

22 Real-time tracking for studying fly behavior in health and disease

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Need

User & Problem: Developing real-time pose estimation methods to quantify and study *Drosophila* behavior

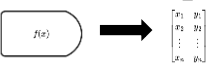
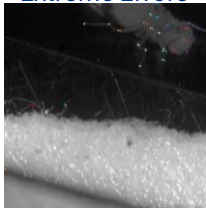
Existing Limitations:

- Extreme errors
- Computationally expensive
- Sensitivity to image imperfections

Objectives:

- Reduce extreme errors
- Reduce latency of pose estimation

Extreme Errors



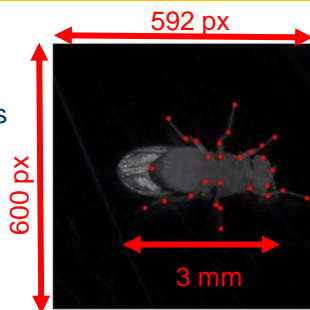
Design Inputs

Constraints:

- C1. Experimental Setup
- C2. Video Properties
- C3. Number of Keypoints

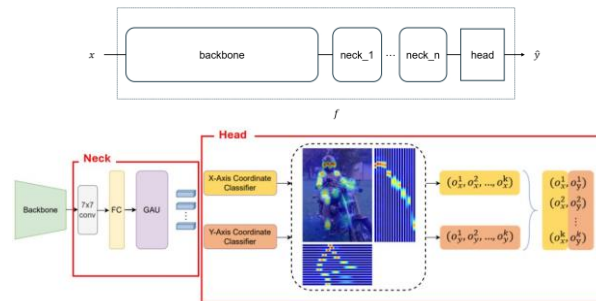
Requirements:

- R1. aPCK error: 5%
- R2. Latency: 15ms

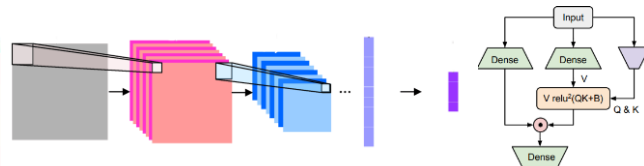


Solution – Design/Build

Neural Network:



RTMPose : **Backbone** – CSPNeXt (ConvNet + CSP); **Neck** – 7x7 ConvNet, FC, GAU; **Head** – SimCC



Verification

aPCK test: Predict keypoints on 562 frames and compare them with human annotations and calculate the percentage of incorrect keypoints

Result: 7.09% FAIL

Latency Test: Run the solution on CPU and measure prediction latencies on 562 frames

Result: 8.32 ms PASS

Network	# of Parameters	Latency (ms)
DeepLabCut	25.28 M	197
Solution	3.619 M	8.32

Future

Increasing the size of the solution could improve accuracy at the cost of latency.

Try out new model configurations to reduce aPCK error and latency of the network

