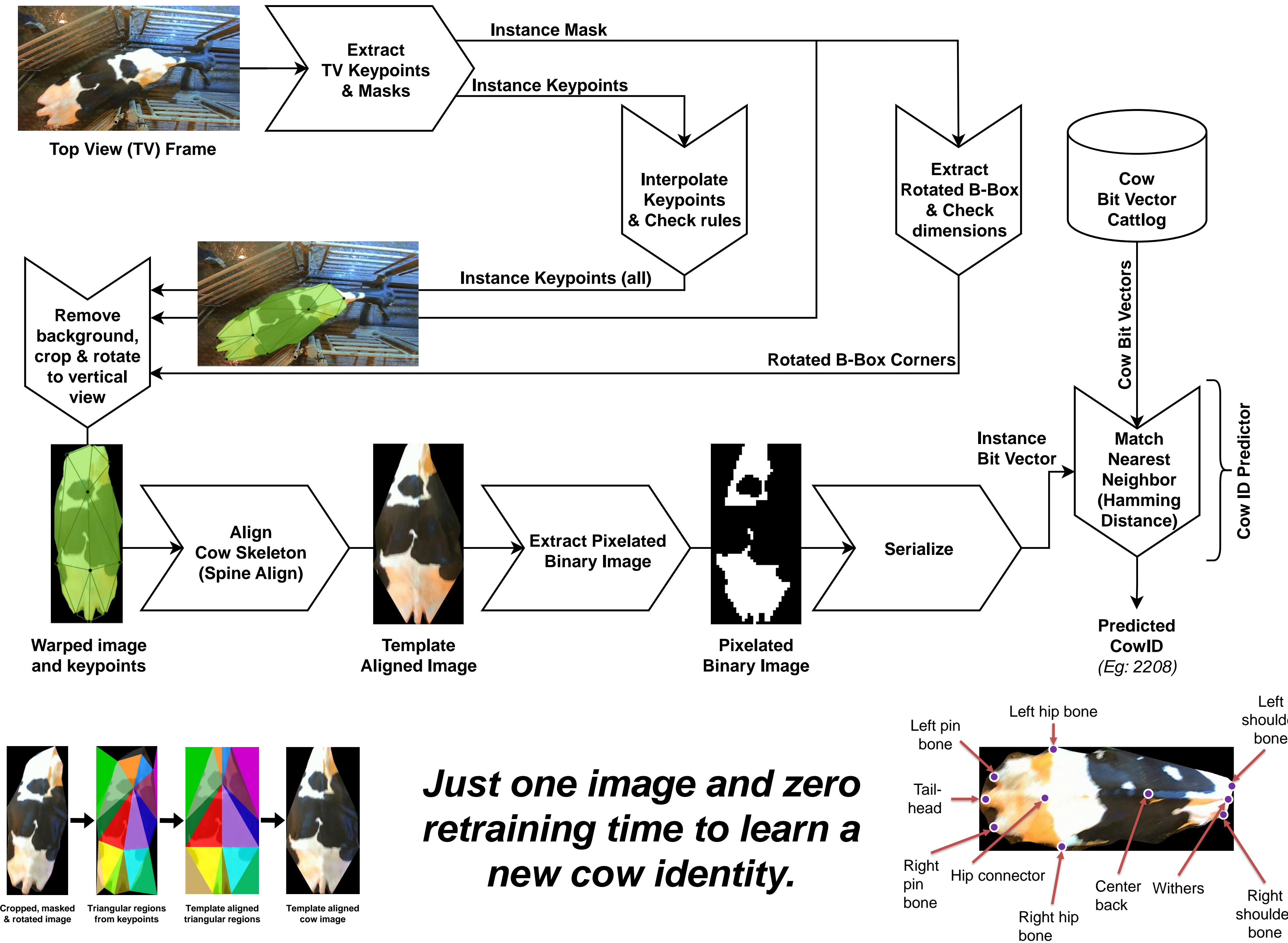
- Limited labelled data for training
- Flexible body structure
- Changing lighting conditions
- Cows outside known set can be in the barn
- Limited time to learn to recognize new cows

Data from Purdue Dairy



The Cattlog

Train day	Test day
153 COWS	170 COWS



Just one image and zero retraining time to learn a new cow identity.

