**Project Title: Real-time Full Fish Detection and Four Key Point Extraction Using OpenCV and/or CNN/DNN on Jetson Xavier NX**

Project Summary

We are seeking an expert algorithm developer to create an algorithm using OpenCV, mathematical formulas, and/or a one or two-layer CNN/DNN for precise, real-time detection of full fish from binary mask images. The objective is to accurately identify full fish and extract four key points (nose, middle of tail, starting top fin, and a point perpendicular to the line from nose to middle of tail) from the binary mask images. These points are labeled in the following figure with the nose as a red circle, middle of the tail as a blue circle, starting top fin as a green circle, and the perpendicular point as an orange circle. The purple and yellow lines in the figure indicate the fish's length and height in pixel units. The solution must achieve over 98% accuracy with minimal execution time on a Jetson Xavier NX computer. Your responsibilities will include full fish detection, consistent key point extraction, deployment and testing on the Jetson Xavier NX platform. You will be given access to our Jetson Xavier NX computer via RustDesk remote software.
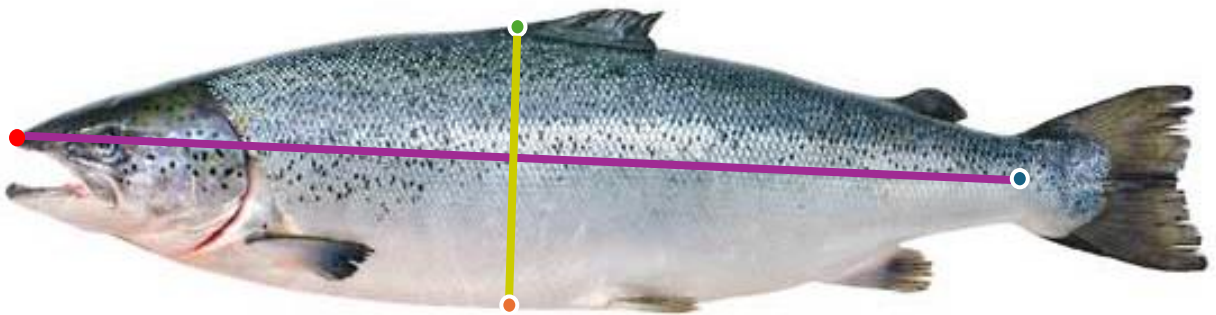
Task List Details

1. **Algorithm Design and Development:**
   - Analyze requirements and formulate an algorithmic approach using OpenCV, mathematical formulas, and/or potentially a one or two-layer CNN/DNN.
   - Design algorithms for real-time detection of full fish from binary mask images.
   - Ensure robustness to handle various fish orientations, partial visibility and potential overlaps in the segmentation masks.
2. **Full Fish Detection:**
   - Implement the algorithm to accurately identify full fish within the binary mask images.
   - Fine-tune parameters to achieve high accuracy (>98%) while maintaining real-time performance on the Jetson Xavier NX.
3. **Key Point Extraction:**
   - Develop algorithms to extract four key points from the detected fish:
     - Nose (Red Circle)
     - Middle of Tail (Blue Circle)

- Starting Top Fin (Green Circle)
- Bottom Point Perpendicular to Nose-Middle of Tail Line (Orange Circle)
    - o Ensure consistency and accuracy in extracting these points across different fish sizes and shapes.
4. **Integration and Optimization for Jetson Xavier NX:**
    - o Optimize the developed algorithms for efficient execution on the Jetson Xavier NX platform.
    - o Utilize hardware acceleration features and optimize resource utilization to achieve real-time performance.
5. **Deployment and Testing:**
    - o Assist in deploying the algorithm onto our Jetson Xavier NX computer.
    - o Conduct rigorous testing using diverse datasets to validate the accuracy and robustness of the full fish detection and key point extraction.
    - o Fine-tune algorithms based on testing results to meet or exceed the project's accuracy requirements.
6. **Documentation and Delivery:**
    - o Prepare a comprehensive documentation detailing the algorithm design, implementation steps, and usage instructions.
    - o Provide all source code written in Python, necessary comments in the code, step-by-step instructions for execution.
    - o Document optimization strategies applied for Jetson Xavier NX.
    - o Following your documentation, our developer will deploy the code and you will provide support for successful deployment.
    - o Provide support for troubleshooting, bug fixes, and performance enhancements post-deployment as needed.