



Automated estimation of mango damages due to fruit flies

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Introduction

- There's considerable **yield losses** in mangoes due to **fruit flies' damages** affect production and marketing worldwide [1].
- In **Uganda** range is **30%-100%** [2].
- **ICRPE-led** African Fruit Fly programme shows **40% of 1.9 million** tonnes mangoes is **wasted** annually [2].
- Potential income not realised due to **these damages** [3].

Introduction

- Traditional approaches damage: Tedious, visual evaluations, physical scouting [8, 9, 10]. Need for automated approaches.
- ML and DL approaches predominant role in quality assessment.
- Accurate, light models [6, 7] for better monitoring needed.



ML in fruit damage detection and assessment

- Fruit damage detection, assessment, and yield prediction **key areas** where ML is transforming agriculture [3].
- These models analyze large datasets to learn features of fruits
- These advancements are powered by **big datasets** and **cutting-edge computational hardware**.
- Deep learning models learn features directly without hand engineering.

ML model Training

- **DL models** Scale efficiently with **big datasets**; performance improves with more data coming in.
- However, for processing, this **requires high-end computing** resources such as **GPUs/TPUs**
- **GPUs**
 - Handle big volumes of data in parallel,
 - Less training, inference time

Data collection: Infected mango images



Data collection: Healthy Mango images



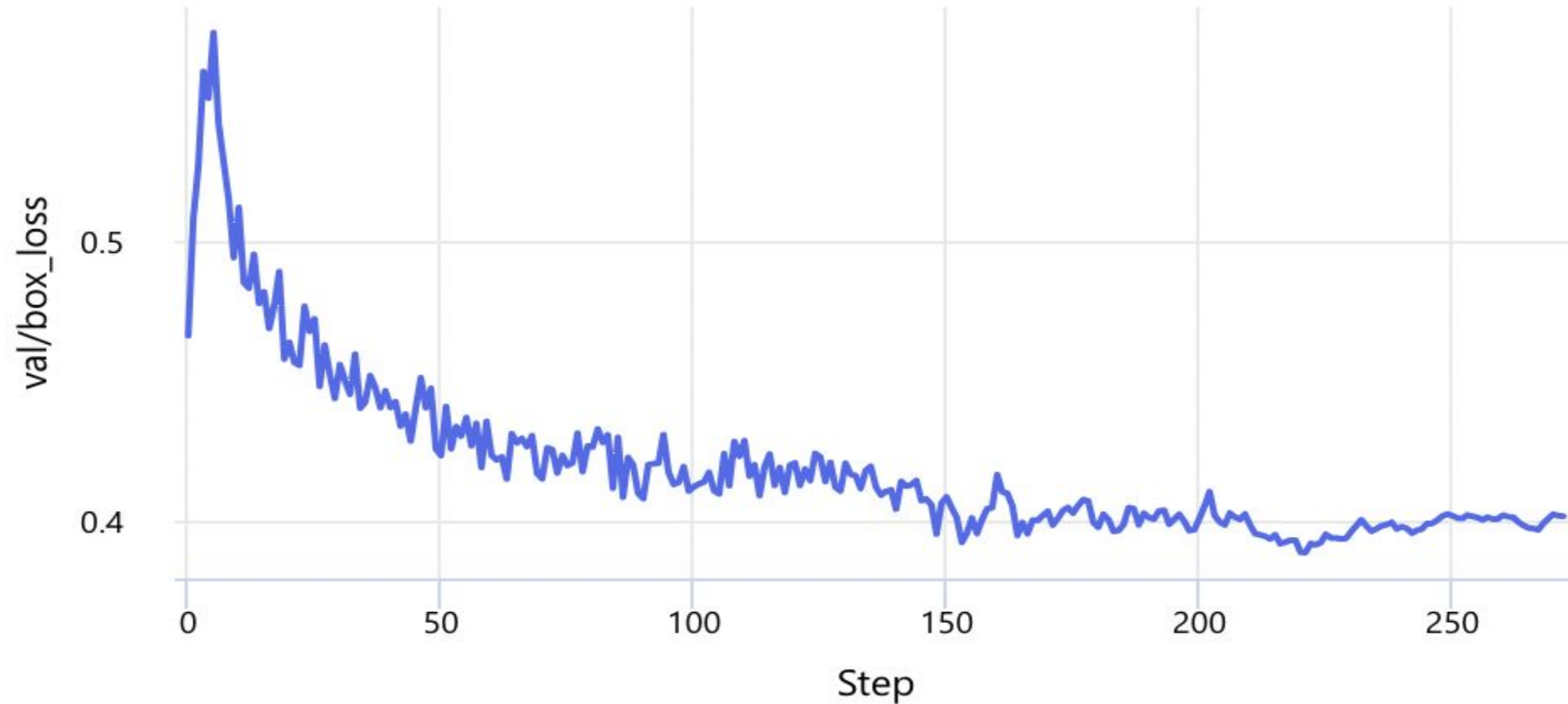
Damage detection

Damage level: **36.0%**



DL based Yolov8l :- loss performance

val/box_loss



val/box_loss

Tools

- Google Colab, Azure
- Python Jupyter Notebook - Web based interactive computing platform

Requirements in running models

- GPU - 1 x NVIDIA Tesla T4 server 16 cores, 110 GB RAM, 352 GB of disk, and an OS Type-Linux

Challenges and opportunities

- Access to high end computational resources
- Knowledge hub - Data repositories with standard datasets shared
- Training

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