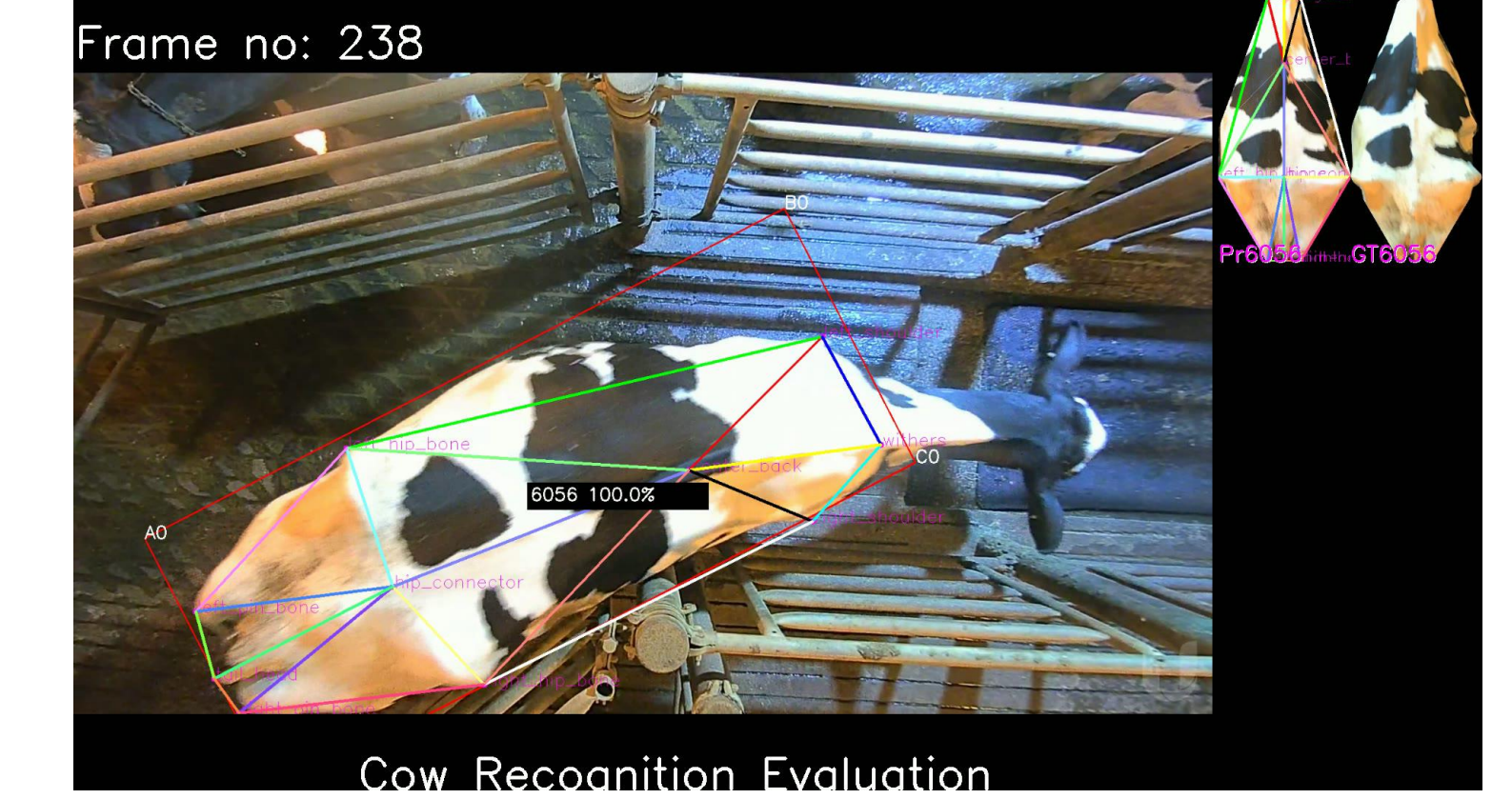
Eidetic philosophy:

- Use stochastic, learning-based models for tasks which humans are innately good at – eg: identifying parts of a cow’s anatomy.
- Use deterministic, non-learning-based algorithms to perform tasks which computers are historically good at – eg: memorizing the appearances of hundreds of cows and finding the best match.

Handling missing keypoints: We use detected keypoints to interpolate missed ones.

Handling misplaced keypoints (Rule checks): We define 21 rules based on length and angle ratios to tell if the detected object is actually a cow. A cow image is considered for identification only if all 21 rules are passed.

Sample output frame



Some cud to chew on

- What if two cows have the same pattern?
- Does this work on cows on which the keypoint detector (Keypoint R-CNN) is not trained on?

Results



videoLevelPrediction = Most predicted cowID over all frames of the video

TL;DR: We turn each cow into a QR-like code and add them to the cattlog. Recognition is done by searching through this cattlog for the best match.

Key References

- [1] Jing Gao, Tilo Burghardt, William Andrew, Andrew W. Dowsey, and Neill W. Campbell. Towards Self-Supervision for Video Identification of Individual Holstein-Friesian Cattle: The Cows2021 Dataset. 5 2021.
- [2] Ali Ismail Awad. From classical methods to animal biometrics: A review on cattle identification and tracking. Computers and Electronics in Agriculture, 123:423–435, 2016.
- [3] Andrew, William, Colin Greatwood, and Tilo Burghardt. "Visual localisation and individual identification of holstein friesian cattle via deep learning." In Proceedings of the IEEE international conference on computer vision workshops, pp. 2850-2859. 2017.